1. ENGAGED SCHOLARSHIP

PAPER ABSTRACTS

Hope Hui Rising, 405, *Multi-Level Design Games for Future-Proofing Post-Flood Cities: Houston as a test case*

Similar to serious games with educational and practical purposes beyond entertainment, design games are effective in generating collaborative solutions to simulated real-life situations in the future (Iversen and Buur 2002, Kyttä, Kaaja et al. 2004). The author proposes a future-proof design game informed by the concepts of multi-scalar community capacity, scenario planning, multi-systems resilience, and adaptation pathways. The Greater Houston region serves as a test case to illustrate how flood adaptation design can be facilitated by these essential components. The multilevel community capacity model has been found instrumental in adapting communities to flooding because the ultimate solutions to flooding involve local, city, county, watershed, and regional level (Davenport, Seekamp et al. 2013). This multi-scalar perspective has been lacking in community resilience literature dominated by inland flooding (Cutter, Ash et al. 2014). Yet, a community's watershed location and distance to the coast could compound inland flooding with riverine and coastal flooding. Three typical community responses to environmental change (resilience, adaptation, and transformation) coincide with three typical climate adaptation attitudes (status-quo with emergency evacuation, adaptation in-situ, and proactive planning for future relocation) (Kates, Travis et al. 2012, Davenport, Seekamp et al. 2013, Maldonado, Shearer et al. 2013, Gromilova 2014). Scenarios have been used to illuminate the consequences of current adaptation attitudes as alternative futures so that trade-offs between alternative futures can be factored into a consensus-based decision-making process in the present (Lebel and Development 2006, Davenport, Seekamp et al. 2013). The interactions of social, health, and flood resilience have been well documented (Tapsell, Penning-Rowsell et al. 2002, Cutter, Burton et al. 2010). A multi-systems approach to resilience enables the use of GeoDesign process as part of the design game to identify suitable locations for accommodating evacuation, adaptation, and relocation scenarios. Adaptation pathways present reactive solutions to instantaneous events, such as tsunamis, and a series of responses over time to an incremental change, such as sea level rise. To prepare for uncertain futures, short-term "no-regret" strategies serve as building blocks of a long-term trajectory to a multi-scalar and multi-systems resilience that enhances future generations' adaptive capacity for environmental change (Barnett, Graham et al. 2014). This research demonstrates the feasibility of using design games to help galvanize interjurisdictional synergies and to engage experts and non-experts in co-creating consensus-based flood adaptation design alternatives across scales, scenarios, systems, and time frames along adaptation pathways that lead to uncertain alternative futures.

Brendan Stewart, Karen Landman, and Daniel Rotsztain, 216, *PlazaPOPS: Tactical urbanism in a vibrant suburban Toronto strip-mall parking lot*

This presentation offers a case study of an active, complex, and in-process 'engaged scholarship' project set in Toronto, Canada. Led by LA faculty members and a recent MLA graduate, plazaPOPS is a high-impact, low-cost pilot project that employs an integrated service-learning and research-based methodology in the design, implementation, and performance measurement of a temporary 'pop up' community gathering space, to be installed and programmed in Summer 2019. Funded in part through the Public Space Incubator, a competitive not-for-profit grant program, the project is situated within a privately-owned parking lot at a vibrant 'mom and pop' strip-mall,

along a wide arterial main street in inner-suburban Toronto — a commercial building typology that is emblematic of the City's development in the early post-war period (Relph, 2013). Built for the car but now used by large numbers of pedestrians, cyclists, and transit riders, a higher than average proportion of whom are new Canadians, these strip-mall streetscapes are important places of community life, despite an inadequate public realm (Farrow and Hess, 2010). With smaller levels of developer-generated investment than elsewhere in the City, and with municipal improvements limited to the relatively narrow strip of publicly-owned right-of-way, there are significant obstacles to enhancing the quality of the public realm following conventional means (Rotsztain, 2018). Inspired by examples of tactical-urbanism (Lydon and Garcia, 2015), the plazaPOPS pilot proposes a new type of privately-owned-public-space (POPS) (Biggar, 2015), that could inform an incremental program of modestly-scaled and strategically-located public space upgrades, each taking advantage of under-utilized portions of strip mall parking lots in large swaths of Toronto, supporting both community life and local businesses. The project engages landscape architecture students through various channels, including an independent study student conducting background research, a graduate design studio developing conceptual design strategies through community workshops, research assistants undertaking pre- and post-intervention analysis, and student involvement in fabrication, installation and site documentation. A series of community organizations are engaged with the project, including partnerships with a Business Improvement Area organization, a local Arts not-for-profit, and a local Arts secondary school, as well as the committed engagement of the local Ward Councillor and City planning staff. The presentation describes the plazaPOPS project design and research methodology, and offers reflections on the risks, challenges, opportunities, and insights that have been discovered at the mid point of the process.

Michael Sánchez and Robert Krikac, 353, *Rural Community Design Initiative (RCDI): A model in transdisciplinary community engagement, participatory design process and experiential learning*

Washington State University (WSU) is a land-grant institution which seeks to continue its tradition of service to society through, in part, an application of knowledge through local and global engagement. Housed in the School of Design and Construction (SDC), the Rural Community Design Initiative (RCDI)—a university / community partnership—endeavors to deliver on the University's mission by harnessing our passion and concern for underrepresented populations and compromised landscapes using "Design" as a vehicle for improving the quality of life in rural communities of the Pacific Northwest. While the field of community engagement scholarship has in some form been a movement in the U.S. since the late 1960s, its early roots of service-learning was primarily centered around student volunteerism. Momentum since the late 1990s has seen the combination of service-learning with civic engagement and with it a new body of knowledge around engaging community through a reciprocal participatory design process, reaping benefits for both the community and university. The purpose of this study is to analyze and document the model of transdisciplinary community engagement utilized by RCDI in delivering a transformative, experiential learning experience to students, confronting and bringing clarity to the complex issues and challenges faced by rural communities of the Northwest while building and disseminating new knowledge of the built environment through the lens of community engagement. This will be achieved first through a case study investigation of two RCDI community projects in Washington. The first is a recent project in the City of College Place, WA in which design standards and guidelines for building design, streetscape design, and public space were produced for the future growth and development of the community. The second case study will be a project that is underway, supporting the City of Royal City, WA in considering a new community center. These case studies will then be compared and evaluated against the current literature in Community Engagement Scholarship by means of an extensive literature review. Results from this study will be used to refine and advance the RCDI's mission and core values as part of a larger initiative, guiding research conducted in the SDC. These outcomes will guide the RCDI in becoming a nationally recognized center and model in community engagement scholarship as well as making it more effective in its contributions and collaboration with the rural communities it serves.

Vaike Haas, 88, *Reconnecting Walking and Biking Routes to School: Suncrest Elementary School, West Virginia*

Walking children build awareness of their physical environment, report more positive emotions, and bond with accompanying caregivers (Ramanthan et al, 2014; Fusco et al., 2013). A Danish study of nearly 20,000 students found walking increased students' ability to concentrate for up to four hours (Niels Egelund, interviewed by Dann, 2012). However, children walking/biking to school in the US decreased from 41-10% in 1969-2009 (Chillón et al., 2014; McDonald, 2007). In West Virginia, 13-20% of students walked to Suncrest Primary School (preK-3) before the school relocated in 2017 to the new Suncrest Elementary School (preK-5) building, just outside city limits. The 0.7-mile (1.1-km) move to a major arterial road reduced walking to <2% of students. The narrow (4.4-ft/1.3-m) sidewalk near school is across a two-lane arterial road, which terminates as a gravel connection to the Rail-Trail. The school's petition for a crosswalk was denied; without markings, walkers to school preferentially cross at an intersection with poor visibility to drivers. Bound by the river and a fenced government facility, the arterial road where the school is located has no parallel local streets. However, by 2018, active commuters began forging shortcuts, with the permission of neighboring property owners; the percentage of students walking doubled from 2017-2018 (from 0.6 to 1.5%). Research suggests the likelihood of walking/biking to school is associated with route options and neighborhood connectivity, factors which should influence school siting decisions (Larsen, et al., 2009). This study identifies deterrents to walking to Suncrest Elementary, quantifying: 1) morning rush-hour traffic near school (drivers, bicyclists/walkers), 2) problem driver behaviors (speeding, failure to yield to walkers at intersections), 3) risk at possible crosswalk marking locations near school (based on: sight distance, vehicular speeds, and time required for walkers to cross). Data collection facilitated discussions with two municipalities (Star City and Morgantown), Monongalia County Board of Education, Suncrest Neighborhood Association, and 79 stakeholders, who influenced a proposal calling for: education, enforcement, and empowerment, as well as alternate walking/biking routes to Suncrest school. In 2017, local officials began to pursue funding for the proposed 1.7 miles (2.7 km) of trails on city/county properties, connecting the school, neighborhood, and Rail-Trail. Through course-based service-learning assignments, landscape architecture students created the trails' initial concepts and continue to help with stormwater calculations and design details. Specifics of this community-engaged service-learning and planning process may be helpful to designers and administrators reconnecting neighborhoods and schools for walking.

Shiyang Zhang, Danzi Wu, Liang Li, and Xiangrong Wang, 124, *Dashilar Micro-Renewal Plan*

Located on the central axis of Beijing, south of the Forbidden City, Dashilar region is one of the most integrated and typical Hutong blocks in Beijing. From June to October 2018, teachers and students from the School of Landscape Architecture(BFU)□together with Dashilar Investment Company and neighborhood committee, carried out a series of field investigations and studies on the regional characteristics and specific problems of the current situation in the cha 'er hutong area, as well as a green micro-renewal practice attempt. The purpose of these studies and practices is to find ways to improve the quality of life and optimize the living environment of residents in Dashilar region. Cooperation Form and Working Method The "Dashilar Micro-Renewal Plan" was launched by a combination of university, enterprise and community. Among them, the School of Landscape Architecture(BFU) is responsible for providing research and practice teams, technology and part of the funding; as the main organizer of Beijing international design week in 2019, Dashilar Investment Company is responsible for providing venues for practice and exhibition, organizing exhibition activities and providing other funds; the neighborhood committee is responsible for providing status information, organizing residents to participate in research and various activities. As one of the responsible teachers from BFU, I worked with students in three aspects: ⊖ Clear the research ideas of green micro-renewal practice and six specific directions of investigation and research; ⊜ Students are divided into

groups to carry out investigation and research mainly in the form of field investigation, interview and image collection, and carry out several discussions. ⊛ Complete the design and construction of green micro-renewal practice base and achievement exhibition. What We Have Done ⊖ Six exhibitions based on specific issues of cha 'er hutong were exhibited in 2019 Beijing international design week: Hutong impression, bicycles in hutong, spontaneous renewal behaviors, daily behavior of residents, green Micro-renewal, and garbage collection. ⊜ As the green micro-renewal demonstration center, No. 12 Cha 'er hutong presents various green micro-renewal methods based on hutong environment to the public. ⊛ The cooperation platform of schools, enterprises and neighborhood committees for the purpose of hutong community renewal was initially established Major Problems and Future Plans The major problems we face are the determination of specific renewal sites, coordination of residents' relations and the financial and policy support. Our future plan mainly includes three aspects: Take community research as a long-term design course for undergraduates, so as to accumulate research results on hutong communities while cultivating students; The green micro-renewal demonstration base is open to residents for a long time and updates the latest research results in a timely manner; Establish more volunteer organizations composed of local residents based on the community itself, and ask government agencies for financial and policy support.

Sophia Meeres, 332, *Arklow: Forest River Main Street Beach*

This paper describes an ongoing research-led teaching studio, the community in which it is embedded and a multi-annual process of engagement that has deepened our knowledge of this place and our relationship with its people. Public participation in the planning process is weak in Ireland. The year-long Arklow studio teaches an approach to understanding place that cannot be gained from desktop study or top-down planning alone. Students engage in deep archival, desktop and in-situ research that includes extensive engagement with local people. The aim is to unravel, analyze and respond more sympathetically to developmental conflicts that affect this town. Historical decisions as well as current plans and future possibilities are critically discussed and shared with the public. The studio seeks to bring about real change in the planning of the town and its environs. Arklow, population 13 000, is located 70km south of Dublin, at the mouth of the river Avoca. Once a fishing village, successive industries transformed the river, its estuary and the town's relationship with the sea. Now a working-class backwater, Arklow lacks infrastructure and employment, but is designated for fast-growth as a dormitory for Dublin. And yet this settlement is also a fascinating community. Rich in kinship, and shared history, located in a unique, beautiful if somewhat damaged landscape Arklow has potential that is being overlooked. Our aim is to bring this potential to the attention of the town itself. The presentation describes events held under the title "Arklow Through the Eyes of Strangers". Focusing on natural assets, the work reminds the town of things it once knew about itself, but has perhaps forgotten. It imagines "Future Arklow" as a confident town, self-sufficient, an attractive place to live and work. It proposes alternatives to the dormitory and asks the public to contribute and voice opinions. One event is described in some detail: a tea-party that particularly touched the people of Arklow. Children who wrote in the Irish Folklore Commission's (IFC) 1937-38 Schools Collection are today in their 80's. We used the Collection to trace authors still living in Arklow, and invite them to become venerable speakers at our tea-party. Some of the town's eldest inhabitants shared memories with (old) friends, family, the public and students. The outcomes of the process were multiple: we learnt as much about the community of Arklow today, as we did about Arklow's changing landscapes and gained the community's trust in the process.

Brad Collett, 486, *Engaging a Legacy in the Tennessee River Valley*

The Tennessee River Valley's legacy of innovation, regionalism and instrumentalizing landscape to overcome grand challenges is a fertile territory for contemporary inquiry and sustained engaged scholarship. The Tennessee River Project is a multi-year teaching, outreach and research initiative that seeks to resituate that legacy in the context of

emergent 21st century challenges. Climate change, unprecedented economic and population growth, and their respective cascades of social, economic and ecological consequences mandate that a region presently dominated by conservative politics and short-sighted, technocratic land development practices be reintroduced to its legacy of innovative planning, design and regional collaboration. This presentation tracks the arc of activity and strategy behind the Tennessee River Project as a sustained engagement initiative since its inception in 2016, its origins in complementary engaged scholarship at local and sub regional levels that preceded it, and the initaitve's trajectory as an agent for reestablishing the role of planning, design and system-level regional thinking in addressing contemporary challenges posed to this legacy-rich landscape. Specific examples of ongoing regional engagement initiatives derived from course outcomes and faculty creative activity will be used as a basis for discussion of efficacy of sustained engaged scholarship to these ends.

Joshua Cerra, Victoria Chanse, Chingwen Cheng, Kevan Klosterwill, and David Pitt, 313, *Engaged Scholarship to Catalyze Adoption of Design Strategies for Climate Change Adaptation and Mitigation – Part 1*

Inspired by this year's CELA2019 conference theme "Engaged Scholarship: Bringing together research, teaching, and service" and its resonance with our own community-engaged research and teaching, we envision an opportunity to share and discuss with CELA participants the potential for engaged, participatory action research programs to inspire community awareness and action in the face of climate change. This work revolves around the value of the engaged scholarship "process" as much as the "products" that design studios co-generate with communities to understand the role of engaged scholarship in catalyzing community awareness and action toward climate adaptation and mitigation in landscape design and planning. This panel session focuses on the coupling of engaged scholarship and design studio activities related to climate change adaptation and mitigation in the context of community design. It describes strategies for integrating scholarship with design studio activity while engaging community stakeholders in climate adaptation and mitigation-focused design efforts in diverse biophysical and socio-cultural settings. Presentations of case studies from Cornell University, Arizona State University, University of Maryland, and University of Virginia examine the potential for coupled studio/engaged scholarship efforts to: a) generate alternative design scenarios in pursuit of strategies for climate change adaptation and mitigation; and b) begin to evaluate the effectiveness of engagement methods for incenting action toward climate adaptation and mitigation in specific communities. A review and meta-analysis serve as a prelude for inviting audience members to participate in a guided evaluative discussion of the challenges and opportunities for coupled studio/engaged scholarship efforts in inspiring action toward climate change adaptation and mitigation in communities. Conduct of the panel session seeks to attract and promote a peer network of scholars working to develop social-ecological systems-based approaches that compare and advance the efficacy of coupled studio/engaged scholarship efforts in enhancing climate awareness and catalyzing change in communities threatened by climate impacts across a range of climatic, biophysical, and socio-cultural contexts.

Sadik Artunc, 143, *Scholarship of Teaching through Engaged Scholars*

Whether it's at the university or the classroom level, all educators have the obligation to teach well and to foster important forms of student learning. A more scholarly approach to teaching entails practices of classroom assessment and evidence gathering informed not only by the latest ideas in the field, but by current ideas about teaching the field and the effectiveness of its impact on student learning. Some of the pedagogical approaches that have long been used for landscape architectural education, becoming more popular in non-professional curricular. These include but are not limited to "experiential learning", "project-based learning" and "service-learning." "A scholarship of teaching will entail a public account of some or all of the full act of teaching – vision, design,

enactment, outcomes and analysis in a manner susceptible to critical review by the teacher's professional peers and amenable to productive employment in future work by members of that same community." (Shulman, 1998) Addressing the gap between classroom practice, professional learning and educational research marked the work of educator Ernest Boyer. He used the term scholarship of teaching to validate teaching as a scholarly activity, not "as a routine function, tacked on, something almost anyone can do." He argued excellent teaching is much more than artfully transmitting information to students – it's about transforming and extending knowledge and is marked by the same habits of mind that characterize other scholarly work (Hutchings & Shulman, 1999). Teaching, he believed, should be taken more seriously as a profession, much like medicine or law. I believe that recognition of "Academic Practice" as opposed to "Private Practice" or "Public Practice" in professional of landscape architecture is small step toward that goal. This presentation will discuss on opportunities and challenges created by "experiential learning", "project-based learning" and "service-learning" as pedagogical means in scholarship of landscape architectural teaching. The presentation will share examples of how these methods prove most effective not only for education of students in professional curricula but also for development of faculty as engaged scholars of teaching and professional practice of landscape architecture. It is hoped that a better understanding pedagogical theories behind these means would provide more effective engaged scholarship for improvement of education and advancement of the profession of landscape architecture.

Lori Catalano, 246, *Community-Based Engagement: A critical reflection*

The idea of connecting university classrooms to real-world problems is not new and there are many successful faculty and programs doing this type of work. It is common to have multiple faculty engaging in real world projects, albeit often doing so separately and independently from one another and typically with different municipal or community partners. It is less common to coordinate such engagement across a department or university, and to direct this larger scale effort to a single city or community for a longer duration than one semester. Based on the presenter's involvement in community engagement endeavors at the course level, the department level, and as the interim program manager for a campus-wide initiative covering 17 projects over two years within one community, this presentation compares three case studies: one for each kind of partnership. • Individual faculty/Community partnerships • Department or program/Community partnerships • Higher education institution/Community partnerships This comparative study uses two different lenses to analyze the effectiveness of these partnerships. The first lens focuses on the positive potential of community-based engagement. It uses the three essential components for authentic community-higher education partnerships identified in Portland State University's report of the Community Partner Summit (Community-Campus Partnerships for Health, 2006-08, p. 13). 1. Quality processes (relationship-focused, characterized by integrity; trust-building; acknowledgement of history, commitment to learning and sharing credit); 2. Meaningful outcomes (specific and significant to all partners); 3. Transformation (at individual, institutional and organizational, and societal levels). For the second lens, the author uses criteria identified by John W. Eby in his paper titled "Why Service-Learning Is Bad," March 1998, to compare and reflect on these projects for potential negative impacts. 1. Service-learning grows from mixed motives; 2. Service-learning is based on a simplistic understanding of service; 3. Service-learning teaches a false understanding of need; 4. Service-learning teaches a false understanding of response to need; 5. Service-learning diverts attention from social policy to volunteerism; 6. Service-learning encourages diversion of agency agendas; 7. Service-learning can do harm. This presentation is meant to challenge preconceived notions that all community-based engaged is good and, more importantly, to encourage honest reflection about the positive and potentially negative impacts of these kinds of partnerships.

Ole Sleipness, David Anderson, David Evans, Jake Powell, Roslynn McCann, and Jason Parkinson, 378, *Engaged Scholarship through Extension Landscape Architecture: A model framework for assessing impacts*

Many landscape architecture programs have rich legacies addressing tangible design dilemmas through community engagement, service-learning, and engaged scholarship (Angotti et. al, 2012). Those situated in land-grant universities often frame these activities as contributory to their institutions' missions. While land-grant outreach is often stewarded by Extension faculty—both on-campus and county-based—who share applied, technical, and research-based information with statewide and local constituents, few Extension faculty are housed within landscape architecture programs, despite the discipline's rich legacy of community engaged projects. Of the few programs that maintain Extension landscape architecture faculty, little research has been published on how Extension augments and facilitate programs' engagement of community-based design issues (Sleipness, et al., 2016. This study assesses impacts of Utah State University's Extension landscape architecture program's known engagement work over several decades. Archival research identified the program's extensive body of work, comprised of over 250 known projects performed over four decades. During this initial investigation, projects were inventoried, characterized, and catalogued according to project typology, site scale, geographic setting, decade initiated, and level of engagement with departmental faculty, students, community members, and others. From these known projects, 20 projects were selected for further investigation based on selection criteria including: availability of original design documents, willingness of key informants to be interviewed, and diverse representation of project typology, setting, scale, and other dimensions. In-depth investigation of select projects included on-site observation and documentation, semi-structured interviews of key project informants, and examination of project impacts within their local and regional contexts. The study found significant variation among projects' outcomes, potential for projects clustered within proximity to achieve regional impacts, and the role of the department's vertically-integrated annual charrettes in catalyzing additional work for both the department and professional design firms. We also illuminate some logistical realities for programs nationally for documenting and studying their own bodies of community engagement projects over time. While examined projects demonstrated profound and positive impacts, convenient and comprehensive data on the full roster of projects from the program's four decades proved elusive, due to changes in personnel, technology, and erosion of institutional memory. As design programs strive to accurately assess the value of their work, this study offers a model framework for how programs can maintain comprehensive records and ongoing assessment of their community-based design engagement for retaining institutional memory—and future research investigations.

Kristine Miller and Rachel McNamara, 345, *Challenges and Opportunities in Equity-Driven Practice*

The purpose of this study is to better understand the challenges and opportunities for advancing equity through landscape architecture practice. Equity in this study is defined as "just and fair inclusion into a society in which everyone can participate and prosper." This study emerged from a long-term collaboration between Juxtaposition Arts and the University of Minnesota's Department of Landscape Architecture called ReMix. Remix envisions the Twin Cities' environmental design professions as diverse and equity-focused. Since 2005 we have collaborated on teaching, research, and engagement efforts. We offer equity-focused environmental design experiences for young people of color and/or low income at Juxtaposition Arts, for undergraduates across the University of Minnesota, and graduate students in the Department of Landscape Architecture. We conduct community driven design and research projects on a range of equity issues including transportation, public space design, and education. Informal conversations with ReMix grads pointed to a need to learn from professional landscape architects working in different sectors about their experiences advocating for equity through their work. With funding from the UMN Undergraduate Research Opportunities Program, UMN student Rachel McNamara conducted (interview-guide) interviews with fifteen Twin Cities landscape architects and designers during the Summer and Fall of 2018.

Interviewees practiced in public agencies, non-profit organizations, and private design firms. Through analysis of interview data we found similarities and differences among how practitioners view the possibilities of advocating for equity from their particular professional positions. For instance, public sector designers see opportunities to help remove obstacles faced by community members who want to participate in decision-making. However, the time they spend removing barriers to participation through more innovative and sustained engagement strategies counts directly against the project's overall construction budget. Private sector practitioners expressed that if a designer is perceived by their employer or potential employers as an "activist," it can diminish their job prospects. Private sector designers also felt that design training for students interested in equity needed to be a "both/and" where students gain a strong base in traditional technical skills and knowledge about how professional designers can use their skills to advance equitable outcomes. All designers reported a reticence to change within the field because equity is seen as too complex an issue to tackle and a need for more professional designers of color in the Twin Cities.

Joshua Cerra, Victoria Chanse, Chingwen Cheng, Kevan Klosterwill, David Pitt, 313, *Engaged Scholarship to Catalyze Adoption of Design Strategies for Climate Change Adaptation and Mitigation – Part 2*

Inspired by this year's CELA2019 conference theme "Engaged Scholarship: Bringing together research, teaching, and service" and its resonance with our own community-engaged research and teaching, we envision an opportunity to share and discuss with CELA participants the potential for engaged, participatory action research programs to inspire community awareness and action in the face of climate change. This work revolves around the value of the engaged scholarship "process" as much as the "products" that design studios co-generate with communities to understand the role of engaged scholarship in catalyzing community awareness and action toward climate adaptation and mitigation in landscape design and planning. This panel session focuses on the coupling of engaged scholarship and design studio activities related to climate change adaptation and mitigation in the context of community design. It describes strategies for integrating scholarship with design studio activity while engaging community stakeholders in climate adaptation and mitigation-focused design efforts in diverse biophysical and socio-cultural settings. Presentations of case studies from Cornell University, Arizona State University, University of Maryland, and University of Virginia examine the potential for coupled studio/engaged scholarship efforts to: a) generate alternative design scenarios in pursuit of strategies for climate change adaptation and mitigation; and b) begin to evaluate the effectiveness of engagement methods for incenting action toward climate adaptation and mitigation in specific communities. A review and meta-analysis serve as a prelude for inviting audience members to participate in a guided evaluative discussion of the challenges and opportunities for coupled studio/engaged scholarship efforts in inspiring action toward climate change adaptation and mitigation in communities. Conduct of the panel session seeks to attract and promote a peer network of scholars working to develop social-ecological systems-based approaches that compare and advance the efficacy of coupled studio/engaged scholarship efforts in enhancing climate awareness and catalyzing change in communities threatened by climate impacts across a range of climatic, biophysical, and socio-cultural contexts.

Jacques Abelman, Yekang Ko, Kory Russel, and Junhak Lee, 94, *Landscape for Humanity: New design pedagogies for critical landscape engagement*

We are currently bearing witness to the unfolding of urgent ecological, spatial, and social questions within the context of climate change in a rapidly changing world. Landscape architects are poised to take up these challenges; their professional and intellectual skillset has a great capacity for engagement around questions of sustainability, resilience and justice. Not only do landscape architects have the capacity to generate concrete design solutions, they

have the potential to operate as leaders capable of mediating complex processes of change through spatial scales, large timeframes, and ecological processes (The Landscape Architecture Foundation, 2016). Landscape for Humanity is a proposal for engagement through design in landscape architectural education. It aims to bring cutting edge interdisciplinary research focusing on the Food- Energy-Water (FEW) nexus (Bizikova et al., 2013) to bear on the sites and communities where it can have the most impact. Now, more than ever, the knowledge and training being generated within academic programs must address real-world problems in order to form the leaders of tomorrow. (Bose et al., 2014). As a new pedagogical model, Landscape for Humanity interweaves three major components: i) a critical theory framework for evidence-based learning incorporating the FEW nexus through issue-based seminars, ii) action-based design studios where the framework is applied using human-centered design, co-creation and leading-edge geodesign based on the Research Through Design (RTD) approach (Sanders & Stappers, 2008) (Lenzholzer, Duchhart & Koh, 2013) and, iii) leadership and entrepreneurial training for community engagement realized through collaborations with local and international NGOs, master's projects, and post-graduate careers. The University of Oregon Department of Landscape Architecture will serve as a laboratory to experiment with this pedagogical model. Our goal is to create landscape architectural leaders with an entrepreneurial, resilient and critical approach. Our research and engagement platform integrates interdisciplinary perspectives from our faculty's expertise in design, planning, engineering, and geospatial science around FEW and applies them to real world collaborations with community groups and NGO's. The program establishes direct links between design studios, seminars, and master's theses with the sites, communities, and organizations that can benefit the most. Landscape for Humanity will establish a new pedagogical paradigm that specifically aims to educate landscape architects who will become innovative leaders engaged with and solving the critical issues that threaten vulnerable populations and species. Short-term outcomes will be issue-based seminars on FEW, hands-on projects and intensive service-learning periods resulting in built projects and changed communities, and skill training modules for leadership and entrepreneurship in landscape architecture. Our long-term goal is to make this model available to other landscape architecture programs around the world as a tangible way to execute the New Landscape Declaration.

Jeffrey Hou, Kofi Boone, Mallika Bose, David de la Peña, and Michael Rios, 245, *Educating Design Activists in Landscape Architecture*

The field of landscape architecture is experiencing a surge of interest in design for transformative social outcomes broadly defined as design activism. As evident in recent award-winning student entries as well as common topics among studio projects and study abroad programs, socially engaged design and professional responses to urgent social and environmental challenges has become a growing aspiration especially among students and emerging practitioners. The Landscape Architecture Foundation's New Landscape Declaration (2017), with a strong focus on social and ecological justice, resilience, and democracy, is also indicative of this growing interest. A recent online conversation on activism through design hosted by the McHarg Center (2018) at Penn provides further evidence of a desire for broader conversation. In the meantime, despite the growing interest, design activism is addressed specifically in a limited literature (e.g., Hester, Jr., 2005; Hou, et al., 2005; Fuad-Luke, 2009), and relatively little has been explored in the context of professional education. Is the current model of landscape architecture education meeting the challenges of our time? Are students acquiring the necessary knowledge and perspective to address these urgent issues of equity, justice, and climate adaptation challenges facing vulnerable communities that traditionally lie outside the scope of professional practice? Are we preparing the next generation's leaders who can elevate and position the profession to be at the forefront of the movement? How can we prepare students to become not only competent practitioners but also design activists who are socially and politically engaged to produce transformative outcomes? This panel will assemble a group of leading and emerging educators in landscape architecture to discuss challenges and opportunities on educating and nurturing design activists and leaders in the field. Building on the current literature on service-learning, community engagement, and public interest design

education (e.g., Angotti, et al., 2011; Bose, et al., 2014; de la Peña, et al., 2017; Abendroth and Bell, 2018), the discussion is expected to produce insights and identify frameworks and approaches for advancing current educational practices in landscape architecture. As an interactive session, following short presentations by the panelists, we will engage the audience in collectively defining design activism, identifying common challenges and gaps in curriculum, and sharing strategies for success.

Mark Lindquist, 280, *Co-designing Resilience: Engaging residents in the design and application of a video game-based decision support system*

Green infrastructure (GI) can have a positive ecological and social contribution in urban environments and is also seen as an essential component in efforts to rebuild the resilience of legacy cities. Despite the recognized importance of GI there is a missed opportunity to more fully involve residents in GI planning and design, which can lead to more successful and resilient outcomes. Integrating the concept of ecosystem services (ES) into public participation processes can enhance outcomes but requires robust decision support systems (DSS) that can more effectively incorporate community needs. Complicating this integration is the challenge that the value of specific urban ES will vary greatly both between and within cities, influenced by the environmental and socio-economic characteristics of the community in question. As such, collaboration and engagement with community members to specify the ES that are important and meaningful to them must be a part of any GI imitative and requires a DSS that is flexible and adaptable to different communities and contexts. This paper describes the development of a novel DSS engaged local residents in identify stakeholder needs which were then incorporated into a 3D visualization based DSS using the Unity game engine. The DSS is evaluated in the context of a Greenway planning and design project in the City of Detroit that included multiple stakeholders with varying interests and the success of the DSS assessed. The paper ends with the identification of future research needs.

Kris Fox, 128, *Design Emancipation Technology: Giving purpose to BIM/LIM through community-based design*

Dozens of articles on Building Information Modeling / Landscape Information Modeling (BIM/LIM) have been published during the past ten years, however their focus has been on project workflow and communication efficiencies. The purpose of this paper is to reframe how BIM/LIM, mass customization, and modular construction strategies could be used to increase public engagement in community-based design. Using the case of public school playground design involving parent groups in Vancouver, British Columbia, Canada, the paper will demonstrate how BIM/LIM (type interface) can be used effectively to enable landscape architects to work with community interest groups to facilitate their participation in co-design, project planning and construction management. In addition to enhancing community engagement, reframing the use of BIM/LIM also offers new opportunities for Landscape Architects to work collaboratively with a wider range of participants in the construction industry. Specifically, this paper will illustrate how BIM/LIM can be creatively used to better realize design and construction costs in real-time, better manage the sequence of design, and allow for phasing strategies to spread costs. If this software were publically accessible as a web-based tool, it would enable non-professional users to better understand the design process and development context prior hiring design professionals. Additionally, such a BIM/LIM type of interface, simplified for public web use, could be coupled with other web resources, such as the award winning Outdoor Playbook, which is a "how to" guide for Canadian parent groups tasked with designing playgrounds. BIM/LIM can also enable involvement of multiple interests in identifying material and modular element choices and cost options to make project costing more transparent and reduce 'guesswork' in taking design concepts through to construction. By making BIM/LIM web-based tools available and demonstrating their advantages and successful project applications can also create a shift in North American landscape construction to

adopting the BIM/LIM "process". BIM has the potential to have a huge impact in the design and construction industries, but its potential use is not well understood or developed. By demonstrating its role through the Vancouver case experience this paper will illustrate how it can be effectively used in both community-based design and construction management.

Carolina Segura Bell and Barb Young, 200, *Branching Out: Engaging community through interdisciplinary, vertical, collaborative design charrettes*

University of Kentucky Design Week began in 2012 as a collaboration between Design Workshop, a landscape architecture, planning and urban design firm, and the University of Kentucky Landscape Architecture program housed in the College or Agriculture, Food, and the Environment. Design Workshop introduced students to their collaborative, community-driven, practice through a week-long charrette. In 2015 third-year students from the Interior Design program in University of Kentucky's College of Design joined Landscape Architecture in a similar charrette experience with ongoing studio partnerships. This interdisciplinary collaboration has continued each subsequent year through engagement with the local community, including representatives from the city-county government, to identify and provide new perspectives on design opportunities within the city's landscape. According to Boyer (1996), "the search for answers to our most pressing social, civic, economic, and moral problems" can be accomplished through community-engaged scholarship. Community engaged learning experiences, such as Design Week, can provide opportunities for students to participate as citizens in their communities and allow them to practice design thinking and application to current issues. Design Workshop boasted the benefits of collaborative design processes which benefit students, faculty, professionals, and the community. This mutual benefit is also reflected in the literature on community engaged scholarship (Ash and Clayton, 2009; Bringle and Clayton, 2012; Boyer,1996; Furco, 1996). The purpose of this study is to identify areas of impact for each participating stakeholder group. UK Design Week 2018: Branching Out, will be presented as a case study. The project scope targeted a proposed new park in downtown Lexington, Kentucky. The park will be at the culmination of a trail and streetscape which will connect smaller, pocket parks, through downtown. Students studied accessibility to the proposed park from neighboring communities. Design Week activities included keynote presentations from the city, a local design consulting firm, a case-study field trip, and two afternoon team workshops. Following Ash and Clayton (2009), community engaged learning experiences should seamlessly combine academic learning, community engagement, and critical reflection on experiences. Students who participated in Design Week were asked to write essays, complete surveys, and engage in class discussions. The community and professional stakeholders provided reflections through presentations, on social media, in surveys and in interviews. This qualitative approach to gathering perspectives aims to identify areas of impact for each stakeholder group. This presentation will identify areas of impact, benefits, and challenges to working in interdisciplinary, collaborative, and vertical studio structures for engagement.

Maren King, Robin Hoffman, and Elena Juodisius, 268, *The Evolving Dynamics of the Engaged Scholarship of Sustainable Community Development*

The Evolving Dynamics of the Engaged Scholarship of Sustainable Community Development Our academic community design and research center was established in 1999 to facilitate students and communities members working together to build knowledge and tools to create and manage sustainable communities. Although our mission has remained constant, our approaches and practices have evolved. Established in response to requests for assistance and a desire to institutionalize community based service-learning, the initial focus of education and evaluation was student learning. Team teaching in foundation studios included participatory methods; students were well prepared through instruction and practice to engage with residents in vision planning and site design projects.

Evaluation indicated that these projects were positive learning experiences for students and community members, yet it was evident that while students advanced their knowledge and skills, higher level outcomes for community members and their communities were not being achieved. Several factors, including involvement in the Erasing Boundaries Consortium (Angotti et al, 2011), shifted the balance in our education and research activities to be more inclusive of our community partners. Our approach has continued to evolve, establishing partnerships for collaborative learning to meet the goals and build on the strengths of the community with whom we work. This has provided diverse opportunities for our students, outward focused research and service projects for faculty, and establishment of community design education programs; however, the inclusion of participatory methods and projects through required studios has declined. This study reflects on the changes that have occurred over the past two decades, the internal and societal influences, and the benefits and challenges of a practice that seeks to provide a meaningful connection between an academic institution and its local and regional communities. The intent is to open the discussion about our role as educators of future landscape architects and of the broader society to support engaged and educated community members who are essential in the creation of sustainable, resilient and just communities (Athman, et al, 2001. Barth,et al, 2017). Methods include: 1. interviews with current and past faculty collaborators and community partners, 2. analysis of student evaluations, community process and reflections, and 3. literature review of sustainability and contemporary approaches that promote the opportunities to create values, develop attitudes and acquire skills and knowledge. Initial findings include the need to find meaningful ways to fit iterative opportunities for engaged scholarship as an integrative practice into an already full curriculum. Understanding that there are different purposes of engagement and community participation should guide deliberative program decisions and partnerships with organizations. While research indicates that learning in and with social groups and different disciplines can lead to new insights and innovations to address many of the complex'wicked problems' which we face (Hurlbert And Gupta, 2015), this social learning can be very time consuming, and may need to be integrated through projects and research outside of the core curriculum.

Rebekah VanWieren, 495, *Vacant Land Regeneration on Reservation Land*

The Town of Poplar, located on the Fort Peck Reservation, is challenged by the complexities of blighted properties in transition from past industrial uses and disinvestment within a rural context. Many of these properties are vacant, brownfields, or simply not maintained, creating community spaces that feel unsafe, underutilized, and contribute sediment and potential contaminants to the local watershed. The regeneration of these properties has immense potential to improve ecological and social conditions (Nassauer and Raskin, 2014). This case study presents a unique partnership among the Assiniboine and Sioux Tribes Office of Environmental Protection, the US Environmental Protection Agency (EPA), and a landscape design service-learning studio to regenerate a vacant lot through the use of green infrastructure. The partnership has also helped lay the groundwork and engaged citizenry for the Town's first master planning process currently underway. Working site plans and the participatory design process will be discussed with a focus on the multitude of landscape benefits that result from green infrastructure and partnerships to regenerate vacant land (Foo et al., 2014). The presentation will also explore the state of vacant land on Native American Reservations, and the unique challenges and opportunities within this landscape and cultural context that differ from urban vacant land.

Bob Scarfo, 37, *Setting New Research Agendas: Building resilient communities on resilience in youth [Abtract missing]*

Holly Nelson, Christina Kaunzinger, JeanMarie Hartman, Edwin Gano, Lena Struwe, and Laura Lawson, 354, *Engaged Learning in the Campus Landscape*

Land grant institutions have historically used the campus landscape as a classroom and laboratory for teaching, research and outreach on agricultural topics. Contemporary challenges urge us to expand this model of engaged learning beyond traditional agriculture to a diverse array of sustainable landscapes and practices. We are using our resources – our land, our students, our curricula, and our Facilities staff – to catalyze transformation of our campus landscape to a Living Laboratory, where students design, install, monitor, steward, and communicate landscape solutions to 21st century problems. This endeavor is about designing and making – about creating real places in the educational landscape where the Rutgers community can learn, relax or socialize. These student-designed landscapes are activating a conversation about engaged scholarship and sustainability on campus. The Living Laboratory is part of a new University-wide initiative that aims to enhance and link hands-on research and education through a network of on- and off-campus resources and experiences in gardens, forests, and biodiversity collections to enhance and innovate college education, promote lifelong learning, and enrich human lives as part of sustainability and conservation of global natural resources. Called the "Scarlet Pimpernel", this project creates connections to arts and humanities, as well as business, engineering, medical programs, and more--within the university and reaching to the world outside of Rutgers, together becoming more than the sum of our parts. This program grew out of grassroots faculty, staff and student efforts and is supported by The Office of Academic Programs at the School of Environmental and Biological Sciences. This paper describes our vision for engaged learning in the campus landscape, our early successes and current challenges. First achievements include a Living Lab meadow and garden complex that surround the New Jersey Institute of Food, Nutrition and Health (IFNH). The mission of the Living Lab complex and IFNH are complementary and their proximity enhances messaging. IFNH is housed in our newest, sustainably-designed campus building and its Harvest Café features "Menus of Change" promoting healthier, more sustainable, plant-forward diets. Scarlet Pimpernel bi-weekly "drop-in" lunches bring faculty and staff of diverse disciplines to this table, disintegrating academic silos. Challenges inhibiting our success include an understaffed Grounds crew, conflicting definitions of landscape stewardship, lack of education on natural ecological dynamics and ecosystem services, and the academic reward structure. Our approach can serve as a model for how integrative and experience-based learning can work outside as well as inside for all universities.

C.L. Bohannon, 487, *Utilizing the Residential College Model to Fuse Leadership, Social Change and Community Engagement*

This presentation focuses on the potential of the residential college model to extend the place-based learning ethos of Landscape Architecture beyond the discipline. Drawing on previous scholarship examining the intersection between community engagement and engaged scholarship, this work assesses the shared values of the place-based education model within Landscape Architecture and the residential college model to understand the contours, and potential, of transformative and immersive learning experiences. Fusing place-based education into a residential college model has the potential to empower student learning, faculty teaching, and research, and importantly positions students to develop critical capacities in leadership and social change. The Leadership and Social Change Residential College at Virginia Tech is built on the premise of establishing community through lasting faculty-student engagement via activities such as guest lectures, educational seminars, and access to sustained faculty-student engagement, which has the potential for transformative learning experiences within the Appalachian region and beyond. Enduring interactions with live-in faculty allows for students across disciplines and academic levels to create a thriving sense of community that supports academic and community engagement, which is similarly an essential component of community-engaged design. This presentation seeks to demonstrate how the residential college model 1) encourages students to embrace an ethos of social responsibility as part of their academic journey; 2) illustrate programming, college structure, and course offerings that empowers students to become leaders for inclusive, equitable, and sustainable social change that extends beyond their experience at Virginia Tech, and 3) cultivates knowledge about the interconnectedness of the most pressing social issues in effort to prepare students as future leaders to effectively respond in culturally and socially responsible ways. The presentation will explore the

implications of the intersectionality of the residential college model and design education in Landscape Architecture. How do residential college experiences prepare students to become more aware of complex issues in the natural and built environment? The results from this presentation will contribute to current discourse in design education research about transformative education practices, community engagement, and leadership development.

Jayoung Koo, 228*, A Balancing Act: Scoping out the boundary between service-learning and community design*

Design instruction with an emphasis on service-learning through community engagement has become a common experiential learning teaching methodology in higher education settings. Faculty, students, and the client/community greatly benefit from this type of educational training strategy which is a natural process for many landscape architecture projects (Angotti, Doble, & Horrigan, 2011; Bose, Horrigan, Doble, & Shipp, 2014). However, engaged community design work and service-learning projects are intertwined, complex and often contradictory from an educational perspective. Therefore, the instructor must carefully structure and effectively choreograph a balance between obtaining quality student design outcomes and fulfilling the community's needs. Engaged service-learning design studio teaching requires considerable preparation of multiple factors to address a community's goals while covering intended course learning objectives associated with the planning and design project. Crucial factors that influence not only design outcomes but also community impact include the teaching and learning environment, the students' abilities, and the community's preparedness as well as the overall dynamics and motivation of all parties involved in the project. This study compared and contrasted six years of undergraduate service-learning projects at various scales, scopes, and geographic contexts within the state of Kentucky. The goal of this study was to identify a process or method to achieve a balance between studio instruction service-learning goals and objectives and the client/community's desired outcomes. The study qualitatively assessed a community design and engagement studio course through curriculum structure, student observations, and design outcome assessments while also considering factors such as the community partner, project structure, deliverables, and project timeline. Other considerations included design related courses in which students were concurrently enrolled as well as external factors or extracurricular events influencing the students' performances in the studio. Throughout the six years of evolving engaged service-learning projects, smaller groups with a balance in team responsibility proved to be an effective work scale. The students' motivation to fully engage in the course was influenced by life events and other outside priorities. Other findings indicate that technical aspects tend to overshadow the importance of exploratory critical design thinking in real projects. The geographic location of the community projects does not seem to affect the frequency of voluntary visits to project sites. Ultimately, the balance between community engagement and design instruction needs to be prioritized based on the emphasis of the partnership/collaboration, while not sacrificing the quality of work in a context-sensitive manner.

Blake Belanger and Howard Hahn, 294, *Eight Years of Engaged Scholarship in Community Planning and Design Studio*

This paper presents a broad overview of findings from teaching an 8-week summer Community Planning and Design Studio for mid-level MLA students between 2011 and 2018. The studio is coupled with a graduate seminar course designed to support the studio through topical substantive readings, discussions, and individual student research. Two landscape architecture professors co-authoring this paper the courses together for the entire 8-year study period, which witnessed both professors earning tenure and promotion to Associate Professor. Each year the studio engaged a different community across four states and received external funding ranging from $1,000 to $30,000. The professors and students used a variety of community engagement methods to work with project partners, stakeholders, and community members to collect data, hone research inquiries, shape studio goals, and

refine planning and design proposals. While outcomes varied slightly, the studio typically culminated in a formal presentation to partners and stakeholders, a public open house exhibit of student work, and a 300 to 600-page professional report. The consequence and significance of studio outcomes has also varied, ranging from little or no action from project partners to significant impact on planning dialogue, planning documents, and redevelopment strategies. Eight years teaching engaged scholarship in a community planning and design studio provides five primary findings: -geographic size of study area and distance from campus influences studio products -type, motivation, and agency of partners influence community engagement and implementation -engagement methods must be understood and adapted for situational conditions -the studio research and design method should be optimized for community consumption -external funding is available To arrive at our findings, we analyzed 45 variables for each year the courses were offered, organized into four categories: Background, Methods, Outcomes, and Impacts. Depending on the variable, we used quantitative metrics and/or qualitative assessment to document the results. Background variables include information such as location, size, distance from campus, engagement partners, goals, and external critics. Methods variables analyze the teaching, research, and engagement methods used each year. For the Outcomes category we analyzed variables such as the design team proposals, project-specific deliverables, presentation format, and executive summaries. To evaluate studio Impacts such as contribution to community planning dialogue, influence on planning documents, and redevelopment, we interviewed project partners, researched media articles, and reviewed revised planning documents. Our findings may inform other faculty developing engaged scholarship studios. Future research will focus on specific aspects of the courses in greater depth.

Will Green, 304, *Interdisciplinary Studios, Problem-solving with a Focus: Collaboration, engagement and communication for creating sustainable places*

Interdisciplinary studios, problem-solving with a focus: collaboration, engagement and communication for creating sustainable places The benefits of service learning studios and engaged scholarship are well documented. Years of presentations and papers from faculty have reported on projects and techniques for creating designs, reports and providing service to diverse communities and municipalities. They have also assisted faculty in attaining tenure and promotions. As demands from within and outside of the academy have changed along with environmental, economic and social conditions, faculty directing community design studios are being pressed into being more creative and entrepreneurial while delivering the requirements of existing syllabi and curricula. This is a paper about the demands placed on faculty who choose to lead community design studios and it offers a studio method that has evolved over twenty-five years and provides opportunities for students to engage with a public client or stakeholder group while addressing complex issues associated with climate change and sea level rise. The author will describe the process and role of faculty in finding and selecting projects and clients; defining tasks, services, and outcomes; and in directing and administering a collaborative process with many moving parts. It is a process that brings together students, stakeholders, officials and designers that requires a shared commitment between faculty and stakeholders acting as clients. The studio is used to educate and teach students about a design process, the importance of public engagement and methods used to understand sites and communicate sustainable outcomes. To illustrate the presenter will select two public projects: 1) creating a sustainable main street that is integrated with a forgotten river, and 2) an urban riverfront with bridge crossings, circulation needs, derelict land and flood concerns. Professional designers are invited into these collaborative studios to lecture, participate in work sessions and critiques and push the proceed forward at an accelerated rate. Student engagement occurs at on-site meetings, in public workshops and at final presentations of sustainable solutions. Final reports are produced by selected students following the semester, which are often submitted for awards and become part of a faculty's promotion package. The author concludes with a discussion of the value of engaged learning and community design studios as well as the potential liabilities associated with extended time commitments and costs, which may require an

entrepreneurial approach. While the demands are great and the process can be frenetic when completed and interdisciplinary design studio can be wildly satisfying.

Anne Taufen and Jennifer Arnold, 323, *Constructing Grounded Practice: Roadmap to civic engagement, UW livable city year, and the community planning studio*

One of the challenges facing urban regions in a time of pronounced political conflict and spatial inequality is how alternative paths forward might be imagined and pursued. University-based planning and design programs are at the forefront of a movement to build partnerships with various urban publics involved in governance, planning, and policy. This paper considers one of the planning courses that comprised 2017-2018 Livable City Year, a yearlong partnership between the University of Washington and the City of Tacoma. The course, a two-term graduate planning studio, was paired with a city-defined project entitled "Roadmap to Civic Engagement." The project brief included "an accounting of existing methods of community outreach and civic engagement," "that documents existing and recommends innovative ways to connect with residents." As the culminating project for masters students in Community Planning, this involved taking a grounded theory approach to interviewing city staff, coding interview transcripts, identifying emergent themes and categories, and participating in city and community events as additional field study. The deliverable for the city includes a typology of existing civic engagement practices, the articulation of a shared narrative or imaginary, and recommended areas for investment or innovation. This paper considers the practice of conducting qualitative, community engaged research as part of graduate professional training in community planning; including challenges with establishing project expectations, encountering and selectively resisting path dependencies on both university as well as the city side, and guiding and enacting an exercise in grounded theory development within the time limits and organizational bounds of a traditionally rational governance setting. The potential and limitations for such an approach to impact the city's civic engagement practices is examined, as well as the role of qualitative research methodology in professional training - to expand student learning, organizational sensemaking, and normalized forms of knowledge and representation in community planning practice.

Shelley Cannady, 472, *Reaching Out, Reaching In: Reciprocal meaning and relevance in community design*

An observed trend among landscape architecture students is that they seem much more engaged with the prospect of contributing to social and environmental welfare than with designing golf courses and resorts; they are energized by the idea that they could, quite literally, change the world for the better. In response to this trend, many landscape architecture courses take on community design projects. Too many of these projects, post-presentation, are never implemented, leaving both clients and students dissatisfied. Clients still have no site improvement and students have simply produced paper rather than landscapes. The obvious cause for lack of design implementation is lack of funding, but there are also subtler causes: design solutions may be too comprehensive in scope; clients may not have been provided a clear 'first step' for commencing implementation; as time lapses, they may forget the purpose or justification for certain design solutions; or they may simply have been presented with too many choices. In the classroom, how can these issues be addressed? Attention to course objectives, project choice, research, presentation style and content of deliverables are clearly important. A critical discovery, though, is that keen attention to the scope of design solutions is necessary to make the community design experience more satisfactory to both client and student. To illustrate this, recent case studies in classroom community design that have resulted in design implementation, either in part or to completion, will be presented. The author has directed each of these case studies from project choice through research, design development, presentation to clients, and post-presentation follow-up. Case studies include a central gathering space in a public housing development, expansion of an agritourism

business, and a historic church campus. Findings support the common acceptance of the importance of research, extensive client/student interaction, and stakeholder involvement in either the design or implementation processes, but go further to reveal that multi-tiered communication approaches, choice limitation, and micro-implementation goals result in greater chance of project implementation and client/student project satisfaction.

Katie Kingery-Page. Donna Schenk-Hamlin, Brandon Irwin, and Riccardo Prudenti, 408, *Revealing the Story (Stories) of Housing in a Public Dialogue*

Revealing the often-hidden personal stories of housing, story-telling contributed meaningfully to dialogues on an important community health and urban design issue: affordable housing. Funded by a two-year community foundation grant, the project seeks community-based solutions to problems of affordable housing in a Midwestern college town. The U.S. Department of Housing and Urban Development (HUD) defines affordable housing as the condition of spending less than 30% of one's income on housing (including utilities). Cost-burdened is the designation by HUD of spending 30-50% of income on housing, and any greater percentage is designated as severely cost burdened (HUD n.d.). Within the town and its metropolitan area, more than 45% of renters are cost-burdened and 20% are severely cost-burdened (JCHSHU 2017). The research team used four major approaches of engagement: one-on-one interviews, an open public forum, a survey of student renters, and recurring study circles. This paper focuses upon the interview approach and its findings. The interviews purposefully included people with diverse roles in housing: student renters of various ages and backgrounds, workforce renters, homeowners, homeless individuals, property owners and managers, planners, real estate professionals and housing advocates. The interview process served as a training ground for paid graduate researchers interested in design equity and interview methods. Content analysis was completed using a qualitative noting and memo-ing method, followed by coding for affordable housing related themes drawn from literature. Finally, the data was quantitatively examined for emerging patterns, which were categorized as themes. Findings include detailed information on the lived experiences of renters across broad demographics who experience housing cost-burden in the community. Interview findings were shared with citizen participants in the recurring study circles. Deeper understanding of living cost-burdened contributed to the study circles' local proposals to make housing more affordable. While just a part of the overall project, the interviews contributed to a powerful community dialogue relevant to other cities across the United States.

Dominc Fischer and Meghan Kirkwood, 369, *Engaged Fields: Through landscape photography and landscape architecture links*

The landscape of the United State contains palimpsests of infrastructure: rail lines, power lines, water lines, section lines, and pipelines, all built and rebuilt on Jefferson's square-mile grid. Historically, artists and landscape architects observed and mapped our most significant American environments as this grid made its indiscriminate march westward. Many of today's highest culturally valued landscapes, paramount to American identities, were recorded, interpreted and preserved by landscape architects and artists at the forefront of environmental and cultural advocacy. This paper traces a history of synchronous and sometimes inadvertent conversations, between landscape architects and artists beginning with photographer, Carleton Watkins and landscape architect, Frederick Law Olmsted in the 1860s and their contemporaries William Henry Jackson and Timothy O'Sullivan and H.W.S. Cleveland. At a time when few had knowledge of or access to the lands debated by public officials, the photographs, maps, and written arguments created by Olmstead, Watkins, O'Sullivan, and Cleveland helped introduce and connect the public to national land resources and decisions over their management. This paper also looks to Robert Smithson and more recent collaborators, photographer Richard Misrach and landscape architect, Kate Orff as a bridge to our own work aimed at interpreting the large-scale social and environmental impacts of accelerated oil

and gas extraction in the Bakken region of western North Dakota, with the recent Dakota Access Pipeline incision. Our collaboration examines how the disciplines of landscape architecture and visual arts can explicate the multifaceted impacts of infrastructure development in a local region. Rather than foreground the individual photographer's feelings towards or interpretation of a given space, environmental photography highlights the role of biological and engineered inputs in shaping a landscape. Together, we identify with J.B. Jackson's description of a landscape as "a 'synthetic' space, a man-made system of spaces superimposed on the face of the land, functioning and evolving...a composition of man-modified spaces to serve as infrastructure or background for our collective existence" and this perspective guides our work in the Bakken. Through our own cross-disciplinary conversation we ask what we can do as environmental designers and artists to foster and support public dialog about the development of natural resources--as did our disciplinary predecessors, and show as a result one example for engaging with large-scale social and environmental challenges of this century.

Theodore Eisenman, 93, *Engaged Scholarship in Urban Greening Theory & Practice*

Municipalities worldwide are showing substantial interest in urban greening, defined as the introduction or conservation of outdoor vegetation in cities (Eisenman 2016). This includes a range of policies, incentives, and initiatives to vegetate the urban landscape (Tan and Jim 2017). In many cases, greening involves substantial tree planting, and across the United States cities have established ambitious canopy cover goals and major tree planting programs, including some initiatives to establish a million trees (Young 2011). Historically, trees were planted in the public realm of American cities predicated on aesthetics, civic improvement, and national identity (Campanella 2003; Lawrence 2006). But biotechnological rationales based on ecosystem services have recently emerged as the dominant approach to urban tree planting and green space planning and design writ large (Silvera Seamans 2013; Young 2010). Yet, commonly cited environmental benefits of urban greenery are poorly supported by empirical evidence (Pataki et al. 2011), and scholarship on the public policy viability of urban ecosystem services is at an early stage (Chen 2017). For example, green infrastructure may require new forms of governance that are not the norm in municipal management of landscapes and traditional grey infrastructure (Nguyen et al. 2017; Pincetl 2010). Through engaged scholarship at the intersection between urban greening theory and practice, I will share the status and results of two current research projects. First, I will present findings that illustrate noteworthy gaps in urban ecosystem services research, including "disciplinary crosstalk" (Vogt 2018). Second, I will share findings from a mixed-methods assessment of tree survival in a recent tree planting initiative in Holyoke, Massachusetts. As the former paper making capital of the world and with a high poverty population that has recently shifted to majority non-white (City of Holyoke 2013), this makes for a compelling case study of contemporary greening in post-industrial cities (McKendry 2018).

POSTER ABSTRACTS

Xin Jiang, Xiangrong Wang, 52, *Study on Engaged Design Connecting Research, Teaching and Service—The green space reform of Beijing traditional "Hutong" community*

Engaged design, as a medium to activate community, combines scholars' research, students and residents education and community services together. It will change the traditional research framework that is oriented to the publication of the paper. Scholars can not only complete the research tasks in combination with reality. In the process, students and local residents can be taught with landscape professional knowledge, creating a mutually beneficial situation for all participants in many ways. This paper selects the engaged design case of green space reform of Beijing traditional community named "Chaer hutong". This project is a good engaged design example that connecting research, teaching and service to improve the level of living environment and community gardening service of community. The purpose of this study is to analyze the reserch-teching-service mode in this engaged design process and evaluate the comprehensive benefits brought to the three participants and community, so as to explore the better engaged community developmental pattern in the future. In terms of research background, the paper summarizes other similar old city reconstruction cases in Beijing, and compares the similarities and differences between the two cases. The main method of the paper application is to observe the three participants in the engaged design process through long-term tracking of field research. Questionnaires and interviews were conducted by the designer (teacher), implementer (student), and beneficiary (local residents). In order to make the results more accurate and intuitive, the paper quantifies the degree of participation and benefit obtained from the project. The results showed that the participation degree of the three participants were 27.2%, 43.4% and 29.4%, and the degree of benefit levels were 26.9%, 24.5% and 48.6%, which proved that all three participants benefited from this process, especially, the participation of residents played a key role, the mobilization of residents' initiative has promoted the completion of design research. The shortcoming of this study is that the evaluation is too subjective, there may be some errors about the data. Moreover, the development of the model of the engaged design in the future and the relationship between the three participants should be further discussed.

Jianing Yu, Xiangrong Wang, 99, *The Students Design Work of Hutong: Engaged scholarship with stakeholder participation*

This paper presents a design competition of Hutong renovation in China to explore how engaged scholarships benefits to communities while providing students with research and practical opportunities. The venue for the design competition is placed at ChongYong Street, Beijing, in which there exist a lot of Hutongs. Hutong refers to the relatively small alley between the main streets in towns or villages. As a special architectural and organizational structure in China it's in the spotlights of the conflicts between Chinese traditionally family life and city modernization. The same problem is also found around ChongYong Street. Wandering through the Hutongs, it's possible to see families chatting, playing chess, or watering the flowers. But there lacks public open space for activities and the residents' lives are not convenient. In addition, because the alley is narrow, parking vehicles on the roadside often cause traffic jam. Being intended to solve these problems, the competition invites students and designers who live in Beijing to participate. Then with the intervention of the government, students' research and design will be applied to the city. This paper describes how the competition serves the community while providing students with research and practice opportunities, and describe in detail about the design based on community engagement. Before designing, needs of the residents were interviewed. Based on the needs of residents, the concept of time extension, space compounding and community participation is adopted in the design. White-collar workers, residents, students and parents have provided a place to rest, space has served in a comprehensive way and the conflict between traditional life and urban modernization is weakened. In addition, many residents like to grow

flowers and vegetables. In the design we issue "community creation manuals" to residents, guide the establishment of clubs, and spontaneously carry out community greening, making planting activities part of the community. As a result, this design has been recognized by residents and judges, and part of it will be applied to the actual hutong renovation,becoming a good reference for engaged scholarship.

Caroline Lavoie, Todd Johnson, 145, *Drawing for Engagement: The Hinckley Mountain Ability Center studio experience*

For many design students, the once widespread cultural norm of habitual and iterative drawing has gradually become supplanted by a new set of habits dominated by collaging precedent images—created by others—retrieved from the web. While useful for generating visually attractive presentation boards, these new digital design processes lack the fundamentally deep internal understandings of place embodied within the analog process of iterative drawing. In this studio project, faculty, students, and clients used drawing as an essential part of the engaged design process for Hinkley Ranch. Situated in Ogden Valley, the ranch is adjacent to a powder keg of growth pressure, along Utah's urbanizing Wasatch Front and faces threats to its scenery and agricultural lands. Its adjacency to federally designated "critical wildlife habitat" makes the site particularly important for wildlife, watershed health, and the region's future. The owner and inheritor of the ranch, wished to find a way to conserve and provide public access to a 280-acre ranch where she spent her girlhood summers. The purpose of the project was to allow persons with disabilities and those "less privileged" to visit the ranch find strength through interactions with nature. The proposed Hinckley Mountain Ability Center engaged community members in conservation while providing access to persons with disabilities. Drawing provides a powerful path to engagement. Drawing was employed during on-site as inventory, throughout the design and analysis process, used to explore form and scale, and to communicate refined design resolutions. Drawing takes visualization on a trip that circuits from the mind through the heart, mobilizing the hand and flowing to paper. As part of the methodology, the students assembled at the homestead and sketched the landscape. Because of their drawing work, students' emotional responses to the place emerged in their design. The plans and the final sketches were proudly presented in the final document. In an era when investigation could well be done remotely, the studio revealed the importance of visiting the site to directly engage its stakeholders in the process of design. By drawing on site, issues, challenges and opportunities arise to investigate the motives of planning and design in light of the natural assets and the history of the landscapes. The client, once a girl, "found herself" at this ranch and hopes it provides strength for others. Drawing made the studio more successful in engaging with the landscape and the community and in promoting both conservation and access.

Danzi Wu, Li Tan, Chunguang Zhou, 169, *Practical Study on the Restoration of the Urban Seasonal Rivers in Northern China*

Cities originate from rivers, and natural rivers transform into urban rivers in urbanization process. Under the background of China's rapid urbanization, the current research focuses on how to integrate the idea of river near-naturalization into the practice of river ecological restoration and reshape the city-water relationship. Jinquan River in Shandong Province, is a typical seasonal river in northern China. It is dry in winter and floods in summer. The study proposes the "Macro-meso-micro" multi-scale research based on the analysis of morphological characteristics and the automatism process of the rivers at the scales of "watershed scale-river scale-typical reach scale".Through college students' innovation project, field investigation, drones filming , geographical data analysis and other basic field research, a large amount of field data can be obtained, as well as the surveying and researching ability of landscape architecture beginners. Meanwhile it can be combined with the graduation project of undergraduates, to provide participants a design practice with site features, and put forward a sectional design. Through graduate studio courses, the ecological network has been sorted out, with established blue and green lines of the city, and their data collection and research abilities are enhanced too.Through the cooperation among multi-level academic teams, the system of multi-scale near-naturalization strategies on urban channelized rivers has been

established, in order to form the overall ecological view. At the macro scale, referring to the ecological metropolis ideology and the river ecology ideology, four aspects of urban river near-naturalization have been presented, including flood control security, spatial structure, waterfront boundary and interdisciplinary; At the meso scale, according to its space characteristics, methods of urban compact river way, urban elastic river way and new urban river way have been put forward. At the micro scale, based on the river automatism process, ecological revetment treatment and river way plants selectionare put forward. From theory to practice, over designal specification refinement, with multi-level student participation, the project has been finally implemented. The purpose of this study is to propose a research oriented method, in terms of the specific situation of the river. It contributes to river planning and design theories, and provides a paradigm for future projects to deal with the increasingly complicated and diverse river environmental problems caused by rapid urban development.

Vaike Haas, 262, *Brownfield or Cultural Relic? Oil tank field, mounds, and mountain-biking in White Park, Morgantown, West Virginia*

West Virginia University students contributed to site analysis through fieldwork at White Park, a brownfield characterized by layered cultural history and convoluted trails. In 1947, the City of Morgantown established the park from 17 acres of oil tank field purchased from Eureka Pipeline Company. The City added 128 acres in 1973, then exchanged some for land around Cobun Creek Reservoir in 1978 to bring White Park to 170 acres. Lightning periodically ignited oil tank fires during 1899-1939, and the possibility of lingering contamination is of concern. An irregular grid of circular berms surrounded the oil tanks, helping contain oil spills and fires. The berms vary in diameter and include some concentric outer rings and straight segments – features similar to prehistoric Native American mounds. This unique terrain is covered with tangled trails used for mountain biking and ROTC military training. Landscape architecture students contributed to research to inform White Park's future programming, trail work, and public interpretation. Their work helped reveal the park's rich cultural history, as the site of both Native American and early pioneer settlements. Some of the property line witness trees (predating the US Civil War) show scars from 'tomahawk rights' blazes that settlers used to claim territory. White Park's complexities challenged students to design for multiple objectives: remediate oil contamination, interpret cultural history, and minimize trail user conflicts. This project has applicability for educators as a case study of a complex cultural landscape student design project that required incremental collection of field data and encouraged thoughtful problem-solving.

Carlos Licon, Todd Johnson, 316, *Discovering the Spiritual Legacy of the Landscape: Learning through engagement*

This presentation describes the student's vision for the new life of the Abbey of Our Lady of the Holy Trinity, a Trappist monastery in Ogden Valley. A unique learning experience in the company of a small and aging group of monks in the process of closing the abbey forever. The Trappists established their monastery in the valley in 1947, and for nearly seventy years they cared for the land and created a presence and an impact greatly valued by the local community. As they decided to transfer ownership of their 1800-acre abbey, graduate students were invited to explore alternative possibilities and future scenarios for this beautiful part of the valley and provide the monks with ideas to guide their next steps. The experience resulted in a warm expression of trust from the monks in the students' knowledge and talent. To a great extent, the student corresponded this trust with ideas and possibilities that are having significant impact in the future of Ogden Valley. Summer and winter recreational activities make Ogden Valley a great destination with consequent increasing development pressures. Our students contrasted some of the implications of this scenario with current local efforts to preserve the integrity and image of the valley as small-town agricultural community through conservation easement strategies. After meeting the Monks and spending time in the Abbey, our students realized their analysis needed to integrate the spiritual dimension of the monks' legacy in this place. Filling the void of the monks' absence in the future had to be transferred into the land they worked and cared for. The project became a unique opportunity to explore how the natural and the built environment express

and convey, through the experience of the place, the monks' spiritual legacy and how this could be shared by the next generations of residents and visitors to the Abbey. The planning process included multiple sessions with the monks, where students learned and experienced different ways of looking at the landscape, where time and space were perceived differently. The studio work allowed the Trappists to create transfer conditions that secured their interests, preserved a very large portion of the land and created a landscape resource available for future generations. The monks are no longer in Ogden Valley, but their legacy and their presence are evident in how this place has been adopted by the larger community.

David Anderson, Todd Johnson, 371, *Contested Landscapes: Innovative alternatives through iterative design engagement*

This study presents a model for how design programs can employ iterative engagement of a selected design context to deepen students' understanding of complex environmental, social, and economic design dimensions while simultaneously catalyzing empathy among various community stakeholders. The scenic Ogden Valley, located in Utah's Wasatch Mountains 60 miles north east of Salt Lake City, is facing significant population, visitation, and development pressure in the coming years. In its context of transformational change, this contested landscape illuminates different values held by those impacted by local land-use decisions. A group of private landowners and local stakeholders initiated a year-long study in which landscape architecture faculty and students identified planning and design strategies for enhancing sustainability and social equity through innovative development alternatives. Building upon previous iterations of student-generated design proposals for the area, this study catalyzed a community forum to address the imminent growth challenges facing the scenic mountain valley. The project employed an intensive week-long charrette model during which the department's faculty and students engage in vertically-integrated dynamic collaboration with community partners. Following the charrette, a capstone studio focused in-depth investigation of key topics identified in the charrette that merited additional design investigation with community partners and constituents. Both broad and specific topics were studied – at regional, community, and site scales. Conclusions and recommendations for valley-wide flora and fauna/open space, local community supported agriculture and food as a common cultural experience, planning and design innovations for linking the traditional town of Eden with proposed development at Powder Mountain resort. Dynamically interactive matrix topics were analyzed at common scales, illuminating opportunities for relationships around common values. The matrix was used to guide future collaborations. By visualizing development alternatives and areas of shared values, the project provided meaningful data for community partners, private landowners, and planning policy decision makers. Additionally, the project greatly strengthened connections among stakeholders by inviting close collaboration around place and common values.

Catherine Harris, Michaele Pride, 429, *Sharing Shelves*

In Spring 2018, Michaele Pride, AIA, MAUD, and Catherine Page Harris, MLA, MFA, taught Creative Placemaking for Activism. The studio developed a matrix of interventions to enhance a new BRT line along the historic route 66 Central Avenue corridor. We focused on a single proposal for a set of modular, moveable, multi-functional shelving units to support community members to charge phones or laptops, sit in the shade, distribute goods such as books or food or clothes, and create relational spaces in the city fabric. We implemented the project at a community event to celebrate the advent of a new public library in the International District. The background of the project is derived from Creative Placemaking principles as articulated by Ann Markusen and Anne Gadda Nicodemus, "Many creative placemakers and their patrons strive for more than job creation, reuse of abandoned buildings, commercial retail sales—traditional economic development results. They aim for a more expansive notion of livability." (1). The project also derives from Bourriard's relational aesthetics. (2), and is engaged with a "materialism of encounter" (Bourriard, 3). Methods were to convene a class and solicit community input from multiple communities along the ART route. We built on an existing TOD plan. Student charrettes and prototype

installations led to a presentation with community members, city planners, and stakeholders. One scheme was selected, "The Sharing Shelves," and a location determined by our community partner, the International District Healthy Communities Coalition. Funded by an external grant, the class built four prototype shelves with digital construction techniques. We are seeking further hosts for the shelves. One set has been hosted, and in the next six months, the Sharing Shelves will be implemented at Ciqlovia with Team Better Block, the Albuquerque Natural History Museum Learning Garden, and van Buren Middle School. We continue to gather data through surveys, with more forthcoming as the only surveys were completed at the first library event. This study models an academic/community process made possible through our long standing community partner, the International District Healthy Communities Coalition. To make something compelling and repeatable, required input, critique, and soul. The class and the designers were challenged to take into account diverse needs and perspectives on the value of the transit corridor. The Sharing Shelves does not presume to judge any position on the City's improvements, but to provide an infrastructure for a "relational aesthetic," and a more "expansive notion of livability."

Peter Miniutti, Natalie Gray, Tao Wu, 471, *Landscape Architects Need to Be Heard by Top Decision Makers (TDM)*

A graduate course taught at the University of Connecticut, "Participatory Design & Trans-disciplinary Research in Landscape Architecture", is a theory-based lecture course exploring how community-based participatory design research can encourage citizen participation in development decisions, as well as make these decisions predictable, fair and cost effective. In short, this course teaches students how to instill democratic ideals into a "Design Process" often used by Landscape Architects. A functional democratic system has the supreme power vested in the people and exercised by them directly or indirectly. Most participatory design projects are of a scale that allows a direct democratic process. A rewarding yet messy process that is dynamic, passion-based and subjective. We have all won some and lost some in this arena. The course is divided into 3 parts: (1) the roots of participatory approaches in the USA beginning with associations, civil disobedience and barn raising, (2) revival of participatory approaches from the from the 1960s -1980s. We cover seven approaches ranging from Halprin's collective creativity to Hester/McNally's community development to Susskind's conflict mediation, (3) and concludes with subsequent approaches such as environmental advocacy, social justice and deep democracy, just to name a few. As part of the course, I created a matrix of my 50+ community projects using various parameters. It became evident that if I had a direct working relationship with TDM, the project resulted in having had a much higher chance of being implemented. Why was that? My observations: 1. Landscape Architects are visionary thinkers and TDM have the confidence to support visionary thinking. This type of progressive thinking represents a new direction or a change of the status quo. Lower level decision makers might prefer to "bury" the initiative vs. having to take a stand. 2. Meeting directly with TDM allows for a clear and concise communication. Receiving information through others can lead to "mixed messages". When the Landscape Architect meets directly with the TDM, we can better understand the motivations of the TDM, hence a better chance of satisfying the TDM's program. 3.TDM understand value and control the resources to reward forward thinking initiatives. In conclusion, I believe Landscape Architects often lack the confidence or knowledge of the importance of working with TDM. We have much to offer to society and often our visions don't see the light of day because we are not making our presence known or we allow others to communicate for us.

2. COMMUNICATION AND VISUALIZATION

PAPER ABSTRACTS

Jacob Mitchell, 339*, Measured Perspective: A survey of point-clouds for landscape*

The purpose of this paper is to evaluate point-cloud technology for landscape architectural research and design and provide a survey of its current use. Given how embedded the perspective image is to the idea of landscape(1), it is not surprising that for landscape architects, it is the dominant form of communicating design ideas. The rendered perspective view, expressed by hand or facilitated through the computer, finds its strength as a rhetorical tool precisely because of the ideological power invested in it. Linear perspective offers a perceived control of the landscape and an ability to reduce its multivalent qualities into objects able to be readily understood and instrumentalized(2). This simplification through representation, along with its sufficient facsimile of seeing, makes understanding a design intent through perspective imagery possible without the specialized knowledge unlike orthographic drawings. Critique of linear perspective as a design tool include: the privilege it gives to particular viewpoints leading to a lack of consideration of landscape as a continuous experience; its privileging of the visual qualities over other senses; and the difficulty in capturing and addressing temporal and tactile qualities of site(3). Digital three-dimensional modeling programs offer an inherently multi-perspectival design environment, but reinforce these issues with perspective as they separate "modeling" from "rendering". Despite being adopted by civil engineers, foresters, archeologist, and historic preservationist since the turn of the millennium, laser-scanning technology has seen limited use in landscape architecture and is generally considered an analytic tool(4,5,6). Recent popular exposure notwithstanding(7), the use lidar as a design and representational tool remains underdeveloped. While also allowing for multi-perspectival engagement with a design subject, laser-scanning and other point cloud technology has the potential to integrate seamlessly landscape interrogation and representation. Explored through the authors own visual studies, student work, and precedents projects, this paper considers the point cloud visualization as an operational field(2), or design method, for landscapes. Outlined are preliminary approaches to using point clouds in design including: integration in modeling environments; visualizing existing conditions; tracking landscape change; point-cloud visualizations as an interrogative tool, and hybrid, mixed-media design techniques. Rather than strictly using point clouds as analytical tool to inform design decisions, this paper considers point cloud visualization as a mediator between the design hand and landscape medium. Point-clouds provide a measured, highly detailed visual form of landscape survey that should enable more informed design responses and is thus considered as a new "eidetic operation"(2) in this paper.

Aidan Ackerman, 19, *Paving the Way for Building Information Modeling (BIM) Adoption in Landscape Architecture*

The ongoing debate around the merits of Building Information Modeling (BIM) for landscape architecture has not yielded consensus among landscape architecture practitioners and academics, yet the technology's inevitable intersections with the field are no longer in doubt. A growing body of emerging innovators, comprised primarily of landscape architecture practitioners, are actively tackling the work of adapting BIM tools to meet the specific needs of the landscape architecture profession. By employing homegrown software workflow strategies from within the discipline, these innovators are charting a course for their peers, indicating that a BIM+ landscape adoption roadmap is beginning to emerge. Drawing upon nearly two dozen interviews with over fifty individuals in both research and practice, conducted over six months, this paper profiles those innovators who are creating and sharing

their BIM workflows. Specific examples of BIM adoption in both practice as well as landscape architecture programs are illustrated, serving as examples of the advancement in software modeling and visualization of landscapes that are a result of this new model of open-source information sharing. Findings on the benefits and drawbacks of BIM adoption within landscape architecture are included, establishing a baseline set of findings on the current state of BIM adoption within the field. These findings also explore the most common themes voiced by academics, students, and professionals with regard to BIM adoption in landscape architecture: fundamental terrain and hardscape modeling needs which are unmet by most BIM software; the importance of centralized digital file collaboration with architects; the need for exposure to the phases of a BIM workflow to empower decision making; and the potential for a new model of collective support and information sharing about BIM within the landscape architecture profession. For those landscape architects who have up to this point been hesitant to adopt BIM, peer mentorship and experimentation are generating opportunities that were not available even a year or two ago. Recommendations for adopting BIM in landscape architecture degree programs and professional practice are given, along with an overview of available learning resources, sample workflows, and digital tools.

Evan Lanning and Blake Belanger, 424, *Revealing the Fracklands: A framework for addressing the wicked problems of hydraulic fracturing*

In recent decades, traditional methods of oil and gas extraction in the United States have been fortified by hydraulic fracturing, or fracking. The process of fracking involves injecting water, aggregates, and chemicals into the earth to rupture rock that is trapping oil and gas. This process has unlocked access to once unobtainable reserves, and as a result, U.S. oil and gas production has continued to increase despite recurring forecasts that supplies would peak. While increased production has strengthened some sectors in the U.S. economy, it has also renewed a reliance on non-renewable energy, compromised the well-being of communities, and poses serious environmental threat. While research into the process of hydraulic fracturing and its effects are common, little discussion has been generated regarding the broader impacts of the systems required to construct, supply, and maintain fracking operations. The processes of hydraulic fracturing contain a dense array of components that affect both the present and future state of communities, environments, and economies. As energy demands grow and resources deplete, these millions of facilities will demarcate the wicked problems of a post-oil and gas future and reveal a dense system of derelict infrastructure and underutilized lands. This research presents the Fracklands. Fracklands are a comprehensive telling of the landscapes of hydraulic fracturing. They offer insight into what a dynamic and complex system of modern oil and gas extraction infrastructure looks like. After first defining fracking and discussing current practices and policies as grounds, I present a classification framework for defining the Fracklands. Organized by four approaches – Systems, Typologies, Trends and Futures – this Framework utilizes a set of descriptive methods conducted in three U.S. regions to present and discuss the Fracklands. Results reveal a more complete picture of fracking's effects on the American landscape today, while giving hints of what the Fracklands will present in the future. The Fracklands are a little understood system of components and processes that profoundly affect land, people, place, and society. By presenting the Fracklands framework in this report, I aspire that planners, designers, and decision-makers will have a clear outline for better understanding the nature of this wicked problem. As a point of departure, I propose three unique design-based alternatives to address the future of the Fracklands and dilemmas yet materialized. With the Fracklands revealed, footholds are set for a methodology to be adapted and used in future study for understanding the ever-changing landscape of hydraulic fracturing.

Xin Jiang and Xiangrong Wang, 55, *Visual Communication: Application research of virtual reality technology in landscape exhibition*

The purpose of this paper is to analyze and evaluate the immersive experience modes effects of Virtual Reality (VR) technology commonly used in landscape exhibitions. As a good way to spread landscape knowledge to the public and promote communication, landscape exhibitions have become maturer in China in recent years. With the

development of digital technology, VR technology has been used more frequently in landscape exhibitions instead of the traditional two-dimensional performance. VR technology creates a virtual environment for users in a simulated way through the perceptual behaviors, users can create a feeling of immersing in the virtual environment, which helps them better understand the scale and experience the content of landscape design, with a strong interest and interactivity. Firstly the paper introduces the VR technology types□fixed-end VR and mobile-end VR (they have 2 modes: interactive experience mode and 360-degree panoramic photo mode). Then the paper analyzes the specific VR technology workflow (modeling-rendering-display and interactive participation). The research uses indicator evaluation methods by comparative case study based on 3 representative examples (Sihe garden, Chaer hutong courtyard, Slender West Lake), which were displayed in "Green Corridor 2020" exhibition hosted by Beijing Forestry University during 2016-2018 Beijing International Design Week. The results reveal the effect levels of different VR modes in terms of immersion, interactivity, operability and convenience, its proved that different modes make diverse interaction effects with visitors, and further suggestions for optimizing the display effects of VR technology in landscape exhibitions are discussed at last.

Anna Thurmayr, 140, *From Pigment to Pixel: Artwork as rendering and modeling inspiration*

Current landscape architecture programs generally marginalize the importance of visual arts while emphasizing the benefits of scientific, technical orientation. Workshops on digital drawing and fabrication primarily serve to introduce students to technical aspects such as 2D drafting, 3D modelling, laser cutting and computer controlled routing machines. Using the oldest painting and sculpting techniques from master artists as bountiful sources of inspiration, however, will always enhance the outcome of any design work. Creative processes, artistic skills and experimental approaches in this computer-assisted realm of representation are both encouraged and necessary. Students are challenged to choose a piece of art they love as their role model. By examining this artwork students explore shading, colour schemes, line thickness, proportions, material, atmospheres, and image composition. With greater clarity of the applied representation techniques, students use their newly gained insight as a starting point, rather than a direct copy, for their own design communication. Uniting the stimulation of the artwork and their computer aided drafting skills, students produced a site plan. The two-dimensional rendering method was to follow the 'style' of their selected painting and its specific representation technique. A similar workshop was then conducted with students to choose a sculpture or three-dimensional object as inspiration, and to then produce a physical terrain model. The students learn how to convert the two-dimensional information of the first workshop into a digital model that is the base for laser cutting or computer controlled routing. After the physical model is machine cut, the unfinished casting is manipulated through a variety of analogue processes resulting in the final individual interpretation. With the playful interaction between old style and new technologies, students push through their inspiration and enter a new realm of deep understanding and pride in their unique work. Their heightened development and growth over a short period of time advances their cutting-edge communication and visualization skills in landscape design. The resulting knowledge effectively prepares them for meeting upcoming challenges in design studios and throughout their future careers. Interdisciplinary cross over into fine art and other fields provokes the senses and develops an appreciation for form, light, shape, color, texture and proportion. The resulting hybrid between digital and analogue methods with outside inspiration leads beyond common landscape architectural standards. Honoring the visions, skills and expertise of famous artists and designers allows students to excel in the invention of their own creative representation and to experience personal revelation.

César Torres Bustamante and Joseph Ragsdale, 243, *Photographic Techniques to Reveal and Articulate Landscape Phenomena*

Photographs have historically been a documentary tool and a means of capturing noteworthy moments or features for posterity. Early photographs were expensive to produce, and were reserved for relevant events or portraits of the wealthy. The continuous increase in affordability and accessibility of photography made 1930 the first year in which

a billion photographs were taken[1] and by 1960 about 55%of all photos were of babies[2]. With technological advances, moments and experiences worth photographing have become more accessible, but generally less significant. Photographs used to embody a finding that was unrepeatable, holding an otherwise imperceptible time still for eternity[3]. The transition from film to digital photography not only removed the limit on how many photos a person might reasonably take, but it also eliminated photographs' uniqueness of the moment. The constitutive power of photographs in the shaping of reality, and the perceiving of time and place, seems to have been eroded in the era of smartphone photography. For landscape architecture professionals and students, smartphones allow for quick and effortless recording of information during site visits, analytic studies, documentations and even the digitalization of documents. The purpose of this project examines what techniques are useful to the profession in understanding the role of photography in the design process in an era when 'everyone is a photographer." Given the increasing outburst of photographs taken, the project enquires how can photographic techniques be explored to identify singularity and uniqueness in the landscape and separated from commodified snapshots. Utilizing a combined undergraduate design studio and visualization course, the study explored five photographic technologies to depict site features, movement and temporal conditions, and characteristics and phenomena that are not typically visible or apparent. The techniques make use of traditional film photography as well as smartphones to combine multiple moments or perspectives, through long-exposure, panoramic shots and collage. Christophe Girot asks for a better integration and understanding of contemporary visual thinking in project development and communication [4], and these techniques address this integration by combining photography with site visualization. Photography becomes a representational mechanism for the landscape: it is framed as an analytical tool that not only reveals a given condition but that also articulates possible futures.

Anne C Godfrey, 282*, A Step towards Multiplicity: Photography for complexity*

Landscape architecture still depends on single still photographic images for the representation of landscape spaces. Yet the discipline continues to expand its design practice, working with multiple complex systems to create successful responsible contemporary landscapes. Do our photographic practices sufficiently support the complexity of our current practices? Exploration of non-picturesque multi-image photographic representations has been taken up several times in relation to contemporary practice (Corner 2014; Moore 2010; Hansen, Waldheim 2014; Amoroso 2016). There are good contemporary examples from prominent practitioners (Bargmann, Weller, Cormier, Smith, SCAPE, etc.) yet often these examples are categorized as experimental or edgy practice. The norm is still to present single image based representations of built work and process work. A quick survey of several landscape architecture firms' web sites, local to international, will confirm this. What steps forward can the discipline take to more widely utilize and benefit from a non-picturesque multi-image based practice of using photography for design? Drawing on Meyer's position (2008 for example), the author posits that in order to truly work in a mode of complexity and multiplicity our representations must be able to also act in complex and multiple ways. This is not only for deeper inspiration on the designer's part, but as a form of education for the larger public about the complex and multiple conditions of all landscape places. The author proposes the use of the grid as a first step. Grids are organized, legible, familiar, and still rectangular. Working with grids allows for the representation of a singular in relation to a multiple. A grid can combine complex single images together, or create a larger image in its self. David Hockney's process of creating Joiners serves as a conceptual guide to this practice (2016, 2008, 2012). Further contemporary examples in both landscape architecture (Mayer Reed) and photography (Wolf, Klett; Nishino) join the discussion. Student work exploring the possibilities of the grid is presented along with outcomes. Two major take aways are: 1) grid constructions demand a more expansive process of physically exploring a design site, 2) in-studio reconstruction of the grid (digital or analog) produces an expanded time period of inquiry and assessment of the photographs. Both of these factors increase site knowledge through increasing the time and space in which the site is investigated — instead of relying on a small set of single views taken from one or two vantage points.

Riccardo Prudenti and Katie Kingery-Page, 421, *Effective Visual Representation: Graphic style and the communication of design intent*

Stakeholders benefit from drawings that accurately portray the essential elements of the design and the broader impact that design has on future experiences (Coe 1981). Knowing how people perceive and understand graphics is key to communicating effectively the design intentions. The question guiding this study is: What graphic representation styles increase the non-designers' understanding of design proposals? The author first developed a new site design for a local community arts center, based on a detailed matrix of design intentions derived from extensive stakeholder engagement. Plan views and perspectives employed hand-drawing and digital illustration techniques, and the representative styles ranged from abstract to more realistic depictions based on review of precedent images in academic and professional architectural publications. Careful attention was given to ensure the graphics produced are comparable, such as consistent use of color palette, balance of colors, and inclusion of necessary design components across and within each style set. The research phase of the study included testing the effectiveness of these representations through focus groups of stakeholders. Content analysis of recorded focus group sessions employed a grounded theory approach, and this included repeated listenings and transcriptions, coding and enumeration of understood design intentions, identification of emerging themes including style-related comments, and progressive noting and interpretation. The combination of qualitative and quantitative data revealed patterns in the participants' perceptions of the graphics—primarily the accuracy of understanding the design intentions according to representative styles. Overall, participants revealed that the more real the abstraction, the less understanding takes place. The most abstract styles communicated physical dimensions of the design most effectively and compare equally in terms of communicating experience of place. Graphic communication is complex, and no formula exists for targeting communication in landscape architecture (Kingery-Page and Hahn 2012, Ware 2014). Additional analysis of data from this study continues to inform the development of theories and evidence-based approaches to graphics production including a framework practitioners may use to select stylistic characteristics appropriate to project and audience.

POSTER ABSTRACTS

Omar Faruque, 16, *An Investigation and Analysis of Diagrammatic Abstraction as a Means to Explore, Generate and Assess Design Ideas*

With the proliferation of graphic communication software, both in two-dimensional and three-dimensional modeling, the representation of design ideas has become more and more sophisticated well as convenient. With the advancement of computational technology, we have also seen significant gain in analyzing and presenting environmental and statistical data that are relevant to design decisions. However, the realm of exploration of initial and conceptual design through diagrammatic abstraction remains very important and additional work is needed to advance the knowledge and techniques in this important area of the design process. This paper summarizes a series of investigations the author undertook to review, analyze and assess the knowledge and techniques for various diagrammatic abstractions that have been used for initial and conceptual design both in the professional world and in academic practices during the last five decades. The studies are divided into three distinct aspects: i) the extent of exploration and assessment prior to selecting a design concept, ii) the relationship and relevance between the analysis phase to the conceptual phase of the design process, and iii) the methods, techniques, and their fluidity in generating, exploring and evaluating. The paper also discusses the problems and impediments that prevent adequate exploration and assessment through diagrams. In conclusion, based on the findings, the author puts forth a series of recommendations for improving the current practices and chalks out future research in the realm of diagrammatic abstraction for originating and selecting ideas during the initial phases of design.

Ron Henderson, 25, *Sakura Orihon*

No flower falls as beautifully to the earth as the petals of the cherry, or sakura. This presentation outlines a landscape architect and educator's peripatetic investigation of blossoming sakura across Japan that was the subject of a solo exhibition at the United States National Arboretum in 2018. Represented in the exhibition are rigorous temporal, spatial, and cultural investigations of performative landscape events (the blossoming of the trees and the descent of the blossom to the ground); the cultural practices that surround this landscape event (o'hanami, the cherry blossom viewing celebrations); and recording indigenous horticultural practices of Japan (pruning, branch crutches, rope tenting). The investigation was recorded in orihon (ori, folding; hon, book) sketchbooks in which the author mapped and drew specimen cherry trees over a thousand years old, groves of wild mountain cherry trees, and urban promenades lined with hybrid cherry trees from which to draw out the essence of sakura.

Carolina Aragon, 167, *Climate Change Visualization in the Landscape: A review of public artworks*

In countries like the United States, public engagement around issues of climate change is lacking in part due to insufficient efforts to communicate and engage audiences (Moser & Pike, 2015). Climate change communication is difficult due to the abstract and remote nature of the information, the scientific nature of the message, and the alienating qualities of repetitive and negative messaging (Boulton, 2016; Scannell & Gifford, 2013). Creative practices in the arts and the humanities can overcome some of these challenges by engaging audiences through metaphors, narratives, or visualizations of the problem, while providing personal experiences with the subject matter (Roosen, Klöckner, & Swim, 2017). Current landscape architecture discourse has brought forth the importance of using the landscape as a medium by which to localize climate change information (Sheppard, 2012, 2015). Urban landscapes are particularly poised to fulfill this role, as they are accessible and shared by the public (Nassauer, 2012). However, current methods for engaging the landscape to reveal signs of climate change have focused on digital representations and virtual reality simulations (Dulic, Angel, & Sheppard, 2016; Sheppard,

2105), overlooking landscape-based artwork that visualizes climate change-induced futures. This paper presents a review of public artworks that engages the landscape in visualizing future flooding due to sea level rise. Examples of recent artworks including Eve Mosher's HighWaterLine, Chris Bodle's The Watermarks Project, Catherine D'Ignazio's Boston Coastline: Future Past, and two recent installations by the author, High Tide and FutureWATERS. These case studies provide an initial framework for better understanding the potential for engaging the landscape when communicating about climate change through the arts. In particular, it points to the landscape as an accessible site in which to visualize future scenarios, the potential for engaging landscape processes in revealing climate change, and the role of the landscape as a setting for participatory practices involving local communities. Understanding how artists engage the landscape to call attention to climate change can provide landscape architects with a model for expanded practice. In particular, it supports the use of landscapes for public education and engagement around issues of climate planning, while bringing renewed attention to the value of art as an integral part of landscape architectural practice. These findings are relevant to academics, practitioners and students interested in using the landscape as a setting and medium in which to engage diverse audiences with the pressing issues of climate change.

César Torres Bustamante, 239, *Visualizing Dynamic Landscapes Through Projection Mapping*

The interaction between landscape and image making has evolved from a combination of word and image to brand landscapes with symbolic meaning, to the use of digital tools and time-based media that shape our way of seeing, thinking and projecting[1]. Video presentations have revealed innovative possibilities in landscape design and representation. Christophe Girot has highlighted the potential of video in investigating landscape temporality by recording its ever-changing, and otherwise impossible to grasp, dynamic and fluid characters; digital video can 'deliver an almost immediate assessment of very complex settings, redefining completely our art of observation'[2]. This new genre in landscape architecture is more in tune with the way that we apprehend today's reality. Landscape video is neither filmic nor artistic: it is the ideal tool for complex observations as it offers a new visual understanding of environments[3]. These videos are usually seen on the flat screens of computer monitors, tablets, or projection screens. A new technique uses non-flat surfaces as canvas, merging the formal characteristics of the surface with the dynamic video projected onto it: projection mapping. It was patented by Disney in 1991 as a "system for digitally painting an image onto a 'contoured, three-dimensional object'"[4], and since then it has been used in concerts, theatre, advertising and light festivals. The projection of a moving image into a non-flat surface or object transforms these into interactive 3D displays. Combined with landscape video, it can offer a comprehensive vision of a landscape, a new visual understanding of site dynamics, of its multiple phenomena and temporal and seasonal changes. This study will present projection mapping projects created in an undergraduate digital communication introductory class. While the software for projection mapping usually costs several dollars, the study will show outcomes created using commonly available software and smartphone apps. By playing off of the objects or surface's shape and textures, projects will reveal a convergence of light and illusion aimed at producing a more integral understanding of site analysis, data visualization and contemporary visual thinking.

Howard Hahn, Pamela Blackmore, Brent Chamberlain, 279, *Konza StudioED: Developing educational outreach platform*

The Konza Prairie Biological Station (KPBS) near Manhattan, Kansas, is a 3,487-hectare research landscape of national significance, targeting key issues facing the remaining 4% of the original extent of tallgrass prairie (Samson and Knopf 1996). The KPBS is one of the original six long term ecological research (LTER) sites, now 28, and is partially funded by the National Science Foundation (https://lternet.edu/). The mission of LTER sites is both research and education oriented. Since many people do not have opportunity to visit Konza Prairie, and access to much of the research station is restricted to the public, a landscape architectural design studio sought to create a virtual Konza Prairie. The intent of the studio was to explore building new skills in immersion technology,

supporting students in developing storyboards and associated visions, and creating an education tool about the tallgrass prairie. The studio was developed as a one semester course bundle that included a formal studio, an associated seminar and technical module. The studio consisted of over a dozen students from three departments on campus, including landscape architecture, education and computer science. The initial concept was introduced in a 2016 CELA presentation, and progress is being reported at 2019 CELA. Summary of this work is being reported in three parts: the pedagogical aspects of conducting the studio, progress creating the virtual prairie (KONZAvr), and development of a companion educational website (KONZAed). This presentation is devoted to KONZAed. Representing the range of research activities being conducted at the Konza in an engaging virtual world proved challenging. Mid-way through the semester we decided to split off an education-focused group to explore simpler technologies to incorporate wide ranging documentation being collected: aerial drone imagery, 360-degree field video, video of research field activities, interviews, and hundreds of photographs. As a result, an interactive web map was developed to spatially locate the research activities and serve as a navigation hub for virtually touring research stations across the site. The education students then researched and culled relevant Next Generation Science Standards (NGSS) to support the development of downloadable worksheets and online exercises appealing to elementary students and the general public. As the project evolves, it is our intent to hyperlink educational users back to the game-based VR side for enhanced learning engagement. We are working with the Konza educational staff to establish long-term maintenance, integrate the project to support current Konza educational activities, and assess educational effectiveness.

Mark Lindquist, 284, *Immersion vs. How it Sounds: Comparing the effect of virtual reality and sound on landscape perception*

This paper presents preliminary results of exploratory empirical research investigating the effect of viewing 3D landscape visualizations in virtual reality compared to a computer monitor, and how sound impacts perception. Five landscape types were paired with three sound conditions (no sound, generic sound, realistic sound). Perceived realism, preference, recreational value and biodiversity were evaluated in a controlled laboratory environment. Results indicate that sound has a larger perceptual impact than display mode regardless of sound source across all perceptual measures. The results are considered to asses how sound can impact landscape preference and spatiotemporal understanding. The paper concludes with a discussion of the impact on designers, planners and the public, and targets future research endeavors in this area.

Peter Ellery, Natalie Yates, 289, *Using Drones in Landscape Architecture: Project processes, outcomes and significance*

In recent years, the use of Unmanned Aerial Systems (UAS), or drones, to capture and depict landscapes in both 2D and 3D representations has grown. Drone technology and the software used to analyze the data captured have expanded and improved exponentially. Initially drones equipped with GoPro-type video cameras captured aerial views of landscapes and property sites that until then had only been available through satellite images. Presently, high definition cameras (sometimes in addition to other sensors) can show aerial photos of large sites at resolutions of less than an inch per pixel and, in conjunction with photogrammetry software, can provide 3D data as well as multispectral information. Drones are being used in a wide variety of roles related to landscape architecture. These roles include the monitoring of building site progress or changes in landscape over time, analysis of plant health, the inspection of structures and places that are difficult to access, the calculation and monitoring of site stockpile volumes and consumption rates, the identification and documentation of historical heritage sites, and the 3D representation and modeling of sites. The software used for the analysis of this information has also developed rapidly. It has grown from the ability to stitch multiple 2D aerial images into one complete orthomosaic image of a site to the analysis and compilation of both vertical and oblique aerial images to create 3D point cloud and mesh models with high levels of representation accuracy. The models and image files created from drone captured photos

using specialty software like DroneDeploy, Pix4D, and ContextCapture can now also be used to accurately measure site dimensions, generate 2D digital elevation model (DEM) files, and contour files showing the site topography. The purpose of this presentation is to provide participants with an overview on the use of drone technologies and software in Landscape Architecture through the presentation of selected projects the authors have undertaken using different types of drones to capture images. This overview will present the process used to gather the drone images during those projects, the products obtained from this technology and software, and how this information was used in a landscape architecture context.

Sahoko Yui, Leonard Yui, 305, *Mapping the Ecologies and Narratives of Waste*

The impacts of waste production are widely recognized, however its system remains obscure. Modern US waste systems are designed to efficiently process waste and to hide that process from consumers. While there is a wealth of literature that analyzes the impact and potential of rethinking waste systems, efforts to visualize this research are limited. We use subversive cartography, psychogeography, and counter geography methods to combine quantitative and qualitative data to create an Atlas of Waste: a series of maps that graphically communicate spatial and temporal impacts of waste, the various ecologies of waste, and reimagine waste landscapes in the US. Inspired by earlier cartographers such as Alexander Von Humboldt and Erwin Raisz and modern cartographic work of Dennis Wood Narrative Atlas of Boylan Heights, Guerilla cartographers Atlas of Food, and Rebecca Solnit's Infinite City, we utilize a combination of digital/analog tools and methods to create maps that tell a story of waste that might be otherwise invisible or unknown. This atlas focuses on exploring the history, stories, impacts of waste in California and the New England region. We reveal the invisible aspects of the modern waste systems and waste research such as identifying the imbalance of waste literature, its focus(es) and its travel prior to its final destination. We also investigate implications of the modern waste system, including mapping of carbon and methane emissions and demographics of the most highly impacted communities. Lastly, we research stories of waste including the history of waste landscapes through stories told from individuals and communities and how we can reimagine waste landscapes.

Robert Ribe, Justin Kau, 311, *How Much Do Design Simulations Gain from Increased Resolution or Dynamic User Exploration? Assessing the reliability of perceptions*

The validity or reliability of design simulations may be improved by greater representative realism or user-directed dynamic exploration. Both entail costs so gains need assessment. A within-group experiment tested whether these increase the reliability of ratings between people with design training or not. Validity was not tested. Designs were created for Kesey Square in Eugene, Oregon and simulated using Rhino and game-engine software. One 'low-realism' simulation mode employed abstracted, simplified vegetation. A 'high-realism' mode exhibited greater vegetation realism. A set of six scenes were extracted from within all simulations. On-line respondents rated these photograph sets for: (1) scenic beauty, (2) coherence (sense-making navigability), (3) perceived realism, and (4) liking (preference). They also performed self-directed 'dynamic' navigations through the game-engine simulations using arrow keys and mouse and rated these experiences for the same qualities. 80 respondents were sampled from residents of American cities and 52 were recruited via the University of Oregon College of Design. Within-simulation ratings' reliability were compared by corresponding ratings' standard errors. Hedges' g was calculated between pairs of simulation modes as another test of between-simulation reliability. Mean ratings were compared to look for biasing effects attributable to simulation modes. Added graphical realism contributed most to reliable ratings while dynamic exploration did not. The reliability of ratings within single simulations was highest for static, high-realism views. The reliability of rating patterns between all types of simulations tended to be consistent toward similar mean values, but mean rating values often differed. Non-designers were more reliable at judging scenic beauty than designers across all simulation modes. Non-designers may instantly appraise this affective quality while designers may allow more complex cognitive ideas or graphical issues to confound the apperception of scenic

affects. High realism simulations of static views are the best simulation mode to reliably convey the spatial configuration of landscapes to non-designers. Designers exhibit less reliable perceptions of this quality. Their perceptions may be 'diverted' by graphical issues allowing perceptions of how realism is achieved to produce more variable ratings of coherence than non-designers. Non-designers are more reliable in judging landscape preferences than designers across all simulation modes perhaps for the same reasons as described above. For either of these types of people, adding realism or self-directed exploration does not improve preference perceptions' reliability. Ratings of perceived realism are not a reliable basis for measuring actual realism. Designers are more reliable than non-designers in agreeing about levels of realism.

Peter Miniutti, Tao Wu, Natalie Gray, 327, *Multi-stakeholder Communication and Public Engagement in Coastal Hazard Mitigation and Resilience Planning*

The University of Connecticut's Community Research & Design Collaborative (CRDC) is an organization consisting of the landscape architecture faculty and students. Our mission is to offer sustainable, equitable, and affordable designs. We seek out opportunities to solve complex design problems in Connecticut towns. This presentation will discuss the role of UConn's CRDC on a sea level rise project for the city of New London, CT. Our role is to take the scientific data developed by the Connecticut Institute of Resilience and Climate Adaptation (CIRCA) and develop a series of design solutions that will mitigate the damage caused by storm surge while spurring economic development. According to CIRCA, the rates of sea level rise observed in Long Island Sound is more than 50% higher than the global average. They recommend planners anticipate that sea level will be 20" higher than the national tidal datum by 2050. Citing CIRCA's work, the Connecticut Senate passed a climate bill that could push the state ahead of much of the coastal U.S.; Senate Bill # 7, "An Act Concerning Climate Change Planning and Resiliency". The legislation will require all federally-funded development projects to adhere to the new restrictions. "Climate change is real, it's man-made, and it's here," said Governor Malloy following the vote. Good planning, based on scientific data, as called for in this legislation, can help communities reduce the damage from coastal flooding. UConn's CRDC has adapted an innovative approach to communicating the various design scenarios to all stakeholders. Utilizing drone photography, detailed laser-cut design models and an interactive "performance-type" presentation, we can react in real-time to audience suggestions/concerns. We can take "What if…" type audience ideas and give an answer, complete with an accurate detailed model in a matter of minutes. The combination of government cooperation and public engagement to address socio-ecological concerns, from a systems perspective, results in cost-efficient and feasible solutions. The visualization of flooding scenarios and a physical model of hazard mitigation planning are efficient and helpful for stakeholders and the public to understand. As planners and researchers, we have diverse tools in our toolbox, however, which one best fits the specified site or region not only depends on the physical environment and its ecological process, but also on the economic and social feasibility. We need to have an open mind to explore various possibilities and combine them to get the most appropriate solutions.

Maria Counts, 420, *Leveraging Inclusiveness: A universal design graphic-analysis method for the master plan and design of university campuses*

There is no doubt that universal design is a requirement for all university campuses nationwide. In order to meet the needs of all people who wish to visit, live at, or study at a physical campus, campus designs need to not only provide accessibility, but be usable to their fullest potential through the ways in which all people can experience place. As such, they should not only comply with such requirements as ADA accessibility standards, but incorporate a comprehensive approach to equitability, physical engagement, perceptible information, simple use, flexibility, and scale, among other facets. This interactive poster presentation and article describes how representational processes in plan, section, axon, and perspective can assist researchers and practitioners in developing more in-depth site design analyses of and strategies for universal designs on university campuses. This article offers a visual approach

to assessing universal design using a series of drawing analysis methods of the Clemson University campus in Clemson, South Carolina as a case study for finding areas of improvements and visualizing universal design. Study focus areas examine physical barriers, slope and topography, program distribution and visual amenities. Questions such as how do we make sites designed to be more universally equitable, accessible and compliant? and how do we perceive spaces and how we design with perception in mind are addressed. Overall, this article explores representation and graphic methods for illustrating how sites can be perceived through more than their visual components such as their topographic range and slope analysis to provide ease and simplicity of use, their building approach for how we access buildings , their places for companion seating, for low physical effort to move through them, and their ability to create spaces that help to foster an inclusiveness in how they are experienced. In other words, that a person with a disability feels just as welcome as someone without a disability. That they are not further disabled by the design.

3.DESIGN EDUCATION AND PEDAGOGY

PAPER ABSTRACTS

(panel) Matthew Potteiger, Benjamin Spencer, Kofi Boone, 368, *Cross-Cultural Engagement in Study Abroad Programs*

Travel and study abroad experiences are well-established practices in design education. Increasingly complex global economies, networks of human mobility, and interconnected environmental problems amplify the imperative for programs that introduce students to these contemporary realities. It is estimated that over fifty percent of university students now participate in some form of study abroad [Altbach and Knight, 2007]. The purpose of this panel is to share pedagogical opportunities, challenges and potential for engaging global communities through experiential learning of travel and study abroad programs. While the transformative value of these experiences is well documented, there is an emerging body of literature that raises questions regarding the nature of the social engagement (Pipitone, 2018). These programs may perpetuate implicit hierarchies and disparities of power, or privilege transformative experiences for students over understanding, respecting and renegotiating equitable social relationships between people from different places and communities. In response the panel will offer models for restructuring institutional frameworks and pedagogical strategies that make a difference in the way students engage complex global communities and issues. Panelists will present different models of study abroad engagement including community-based service learning projects, design activism, and immersive independent study approaches. The programs discussed represent a spectrum of timeframes of involvement from a semester to commitments extending multiple years, and a diversity of context including Ghana, Peru, Ecuador, and Nepal. Panelist will discuss this work in relation the following questions: • How can we re-frame the modes and motivations of study abroad programs to effectively engage community-based timeframes, perspectives, and knowledge? • How can the application of cross-cultural engagement mitigate the impacts of implicit hierarchies between students and local communities? • What pedagogical strategies promote individual as well as socially transformative experiences? • How can the lessons learned from international study abroad be incorporated into engagement in communities back in the US? • What are the long-term implications of study abroad programs for communities and for students' future engagement with the complexities of global communities beyond the academic context? This dialogue will outline pedagogical frameworks and identify specific strategies for cross-cultural engagement with complex social and ecological issues in global contexts

Chip Sullivan, 170, *Divining Design: Teaching sacred landscapes*

This presentation expands on the author's research in the realm of teaching and learning about sacred landscape space. The author will present results from a seminar focused on alternative methods of teaching site analysis and site design based on a contemporary reimagining of the concept of genius loci. The course objectives were to develop ways to put landscape designers back in touch with the hidden forces and currents of nature, and indeed with the long-forgotten wetland and woodland spirits of place. The premise was that current trends of machine learning, coding, remote sensing, and apps and programs that prioritize data and digital interface remove designers from direct contact with the landscape and have overshadowed and practically eliminated an understanding of the metaphysical forces of nature. Through a series of design projects, students in the seminar examined symbolic meanings embedded in landscape archetypes. Students interpreted design principles from each week's lecture and

applied these principles to a weekly site design exercise. The framework for the course was modeled on the history, theory, and expression of the Tarot as a nature-based system of landscape interpretation. For a summation project each student blindly selected four cards from the popular Rider Waite Tarot Deck and was tasked with associating four of their own design principles to the symbolism of the selected cards. As a final exercise, each student cast their own spread and created a new site design divined from their cards. Subsequently, the class collectively designed and produced a professionally-printed set of their own landscape tarot cards, and contributed text to an accompanying guidebook that detailed their design principles for each card. The exercise helped students activate their intuition and direct their design decision-making in an unconventional, yet effective way. The author argues that now is the time to reclaim and reevaluate the role of the intuitive and tangible senses in landscape architecture education. "The tarot addresses one's intuition from a stance which lies between the intellect's own cold rationality and the realms of mystical fantasy." Evelin Burger and Johannes Fiebig; The Ultimate Guide to the Rider Waite Tarot

John Anderson, 296, *Mid-century in the Next Century: Lessons for the current generation of landscape design students*

Nearly every college campus in America includes buildings and landscapes developed during the mid-fifties through the sixties, the era known as Mid-century Modern. These facilities and their surrounding landscapes are reaching a critical juncture in their life, causing campus planners and facilities managers to ask tough question whether they should be considered historic and therefore preserved/ adapted or demolished. The landscapes are especially vulnerable, with decades of deferred maintenance hastening deteriorating hardscapes and plant material in decline. Utilizing the concept of the university campus as a learning laboratory, this study argues that current students in landscape architecture could benefit from exposure to these landscapes and what can be done to preserve or adapt them. Students may also benefit from learning more about the influential designers and significant works created during the Modern era. Exposure to and understanding of these works may likely influence student design cognition and enrich their design palette. Within the context of a course focusing on implementation documents, a semester long project addresses the re-design/adaptation of a courtyard within a precinct of classic modern era buildings on the University of Georgia campus. Throughout the semester, case study lectures introduce the 'masters of modernism' and their signature works, emphasizing the unique details of the projects. Following the course mantra of 'the magic is in the details', students work to develop individual sets of construction documents that include modern era concepts and details culled from the surrounding precinct context. The finished product is a portfolio worthy hardscape/ landscape package, allowing the student to speak with confidence not only on construction document development, but also on understanding, preserving and adapting modern era design principals and features. A pre-test/ post-test format will provide data on whether the students gain cognitive and practical knowledge from the practitioner/ project information given and whether the information provided influenced the detailing and development of the student document packages. Should Mid-century landscapes receive the attention and admiration of earlier era historic landscapes? Our current students will likely be participating in those decisions. Let us utilize this form of engaged scholarship to prepare them to make intelligent choices.

Ann Komara, 386, *Omnia Bene Facere: Teaching landscape history to design students*

History studies and classes are offered in most landscape architecture programs. Approaches to teaching history in landscape architecture programs vary, and the tactics and pedagogy for making it relevant to design students merit consideration. As educators we ask "Why study landscape history" as well as how to most effectively teach it. Using student work to explain and elucidate insights, this paper ponders: "What outcomes support the pursuit of history as a required class?" and "How can a class in landscape history be relevant and useful in support of students' intention to become designers?" The University of Chicago's position states that the study of history should prepare students to "… excel at historical inquiry, research, and analysis. [It] demands critical inquiry, the use of evidence, and sophisticated evaluation of information." This presentation offers a model for teaching landscape history

through an examination of a body of papers student produced in a required class. The presentation specifically addresses graphic analysis as a means of exploration and discovery. The analyses are one component in a set of five related paper sections focused on a single designed landscape and its designer(s). The overall final product acknowledges the designers and patron(s), situates the project in its cultural and geospatial context, and considers the design's impact or relevance to the profession. To support the development of the set of papers, the course delivery incudes exercises and inquiry sessions calibrated to guide students through formal analysis and develop practices and critical thinking required for understanding the overall organizational ideas evident in the design. Multiple examples of these papers identify the value of this approach for emerging designers. The graphic analyses forge insights about the design composition leading to a better understanding of how the landscape reflects ideals and conveys meaning in the era of its production. The analytic effort furthers the student's ability to assay a design, and unpacking the plan and its parts can "reverse engineer" a design process, and show relationships and conceptual gestures. The graphic inquiry thus connects landscape history to the design curriculum and forms a foundational aspect of the designer's education.

Pauline Hurley-Kurtz, 418, *Integrating Service Learning and a Design Build Tradition on the Ambler Campus and in the Philadelphia Area Community for over 100 years*

The Pennsylvania School of Horticulture for Women (PSHW) was founded on the present-day Temple University Ambler Campus in 1911 by Jane Bowne Haines. Located on a seventy–five acre farm in Montgomery County, PA., PSHW established a strong tradition of service learning. One of America's first schools of environmental education for women, the focus was on a practical education including animal husbandry, horticulture, and landscape design. From 1924 until 1952, the school was directed by Louise Carter Bush-Brown, an early graduate of PSHW. Her husband, James, a landscape architect and faculty member, taught landscape design. He designed the Formal Gardens and collaborated with Beatrix Farrand on the design of the Bright Memorial pavilions. The PSHW farm included horses, cows, an orchard, bees, and a wide range of crops. Students were involved in the management of the farm and gardens and earned Associates degrees in Horticulture, Landscape Design or Agriculture. After her retirement in 1952, Bush-Brown founded the Neighborhood Garden Association of Philadelphia. Temple University purchased the former PSHW campus, by then Ambler Junior College in 1958. Four-year bachelor's degree programs in landscape architecture (BSLA) and horticulture (BSHort) were established in 1987. John Collins, FASLA, a prominent landscape architect and nurseryman was appointed chair of the new Department of Landscape Architecture and Horticulture (LA-Hort) in 1988. A design-build studio in the BSLA program provided faculty and students the opportunity to design and construct gardens on the Ambler Campus, in Philadelphia, and currently exhibits for the Philadelphia Flower Show. A Master of Landscape Architecture program (MLArch), founded in 2010, incorporates landscape restoration as a major curriculum focus. The Rose Valley and Tannery Run stream corridor woodlands, significantly degraded by invasive species, are project sites for landscape restoration classes. ASLA and SER student chapters engage in community service projects such as the ABC house garden in Wayne PA. This paper will focus on hands-on service learning as an overarching theme in the history of education at the Ambler Campus and as a catalyst for positive change through gardens in the larger community. Landscapes that faculty and students designed, constructed and restored will be featured. Interviews of MLArch, BSLA and Ambler Junior College alumni, students and faculty will further illustrate the importance of this tradition of service learning.

Daniel Cronan, 298, *The NEXUS Studio: A synergistic pedagogical approach for integrating research and evaluating learning in a landscape architecture studio*

Evaluating a student's development is key to understanding effective techniques for teaching and learning, applying relevant research, and developing competencies for practice. The purpose of this project is to integrate landscape architecture and planning education with a research project addressing socio-ecological issues for a landscape. The

project systematically evaluates student learning within a studio course by analyzing self-reported and spatially explicit evidence of learning concerning Food, Energy, and Water Systems (FEWS) at the landscape scale. The results aim to equip educators in Landscape Architecture and Planning with effective tools and methods for evaluation and course revision. The studio elicits stakeholder-defined key issues addressed within a funded National Science Foundation (NSF) project in Magic Valley, Idaho. Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) is an interdisciplinary research project seeking to address issues concerning drought, water demand, water quality, and food security by using a stakeholder-driven alternative futures process (Kliskey et al., 2017). The method gathers, assesses, and evaluates evidence of student learning. It uses measurement and mapping combined with student surveys to evaluate two forms of evidence: self-reported and spatially explicit. Self-reported evidence takes the form of responses to a questionnaire administered both before and after course instruction. This evidence determines which factors applicable to key competencies in sustainability (Wiek et al., 2011) are improved by research and design. These transformative learning concepts described as 'a comprehensive approach to sustainability research and problem solving' (Wiek et al., 2010) provide the research-based foundations necessary to assess student learning within landscape architecture studio projects. The spatially explicit evidence is student designs for landscape interventions at the landscape and site scale, again both early in the sequence and after instruction. The spatially explicit evidence of learning in the studio evaluates learning using future scenario assumptions driven by the INFEWS stakeholder group and geospatial tools such as an evaluation framework developed by a collaborative effort from the student group. Combined, both forms of evidence provide criterion for a rubric to assess student learning. The results of this study present and interpret the project's evaluation of evidence of learning. Findings indicate areas for improvement supported by design responses, comparisons of feedback from the questionnaires, or a combination of both. Learning outcomes will guide recommendations for future courses regarding multi-scalar approaches for integrating research in landscape architecture and planning education.

Arthur Rice, Hossein Saedi, and John Nietfeld, 147, *Building an Understanding of How Design Studios Promote Cognitive Development and Creativity*

The design studio is a very special forum for education. It is a place for one to one interaction between the instructor and the student. It is the place where problem based instruction forces students to deal with ambiguity and commitment. Today design education around the world includes design studios that often employ problem-based instruction. Another reality is that studio instructors often teach the way they were taught. Design instructors are usually experts in their field of design but may have very limited knowledge of learning theory and cognitive development. This study employed a grounded theory research methodology. The goal of this qualitative research method is to build theory form qualitative data that is collected and analyzed systematically. For this study the qualitative data came from a series of open-ended questions sent out to approximately five thousand college alumni from the disciplines of landscape architecture, architecture, industrial design and graphic design. The prompt for the questions was the following. "Please think of a specific time in studio where you had a realization/understanding that you feel significantly helped your development as a designer …". The questions that followed were: What was the realization/understanding? What was the nature of the interaction with the studio instructor that resulted in the realization/understanding? What was said or done by the instructor and how did you respond? When in your program of study did this interaction take place. The data was then subjected to a systematic content analysis to identify common themes and trends and correlated with background information on major, gender, and years since graduating. The results were organized under the schema presented in William Perry's ground-breaking work "Cognitive Development in the College Years". The analysis revealed that critical interactions related more to questions asked by instructors rather than information provided. In addition, often "extra" activities had a significant impact on changes in perception. The overall goal of this study was to lay a foundation for future research by identifying and defining the nature of studio interactions that contribute most to cognitive and creative development.

Haven Kiers, 129, *Nature Rx: Improving health by spending time outside*

Ever accelerating technological changes have had an unfortunate effect of disconnecting us from our native outdoor habitat. Recent studies have shown that people spend more time indoors looking at screens than they do outside enjoying nature and, as a result, our health (both mental and physical) has suffered (Louv, 2011; Williams, 2018). In our role as educators, how can we encourage people to rediscover their relationship with the natural world? Landscape architects are in a unique position to provide a remedy for the imbalance that has come to characterize everyday life. UC Davis is one of a number of universities attempting to address this nature deficit disorder through a series of programs that fall under the umbrella of "Nature Rx." This paper will focus on specific aspects of two of those programs (a weekly freshman seminar and a series of hour-long nature interventions for faculty and staff) and their attempts to embolden participants to push competing priorities and activities aside and embrace the simple enjoyment and healing power of the outdoor environment. Goals of the programs included: 1) exposing students, staff, and faculty, to the gardens, green spaces, hidden nooks, and natural areas at UC Davis; 2) introducing them to members of the community that interact with nature on a regular basis through research or vocation; 3) identifying the organizations that connect people to nature at UC Davis; and 4) providing them with information about the therapeutic benefits associated with spending time in nature and the ways in which it can benefit one's health and sense of well-being. A mixture of quantitative and qualitative methods was used to determine the effectiveness of these programs. Data were compiled through the use of pre and post class surveys instruments, final evaluations (from both the freshman seminar and faculty/staff program series), and written personal reflections. Survey data taken from a similar Nature Rx class at Cornell University were also integrated into the findings. Results indicate participants gained greater levels of comfort and familiarity with the campus and its community and developed a deeper awareness of the value of time spent in nature. These findings suggest that directed classes in nature therapy can positively impact the health and well-being of university communities.

Susan Tomizawa, 234, *Tapping into the Affective Domain to Shape Student Values: Personalizing the loss of biodiversity*

This presentation explains through examples of student work how education related to environmental challenges such as the loss of biodiversity should extend beyond cognitive outcomes to tap into the affective domain as a means of shaping student attitudes, values, and behavior. Although the cognitive domain of Bloom's taxonomy is frequently referenced in defining learner outcomes, the affective domain has played a much smaller role in shaping student learning outcomes. This presentation argues that the affective domain is essential to developing student values and behaviors to address many challenges, such as threats to the natural environment, that landscape architects face. The example assignment to be presented required students to imagine how their own lives would be impacted by species extinction from a native plant community. Students were asked to choose two or three threatened and endangered species such as a bird, mammal, insect, plant, etc. and write and illustrate what they would miss most if those species became extinct. Their task was to develop an emotional appeal, along the lines of a final "good-bye love song," that would be powerful enough to cause people to change behavior to save a valuable ecosystem. The assignment went beyond the cognitive learning processes to have students personalize the loss of the species, and through this personalization deepen their appreciation and caring for the species being threatened. The assignment resonated with students, leading them to ponder their connection to other species and to express their values through poetry, carefully-worded text and the use of strong imagery. Examples of this creative student work are included in the presentation. Students reported that they had not actually thought about the loss of biodiversity on such a personal level and that it made them appreciate what the numbers and data actually imply and what is at stake in terms of their own quality of life. The implications of this type of affective learning can be applied to any landscape architecture subject matter and is essential when transformation of values and behavior is the expected outcome.

Peter Petschek, 11, *Digital Grading Education as an Access Road to BIM in Landscape Architecture*

1. PURPOSE: This paper explains an approach to teaching Building Information Modeling (BIM) in Landscape Architecture and how digital grading and its application play a major role in a site design project. 2. BACKGROUND: The development of Building Information Modeling (BIM) resulted from the need to solve coordination problems in complex architectural projects. BIM is a method and a process not only the application of a certain software. The BIM process includes BIM construction, BIM coordination and BIM management. Today infrastructure projects are beginning to use BIM as well. The BIM process is starting to become a standard in the building and construction industry. Landscape architecture education must include the BIM modelling, method, and process in its teaching. Community development and the use of BIM analysis tools via engaged scholarship (for example design competitions or controversial projects might use the evaluation of models on sustainability criteria, etc.) could be a future topic. 3. METHODS: A qualitative research approach is used with semi-structured interviews of project participants (students, co-teachers and invited guest speakers). The project consists of a course in the second and in the fifth semester in the landscape architecture program at the Hochschule für Technik Rapperswil (HSR). The project concentrates on BIM construction with civil engineering and architecture software. The site design project in the second semester is the core of the site engineering education in the first year. It is very important for understanding digital grading. Civil engineering software is used to place an access road, parking, drop off and excavation material of a building structure in an existing a landscape. In the fifth semester, the site design project of the second semester is to refine the area around the architectural structure. The building consists of a parking garage with a terrace above. The students will now use architectural software for modelling. The combination of civil engineering and architectural software will result in a BIM for Landscape Architecture model. This model can then be used for further BIM coordination and management tasks. 4. FINDINGS: The fifth semester course will be taught for the first time in 2018. It will start in September and finish in November. The final paper will discuss the results (interviews). 5. IMPORTANCE: The teaching of BIM will be a major topic in landscape architecture "Design Implementation" in the next years as the building and construction industry worldwide transitions fully to the digital. 6. LEARNING OUTCOMES: Understanding how to best teach BIM in landscape architecture. What are the problems students face to learn and apply BIM in a landscape architecture site design project?

Christopher Marlow, 504, *Engaging the Fight for BIM in Landscape Architecture* *

Building Information Modeling (BIM) has been widely used by the building and construction industries throughout the past two decades. BIM is two things – (1) a process or workflow, and (2) an intelligent 3D virtual model. It is largely about a multi-disciplinary team (architects, landscape architects, engineers, contractors, clients/owners, and other project stakeholders) collaborating, from the inception of a project, to design a detailed, intelligent 3D virtual model of that project to be used for analysis, visualization, construction documentation, and implementation. Successful BIM use depends on sharing data in a common format/software. Some common software options (e.g., Autodesk Revit, Vectorworks Architect, Graphisoft ARCHICAD, and others) exist for creating BIM models. Unfortunately, they all cater largely to buildings and building infrastructure, and offer inadequate tools for site analysis, site design, landform design, or landscape detailing. While BIM instruction is standard in many architecture, engineering, and construction management curricula, it is relatively uncommon in landscape architecture education. Without some BIM exposure and practice in school, landscape architecture graduates will be at a distinct disadvantage when seeking employment with many of the larger planning and design firms now invested in BIM. Furthermore, the lack of attention to BIM in academia may put landscape architecture in danger of being a non-factor in, or completely left out of, significant projects or project teams. Our profession cannot afford to let this happen. This session will highlight what a small Midwest landscape architecture program has learned through applying BIM theories, workflows, and technologies in its landscape engineering course sequence. The primary goals were to confront the known inadequacy and promise of Revit and Vectorworks, to immerse students in

a BIM-like process, and to explore smart and innovative ways of effectively using them for landscape analysis and design. The author will not only reveal pedagogic goals, execution, and outcomes, but will share what went well, what needs improvement, and how BIM can become a meaningful aspect of landscape architecture education. Ultimately, this session will make a compelling argument that landscape architecture educators should use the inevitability of BIM as motivation to move away from static 2-D design methods, toward intelligent 3-D workflows.

Howard and Brent Chamberlain, 276, *Konza Studio: A pedagogical retrospective*

The Konza Prairie Biological Station (KPBS) near Manhattan, Kansas, is a 3,487-hectare research landscape of national significance, targeting key issues facing the remaining 4% of the original extent of tallgrass prairie (Samson and Knopf 1996). The KPBS is one of the original six long term ecological research (LTER) sites, now 28, and is partially funded by the National Science Foundation (https://lternet.edu/). The mission of LTER sites is both research and education oriented. Since many people do not have opportunity to visit Konza Prairie, and access to much of the research station is restricted to the public, a landscape architectural design studio sought to create a virtual Konza Prairie. The intent of the studio was to explore building new skills in immersion technology, supporting students in developing storyboards and associated visions, and creating an education tool about the tallgrass prairie. The studio was developed as a one semester course bundle that included a formal studio, an associated seminar and technical module. The studio consisted of over a dozen students from three departments on campus, including landscape architecture, education and computer science. The initial concept was introduced in a 2016 CELA presentation, and progress is being reported at 2019 CELA. Summary of this work is being reported in three parts: the pedagogical aspects of conducting the studio, progress creating the virtual prairie (KONZAvr), and development of a companion educational website (KONZAed). The aim of this presentation is to share our pedagogical retrospective by providing insights into the storyboarding process and lessons learned dealing with gameplay development in an interdisciplinary context. Various methods were employed in the course, ranging from theoretical foundations of game development, to employing the Next Generation Science Standards. Numerous software programs were employed to help build and vision the project. The end products of the studio include a simple game environment using the Unreal gaming engine (KONZAvr) and a web-based platform focused on education of the Konza Prairie (KONZAed). The group dynamics, ownership of the project and evaluation methods played a key role in ensuring active participation across students and taught valuable lessons of multi-disciplinary projects. While building 3D games does not typically fall within the scope of the disciplinary practice, the storytelling and application of technology offers essential skills for the next generation of landscape architects.

Brent Chamberlain and Howard Hahn, 278, *Konza StudioVR: Developing the virtual reality environment*

The Konza Prairie Biological Station (KPBS) is a 3,487-hectare research landscape of national significance, targeting key issues facing the remaining 4% of the original extent of tallgrass prairie (Samson and Knopf 1996). The KPBS is one of the original six long term ecological research (LTER) sites, now 28, and is partially funded by the National Science Foundation (https://lternet.edu/). The mission of LTER sites is both research and education oriented. Since many people do not have opportunity to visit Konza Prairie, and access to much of the research station is restricted to the public, a landscape architectural design studio sought to create a virtual Konza Prairie. The intent of the studio was to explore building new skills in immersion technology, supporting students in developing storyboards and associated visions, and creating an education tool about the tallgrass prairie. The studio was developed as a one semester course bundle that included a formal studio, an associated seminar and technical module. The studio consisted of over a dozen students from three departments on campus, including landscape architecture, education and computer science. The initial concept was introduced in a 2016 CELA presentation, and progress is being reported at 2019 CELA. Summary of this work is being reported in three parts: the pedagogical aspects of conducting the studio, progress creating the virtual prairie (KONZAvr), and development of a companion educational website (KONZAed). To create KONZAvr, students researched video games ranging

from educational to epic adventure games. They then developed their own storyline, game art, and gameplay activities. Students learned how to use the Unreal gaming engine and implemented gameplay activities and 3D models. Students focused on developing realistic terrain, character animations (e.g. bison and birds), vegetation, weather, fire and bird sounds. The first task, tagging a bird for conservation efforts, was developed to illustrate how the storyline could unfold as part of the entire gameplay concept. In this presentation we will showcase the Unreal Engine and results produced by the students, identify sticking points, and describe potential applicability to the discipline. Additionally, we will highlight major challenges we encountered when using a gaming engine for developing site designs over large landscapes and provide recommendations for how to proceed. We learned that modelling a large landscape is possible but can be cumbersome and requires significant hardware. However, there are mechanisms that can be used to reduce the significant technical hurdles of employing the Unreal Engine for practice.

Clare Cooper Marcus, 328, *Reflections on the Education of Landscape Architecture Students*

After thirty-plus years of teaching I am convinced of the value of educating landscape architecture students in objective observation of real-world places and in subjective self-refection on the places that have influenced their choice of this profession. Post-occupancy assignments of places such as neighborhood parks and downtown plazas enhance student's skills in close observation of how environments are used, how their use may differ by age or gender, how the design of a place observed might be improved. Early use of this assignment where students were allowed latitude in reporting their findings resulted in dubious pedagogical value. However, with assignment wording and required sections of the submitted report "tightened up", student-work was up to the quality of that in a professional office. A similar re-evaluation took place in the use of field trips as a learning tool. Initially, students were taken to a local designed setting and later we would discuss what we had observed. Despite some verbal suggestions from the instructor, students tended to wander around, take photographs, talk among themselves but the learning value seemed mixed. This changed when they were given an audit sheet in which they had to record their evaluations of a series of discrete design elements, and which allowed their observations to be more organized and their learning to be enhanced. In contrast to the value of fine-tuning students' skills in observing real-world environments, there is equal value in encouraging them to look "inward" at their own environmental experiences and possible biases as designers. The environmental autobiography, required of every student, starts with drawing and writing about a favorite childhood place. They are then encouraged to write about every other environment (through childhood, adolescence, adulthood) that still has a "charge" for them. In conclusion they reflect on how these environmental experiences may have influenced their choice of landscape architecture as a profession, and whether (or not) they might have introduced design biases into their work. Students are assured that there is nothing wrong with any such bias, just that it is important to bring it into consciousness. The analogy is made with how a professional therapist must go through their own psycho-therapy so that they do not "dump their issues" on their clients. In conclusion, these two complementary approaches have proved to be extremely valuable in the education of landscape architects in lecture and seminar courses in "Social and Psychological Factors in Design".

Keith Christensen, 3, *Revisiting Scholarly Production Among Recently Tenured Landscape Architecture Faculty*

The career development and success of landscape architecture faculty hinges increasingly on their scholarship. Research performance is emphasized by academic institutions, whose assessments of faculty productivity are based on quantifiable research behaviors. Landscape architecture education, often emphasizing the preparation of practitioners, does not easily fit the traditional academic department model. As a result, it becomes necessary for landscape architecture faculty to describe the academic context in which they engage in scholarship and may place them at a disadvantage when evaluated. The purpose of this study was to revisit a study of landscape architecture faculty scholarly productivity by replicating a study conducted over the 2008 to 2012 academic years, assessing

findings for faculty tenured since 2013 to establish a more longitudinal understanding of the trajectory of faculty scholarly productivity. The study employed direct content analysis of the curriculum vitas of landscape architecture faculty members who were awarded tenure at public universities in the 2013-14 academic year or thereafter. Common scholarly outputs, such as refereed journal articles, juried competition participation, reports, etc., were operationalized by the research team. Two researchers independently analyzed each vita, thereafter comparing the individual results, and negotiating any discrepancies with a third researcher. The results describe the mean scholarly productivity of landscape architecture faculty during the tenure evaluation period and after the awarding of tenure. The findings suggest landscape architecture faculty members' scholarly productivity continues to be relatively low in comparison with other academic disciplines. An evolving, or new standard of scholarship, among landscape architecture faculty increasingly emphasizes traditional academic refereed products. Landscape architecture as an academic field is in need of greater training in conceptualizing, acquiring support for, conducting, and reporting research to be successful in an academic environment and provide a much needed foundation for current practice.

Umit Yilmaz, 425, *Learning and Scholarship Beyond Boundaries*

Design studios with research potential as media for developing creative work and new knowledge can provide multiple domains of benefits to students, profession, and communities while filling the gap between the theoretical and applied approaches in landscape architecture and planning fields. The studios have been fundamental courses in design curricula, offering effective spaces for active learning and engaged scholarship. This paper presents the particular methods associated with engaged scholarship in vertical and multi-disciplinary design studios that integrate local and international service learning in recent years in the College of Environment and Design at University of Georgia. It will examine the organizational challenges, pedagogies that are employed and assess the outcomes.

Stephanie Rolley, 482, *Professors of Landscape Architecture: Where and who are they?*

Anecdotal evidence points to a lack of professors in landscape architecture. Limited numbers of qualified promotion and tenure reviewers, low visibility of professors in service to the discipline, and celebrations of more retirements than promotions raise the question: Where and who are the professors, often referred to as full professors, in landscape architecture? Professors are promoted to the rank, largely, because their research, scholarship and/or creative activity attained national or international recognition. Their advancement represents a substantial investment on the part of their employer and they, in turn, have invested deeply in their institution. More than a simple hierarchy of rank or increase in pay, those in the position of professors provide the backbone of academic units and their discipline. They often take on responsibilities beyond teaching, research and service, providing formal and informal leadership in departments, colleges and universities and their disciplines. The demographic composition of the cohort influences the development of the discipline and a decline in the number of landscape architecture professors challenges the capacity of the discipline. Analysis of the cohorts of landscape architecture faculty who are professors and those who might be based upon their tenure in academia will address the state of the professor in landscape architecture. Presentation of the characteristics of the professors of landscape architecture in programs accredited by the Landscape Architectural Accreditation Board will include the gender, ethnicity and race, and age of this cohort. Presentation of the characteristics of associate professors of landscape architecture will address the same characteristics as well as their time in rank. The intent is to provide a summary of the current condition and potential future for the rank of professor in landscape architecture.

Ned Crankshaw, Michael Seymour, Matthew Powers, Tasha Cotter, Brian Lee and Jordan Phemister, 112, *Recruiting Students into Undergraduate Programs in Landscape Architecture: Predictive data, methods, and tracking*

Data aggregated by the Landscape Architecture Accreditation Board (LAAB) from programs' annual reports demonstrate that widespread concerns about student enrollment in landscape architecture programs are well founded. Despite this concern, CELA conferences have included sparse discussion of evidence-based, practical guidance for programs' recruiting efforts or reports on recruiting successes. A notable exception is CELA 2014 in which Seymour and Powers began reporting on their research and a discussion by program administrators led Mark Boyer to organize a compendium of schools' recruiting methods. Effective recruiting requires analysis of prospective students' interests and attitudes to enable better communication, development and implementation of a recruiting program, and tracking to recalibrate recruiting efforts. This panel will address these topics in a comprehensive discussion of undergraduate recruiting. Ned Crankshaw (University of Kentucky) will moderate the panel and provide an overview of enrollment data compiled by the LAAB. Michael Seymour (Mississippi State University) and Matthew Powers (Clemson University) will present on-going research that reveals prospective students' attitudes in a way that helps identify those who may be more likely to pursue landscape architecture when provided information about the discipline. In addition, the research of Powers and Seymour identifies communications methods more likely to reach students in a positive way. Tasha Cotter (University of Kentucky) will discuss the UK Department of Landscape Architecture's evolving recruiting plan and its implementation. Recruiting potential LA students at UK spans a spectrum from less direct methods that reach larger audiences to more direct contacts that reach smaller audiences. Cotter will also discuss the link between recruiting and advising, which aids student retention and provides a feedback loop for future recruiting. Jordan Phemister (University of Kentucky) will discuss the department's introductory course, which UK considers an essential link in the process of building an undergraduate student body. This course is non-studio but provides students an intensive set of experiences with each other designed to build camaraderie and commitment, while introducing landscape architecture as a design discipline with an ethic of humanism and environmentalism. Brian Lee (University of Kentucky) will present analysis of student records from the UK Department of Landscape Architecture that forms a preliminary understanding of the geographic/demographic profiles of the department's students. His analysis uses ESRI's tapestry segmentation to identify the types of geographic locations that might be most worth the department' recruiting investments. In addition, Lee will discuss predictors of student success in the UK LA program.

Amitabh Verma, 248, *Manual Skills, Technological Present: Identifying the place of hand graphics in landscape architecture today*

The increasing integration of technology in contemporary society has had a corresponding impact in the profession of landscape architecture (along with architecture, planning and urban design). Many traditional tasks, performed manually for centuries, are now accomplished largely with software programs and machinery (Martens, 2010). This development is perhaps most apparent in visual communication (drafting, drawing, lettering, rendering, etc.) which, although formerly exclusively manual, has largely become a mechanized undertaking (Cureton, 2017). The increasing reliance of the profession on digital media holds complex, wide-ranging implications for the future, in education and in practice. In this context, the author seeks to identify and reframe the place of manual graphics within the profession today, seeking to uncover implications for landscape architecture education. This paper asks a critical question: How do we assess the altered contemporary relevance, applicability and significance of a skill that was formerly an integral foundation of our profession? Further, in these transformed circumstances, how must its pedagogical dissemination be reexamined and adapted, so as to ensure continued relevance and integrity? The paper argues that the prevalent trend towards greater technological dependence must be countered with an increased emphasis on the importance of manual graphic skills in landscape curricula. The import of this skill must be recalibrated, and then communicated to students, to ensure that they view and comprehend this skill in light of its

new contextual identity, separate from its historical antecedents. Beginning by delineating the centrality of this skill to the profession, the paper outlines recent developments, which include an increasing number of voices calling attention to this issue. It examines current public discourse, expressed in academic and professional forums, as well as publications aiming to underscore the essentiality of manual graphics in the design process (Hutchison, 2016). On this broad foundation, the author seeks to overlay a personal, practical perspective, acquired through: • feedback from instructors teaching visual representation in a landscape architecture program • interviews and discussions with landscape firms This paper seeks to meaningfully contribute to a discussion which references a fundamental component of the identity and meaning of landscape architecture. It intends to utilize these questions to solicit feedback from colleagues at peer institutions with the ultimate objective of facilitating and establishing collaborative engagements.

Lijun Hao, Ming-Han Li, Zhetao Xiao, and Jinyoung Wu, 90, *A Case Study of Information-based, Technologically Mediated Teaching Methods in Landscape Architecture Design Course*

The paper introduces the reform and innovation of teaching landscape architecture design course guided by information technology in China. We experimented a new pedagogical approach that has nine steps, including literature review, variable assignment book, rapid design, special lectures, technical specifications, introduction of real project, design by traditional hand graphic, computer-aided design, and pinup/exhibition. In each step, information technology is employed to integrate information and course content. A holographic digital design management platform was used to monitor the teaching quality in the whole process. This approach is intended to improve the students' cognition of the landscape sustainable development, guide students to develop sound design ideas, cultivate effective learning, thinking and working methods, establish holistic views on human living environment, and improve students' professional qualities. The paper also introduces five information-based teaching sequences: 1. Demonstration sequence: Through instructor's guidance, this sequence broadens the students' vision of the landscape architecture field; 2. Implementation sequence: This is to establish the information database of the ecological and cultural landscape architecture design cases; 3. Interexchange sequence: Based on the integration of information and practice, this sequence strengthens the interaction between real-world teaching and virtual simulation teaching; 4. Outreach and service sequence: This sequence highlights the outreach and service efforts reflected in landscape architecture design culture and the uniqueness of different universities; 5. Interaction sequence: This sequence enhances interaction through technology by using Weibo, Forum, QQ group, WeChat group, SMS and other instant messaging. We experimented and monitored the new education system for 5 years. We used questionnaire to survey students from freshman to senior years to evaluate the effectiveness of the new pedagogical approach. 630 valid survey responses were received. We found that the new approach has improved the quality of learning, and the teaching reform has achieved promising results. 90.7% of participants believed that the application of information-based learning mode is useful for learning. 96.5% stated that information-based learning mode is effective for improving design ability and hands-on experience. 97.7% believed that the use of information technology can improve the ability to acquire and process information.

Benjamin George, Peter Summerlin, and Taz Fulford, 240, *Software and Technology Use in the Field: How educators can best equip students for practice*

Software and technology are thoroughly entrenched as an essential tool for designers. However, there are many available options vying for designer's attention and use, and it is often difficult to assess and understand the ramifications of adopting certain software packages. For educators, working to prepare students to become future practitioners, it is important to understand how software is being used in the profession in order to better train their students. This presentation reports the results of a national study of practitioners in the field of landscape architecture. The data collected builds on the results of previous research into the use of software in both practice (Calabria, 2012; Calabria, 2016) and in academia (Summerlin, George, and Fulford, 2017; Summerlin, George,

and Fulford, 2018). Combined with this study, educators and students will have a more holistic understanding of the current state of software usage and will better enabled to make informed decisions on what software to teach and learn. The survey was distributed with the assistance of the American Society of Landscape Architects and 482 individuals completed the survey. The survey collected demographic data about the respondent's firm, as well as asking them to assess how often they used various software packages. Additionally, they were also asked to rate how important the software was to their design workflow. In addition to collecting data about software usage, data was collected on the adoption of emerging technologies in the profession. This data provides a detailed picture of the current state of software use in the profession and enables an analysis of how software usage varies across the discipline. Not unexpectedly, the results of the study indicate that AutoCAD, Photoshop, Illustrator, and SketchUp are the most commonly used and most important software packages in the profession. However, when factoring in the type of projects that a firm works on, this ranking changes and other software, such as GIS, Revit, Rhino, and Civil3d, become more prominent. There is also variability in what software is used based on the geographic location of the firm. Larger firms are also more likely to use and value a broader range of software applications. The survey also found that individual emerging technologies are closely related, indicating that some firms are very entrepreneurial in adopting new technologies.

Dorna Eshrati and Kerry Priest, 269, *Who I Am and What Do I Do as a Designer?: Integrating leadership skills with environmental design learning*

A considerable number of beginning design students found design process overwhelming as it is different from what they had experienced in school. A certain level of independence and leadership can be very beneficial in managing how to improve and get used to the ambiguities of design process. Developing leadership skills by seeking people's transformation than just transferring information is introduced by Nick Petrie (2014). He suggests vertical leadership development which refers to "advancement in a person's thinking capability." Unlike horizontal leadership development which focuses more on "adding knowledge and skills", vertical leadership practices can help people get improved in thinking systematically and interdependently (Ibid: 6). To encourage more independent thinking and self-reflection, in an action-research project called "Who Am I and What Do I DO as a Designer?", 14 beginning design students were given the freedom to choose what and how they went about designing in the following phases: 1. Co-creating a practical and attractive assignment statement 2. Choosing design topics with the help of a diagnosing survey 3. Sharing feedback and suggestions in peer-coaching sessions 4. Design 5. Reflection Students practiced leadership development both horizontally and vertically, learning how to approach both technical and adaptive challenges. Even though, students initially found it challenging to give a reasonable answer to that very question, "Who Am I and What Do I DO as a Designer?," by leveraging the leadership skills and practices and encouraging the students to spend time reflecting on "self" and the motivators that drive their work, we ended up with a classroom of first-year students who had designed something that uniquely reflected who they are as designers. The results of this study can help design schools with curriculum planning to help students improve technically, adaptively, and also personally. A well-functioning education system needs to provide students with enough flexibility to better grasp the content and explore their identities and their own unique practical learning methods. Even though teaching technical skills is for sure the major core of first-year design programs, this study reinforces the necessity to consider vertical leadership development opportunities for students in curriculums along with horizontal development. This will help students become more independent thinkers and in upper studios, they are more likely to become what Petrie (2015) called interdependent collaborators and engage others in leadership activities. Consequently, they can make better sense of their individual purpose of higher education and get more motivated to engage in academic activities.

Kendall Mainzer and Alexandria Chomyn, 355, *Landscape Architecture Leaders: Effective engaged recruitment & development*

Despite recent trends in declining application and enrollment numbers, Penn State Landscape Architecture has enjoyed three years of remarkable recruitment and yield, expecting incoming BLA classes of 40 students with an average yield rate higher than the national rate. This success is even more notable considering the relatively low application numbers and high cost of a Penn State education, regularly the most expensive public education in the United States. To combat low application numbers, Penn State Landscape Architecture took a proactive, multi-prong approach to recruitment that enjoys the additional benefit of design education that extends beyond the studio in leadership development. We started a program called the LA Leaders. By shifting to a student-led recruitment strategy built on a guest-service platform and backed by market-research and clear messaging, Landscape Architecture programs can defy the odds and enjoy strong incoming cohorts of passionate, informed students. We have been careful to strengthen the undergraduate students' informed investment in their program by engaging them as key participants and drivers of mission-related departmental initiatives, particularly our emerging center, E+D: Ecology + Design. Through research, symposia, and key integration in major projects, the impact and distinction of our program and its students is enhanced in real-time. This presentation will discuss the strategy behind the initiative that effectively recruits, retains, and develops landscape architecture leaders, including how to identify and cultivate the students best suited to help a program achieve its specific goals related to recruitment. We will also discuss the evolution of the program and its emerging focus on furthering diversity and inclusion efforts within the department.

David Evans and Sean Michael, 454, *Remaking The Impoverished Student ASLA Chapter: A case study in fiscal resources and leadership*

Student ASLA chapters are largely responsible for the preparation of tomorrow's state and national ASLA leaders and professional practitioners. More broadly, they are the most omnipresent reflection of what ASLA as an organization offers to its potential members. As a result, the manner in which student ASLA chapters operate—the benefits they provide, how they prepare leaders, their organizational models—can either enhance or inhibit the desire and ability of graduating students to play a significant role in the Society. A fundamental challenge that faces student ASLA chapters nationally is their budgetary means to operate and to effect lasting good. Financially impoverished student clubs operate in a reality framed by an inability to live up to their potential, and frequently even to the missions they serve. ASLA as a national organization provides no operating funds for these chapters, despite the good they can potentially do, and the fact that they bear the Society's name. Indeed, ASLA expects that each school's chapter will diligently represent the organization, and this in spite of the budget models that frequently rely upon t-shirt sales and member dues as the primary revenue streams. This presentation provides a case study for an alternate model for student chapters. The model was begun at Washington State University in the early 2000's, and sought at its core to move the student chapter from a "poverty mentality" to one of impact, fiscal responsibility, and pride, while prioritizing student leadership development. That model was brought to Utah State University in 2008, where it has since evolved under a new era of faculty mentors. The results have been consistent and significant, and provide a model that can be readily implemented by other schools. The results offer promise for helping shape a new generation of leaders in both practice and our national organization. This singular case study illustrates the effectiveness of a community-engaged design program for providing financial support of a student ASLA chapter, while offering design benefits for public agencies and non-profit organizations through vertically integrated studio learning experiences. Over the course of the program, over 200 LAEP student volunteers have generated over $50,000 of cost-recovery fees while serving 43 public agency and non-profit clients. Through cost-recovery fees, students support multiple extracurricular educational and social events and have established an endowed scholarship fund.

Catherine Brinkley and Meghan Klasic, 351, *Transmission of Knowledge from Study Abroad Field Learning Sustainable Urban Development*

PURPOSE: This research asks: how do students plan to transmit their learning beyond the course? The aim of this research is to help redesign sustainability field learning in order to spur knowledge transmission beyond the classroom. BACKGROUND: The challenges of teaching sustainability are widely discussed. Teaching sustainability requires working at the nexus of multiple disciplines, while piloting new approaches in student learning and at the university-community interface to help spur practice (Holden et al., 2008). The task is to prepare future practitioners for future jobs that are not yet underpinned by a disciplinary major or minor, such as Climate Action Planning (Brinkley and Hoch, 2018; Wheeler, 2008). Educators have suggested that teaching sustainability must go beyond adding new courses or coordinating across curriculums (Santone 2003, p. 61). The United Nations designated 2005–2014 the Decade of Education for Sustainable Development (ESD). The combination of sustainability education and field learning is encapsulated in a variety of emerging programs. Tarrant et al. (2014) found significant synchrony between field learning and sustainability education by conducting a pre-/ posttest, two-by-two factor design of course location (study abroad vs. home campus) by course subject matter (sustainability vs. non-sustainability) on 357 students. Their findings reveal significant higher order interactions for three dependent measures of global citizenry: (a) social responsibility (concern for others, for society at large, and for the environment), (b) global awareness (understanding and appreciation of one's self in the world and of world issues), and (c) civic engagement (active engagement with local, regional, national, and global community issues). Results suggest that it is the combination of location (abroad) and academic focus on sustainability that yields the greatest increases in global citizenship learning outcomes. This research focuses on developing civic engagement in sustainable design through field learning. METHODS: Methods include course feedback, focus groups, and project evaluation. We use data from a 5-week summer study abroad program run from the University of California, Davis. Students (26) visit sustainable planning projects in four countries: Sweden, Denmark, Switzerland and Germany. Graded course deliverables focused on projects that could be shared beyond the classroom through the creation of GIS StoryMaps and op-ed write-ups. FINDINGS: Despite course content focused on established technologies and policies for reducing per capita greenhouse gas emissions, most student projects focused on aspects of livability. Students had no plans to transmit their knowledge beyond word of mouth to family and friends. None had considered engagement with policymakers or seeking publication of course materials. Further work is needed to help meet students where they are comfortable in order to spur transmission of knowledge beyond the course enrollees. IMPORTANCE: Study abroad literature suggests that learning effects are long-lasting, life-changing and career-impacting. Given the urgency of addressing global climate change, this research asks how to shorten the lag time for the impacts of study abroad experiences in sustainable design.

Carolina Aragon, 81, *Material Experiments in Landscape Architecture: Tinkering with algae, waste & electronics*

Current landscape architectural discourse has brought renewed attention to the role of material and technological exploration in advancing the profession's ability to address issues of sustainability and resilience. Material innovation in landscape architecture has been explored through a re-examination of traditional materials' performance (Yglesias, 2014); an organizational and conceptual framework for technological innovation and its interface with the dynamic and complex qualities of the landscape (Margolis and Robinson, 2007); and more recently, by exploring responsive technologies that bring into focus to environmental information that normally escapes our human sensory abilities (Cantrell and Holzman, 2016). Nevertheless, from a pedagogical perspective, material and technological experimentation in landscape architecture curricula remains limited. This may be in part due to the dominant role of representation as the primary medium by which design is learned, understood, and explored; and the ever-growing temporal and geographic scale of landscape projects. Direct material exploration, however, can provide alternative ways of understanding a subject, while providing opportunities for creative manipulation and innovation. In contrast to representation, it can provide direct feedback on technical performance, while providing a platform to better understand the aesthetic and experiential qualities of materials in outdoor environments. This paper presents examples of hands-on material experimentation developed by students in two

courses taught at the University of Massachusetts Amherst: Material Experiments in Landscape Architecture and the undergraduate junior studio, Upcycling in Public Space. These examples present innovative material explorations involving the use of waste materials, smart materials, electronics, and living organisms (bio-design). These projects harnessed the designers' abductive strategies of inquiry—which promote generating multiple explanations (Shearer, 2015)— while focusing on the perceptual qualities of the materials, to present innovative prototypes which could be further developed as landscape applications. While there are several limiting factors related to the applicability and translation of these experiments into landscape architectural practice—namely those of time and scale—these experiments present a model for promoting new lines of inquiry within landscape architecture education. In particular, this model introduces students to interdisciplinary research and promotes the role of design and creative work in fostering innovation. In conclusion, this paper argues for the pedagogical value of direct material experimentation to advance the role of designers in shaping technologies that address future challenges from a technological and humanistic approach.

Zhihan Tao, Galen Newman, Arnold Michael, Wonmin Sohn, Lingyue Cao, Ming-Han Li, and Jun Hyun Kim, 57, *The Living Green Infrastructure Lab: Advancing interdisciplinary teaching and professionalism in landscape architecture pedagogy*

Planning strategies emphasizing stormwater management, such as Low Impact Development (LID), are increasingly utilized in sustainable design/development (Sohn et al., 2014). LID is an innovative approach treating stormwater at the source, using uniformly distributed green and engineered facilities (Reja et al., 2017). This project educates and train students in LID alternatives through the creation of a hands-on outdoor classroom involving the development, installation, monitoring, management, and evaluation of a stormwater management facility which acts as an interactive test plot/living laboratory for testing the effects of green infrastructure (GI). Using a site on the Texas A&M University (TAMU) campus, faculty and students across three colleges (Agriculture, Architecture and Engineering), including the Landscape Architecture and Urban Planning, Horticultural Sciences, Civil Engineering, and Biological and Agricultural Engineering departments designed, implemented, and are monitoring the effects of a rain garden. The three year project employed long-term involvement in hands-on learning activities by an over 200 students. Landscape Architecture students provided the designs and construction details, Horticultural Sciences students propagated and grew all plants for the project, and Engineering students help monitor environmental quality changes. Landscape architecture students developed a larger-scaled campus master plan to teach students about LID and GI. The rain garden design was, then, created as a detailed landscape design within the broader conceptual master plan. Student work was evaluated by landscape architects, urban planners, horticulturalists, and campus facilities maintenance personnel. The most suitable design was then selected by the campus facilities management director and campus landscape architect. The design was then presented to the Council for the Built Environment at TAMU for refinements and approval. After several consultations with civil engineers and horticulture professionals, the planting plan, grading plan, and infrastructure construction design were finalized. Prior to the installation of the project, the runoff speed, volume, and water quality were monitored and recorded using water samplers produced by ISCO and consultation with the TAMU AgriLife Extension Service Soil, Water and Forage Testing Laboratory. The entire construction process was recorded by time-lapse cameras to produce videos for further inspection and educate students about the different phases: site preparation, grading, paving installation, metal structure installation, and planting. After the installation, post-design water quality measures were conducted and compared to pre-installation data. The collaboration between multidisciplinary professionals helped students better understand the professional design process and opened their eyes to evaluation methods and positive impacts of green infrastructure.

Cathi Schar, 441, *Proof of Concept: Waipahu transit oriented development collaboration*

This paper examines a multi-departmental, multi-curricular, and extramural collaboration on the Waipahu Transit Oriented Development (TOD) Proof of Concept Study for the State of Hawai'i Office of Planning. The study aims at a new planning and design framework for state-owned lands surrounding Honolulu's controversial billion-dollar rail line, focusing on the Waipahu Town station. The study gathers eight faculty members from intersecting academic units: the Department of Urban and Regional Planning (in the College of Social Sciences); the Center for Public Policy; School of Architecture; and Sea Grant Colleges, contracted as a project team through the University of Hawai'i Community Design Center (UHCDC), a hybrid teaching-practice established by the School of Architecture to provide a university-wide platform for interdisciplinary research and design inquiry on public interest built environment projects, aimed at the integration of education, practice, and outreach. The team focused coursework and extramural research on efforts that include community engagement, an ecological hazards assessment, an ecological asset study, site planning studies, infrastructure and transportation recommendations, flood mitigation measures, a design futures digital optimization model, and block typologies and designs for the state parcels. The final deliverable for the study is a report that compiles these efforts and develops a framework applicable to other state-owned parcels near the other 20 proposed transit stations. This paper reflects on the value of this study to the state, in comparison to more typical commercial planning services; and to the university, as a driver of departmental faculty and student collaboration. It will also provide metrics that start to assess the overall effectiveness of this collaboration, through the measurement of costs, benefits, and challenges to the state, faculty, students, and community. The Waipahu TOD Proof of Concept Study is one of the first UHCDC projects with this magnitude of faculty collaboration. In total, the project spans six courses, eight faculty members, and three departments. With other similar multi-departmental extramural collaborations in the pipeline, this project also provides an opportunity to reflect on the role of community design centers as a collaborative platform rather than a collaborative practice, looking at the University of Arkansas Community Design Center, the Detroit Collaborative Design Center, and the EPIC-Framework for diverse context, and likewise, to measure the costs, benefits, and challenges of this hybrid model.

Kofi Boone, Ken Yocom, Megan Barnes, David Gooze, 285, *Recruitment and Retention in Undergraduate Landscape Architecture Education*

Currently, undergraduate landscape architecture education is facing a multitude of challenges. Although we celebrate the unprecedented global growth of landscape architecture and its positive impacts on many academic programs, we are also concerned about the concurrent trend of decreasing numbers of undergraduate programs and lower enrollment numbers. In addition to not aligning with unprecedented professional exposure and recognized impacts made by landscape architects in a changing world, the decline of undergraduate programs impacts our ability to provide career pathways for high school students. As a profession uniquely equipped to lead in an age of extreme climate change, rising seas and inequity, landscape architecture is and should be seen as an attractive career option for high school students seeking higher education. Why is enrollment declining and what can we do as educators and professionals to attract potential students. This panel discussion will report on the findings of a nationwide survey of undergraduate landscape architecture programs that gathered broad views about the causes of recruitment and retention challenges for undergraduate programs and strategies for growing landscape architecture education at the undergraduate level. The panelists will provide a brief overview of the state of undergraduate landscape architecture education, highlight specific challenges faced, and focus primarily on potential solutions based on proven techniques implemented by programs across the country.

David Barbarash and Sean Rotar, 391, *Integrated Project Assessment and Effectiveness*

Professional projects in landscape architecture require a broad spectrum of knowledge and skills for their successful execution. In particular, design theory, sociology, grading and drainage, plant materials, and construction are vitally interrelated in the creation of successful spaces. Students have demonstrated difficulties

translating content from disparate courses into their design projects, leaving gaps in realized design despite both perceived and measured competence with related knowledge and skill competencies. In an effort to simulate this spectrum of knowledge required in professional design projects, as well as the processes and rigor required in an office setting, the landscape architecture program at Purdue University initiated an integrated project process during the fifth and sixth semesters of a student's undergraduate degree. Courses in grading and stormwater design, plant material, and construction documentation are taught alongside a thematic studio, replicating the complete project process and iterative nature of a professional office setting. While the idea of an integrated project is not new, being described in Levy's "Total Studio" (Levy, 1980) and Steinitz's "Framework" (Steinitz, 1990), the authors have evaluated the effect this integrated project process has had on student's perception of their ability to create robust, integrated designs. Students completed surveys to assess their perception of the importance of the interaction among theory, skills, knowledge, and final design product, as well as their own abilities to integrate the knowledge areas. A trial study measuring student preferences and response to the integrated project process (Rotar, Barbarash, et.al. 2014) showed promising trends; the current study presents 4 years' survey data and presents conclusions indicating a statistically significant increase in student perception of their abilities to integrate these four topics into stronger design solutions. In addition, professional office assessment of both intern and post-graduation student abilities with pre- and post-integrated project experiences are discussed to determine the real-world benefits of integrated project coursework as an educational and experiential methodology.

David Smith and Wolfram Hoefer, 455, *Teaching Formal Frameworks for Structuring Planning and Design Objectives for the Regional Scale*

A major challenge for students jumping from local- to regional-scale design and planning is the dramatic increase in the complexity of systems involved. Students, when confronted with this change in scale, are often overwhelmed by this complexity. One way to help students make this transition is to provide them with a framework for structuring the objectives and priorities that guide their interventions. This paper discusses the introduction of one of these frameworks, Problem Tree-Solution Tree analysis, to an undergraduate regional planning and design studio. The Problem Tree-Solution Tree methodology [1,2] is designed to help focus interventions by identifying achievable objectives that have a clear causal relationship to a central problem or goal. The approach has been applied in addressing such complex issues as energy policy [3], agricultural economics [4], and global public health initiatives [5]. In the method, participants identify and diagram chains of cause-effect relationships around a central problem (the problem tree). These are then reframed as specific objectives that lead toward a singular goal—i.e. a solution to the central problem (the solution tree). Interventions can then be focused on achieving a set of smaller, targeted objectives that lead toward that goal. The studio in question focused on storm water management issues affecting a portion of the Passaic River in New Jersey. This stretch of the river crosses five counties and nearly 20 physically and socioeconomically diverse municipalities, and is contaminated by both industrial pollution and combined sewer overflows. One learning objective of the course was to analyze and respond to the numerous landscape systems that relate to storm water movement and contamination affecting the river and its adjacent communities. At the start of the semester, students were given a brief walkthrough of the tree construction process. Working in groups, they were then given one week to research the site and its issues, and to develop a problem tree based on their understanding of those issues. These trees were revised midway through the semester to incorporate new information drawn from GIS-based inventory, case studies, and presentations from experts. The assignment was assessed primarily on each group's ability to determine appropriate cause-effect relationships among the issues. Finally, groups turned their attention from the broader context to subsections of the study area to develop interventions, starting with a problem tree assessing issues specific to their subsite. Students dealing with the complexity of the regional scale often struggle with a persistent lack of confidence in their knowledge of the site (i.e. "analysis paralysis") and with difficulty keeping interventions focused on stated objectives. The students of this studio showed minimal difficulty with these issues, especially when compared with

approaches that were more free-form or based on working from real-world examples. While it is difficult to quantify the effect of this approach, it is apparent that providing a formal method for conceptually structuring a highly complex system can ease the transition from the local scale to the regional scale.

Celen Pasalar, Anna Grace Fitzgerald, and Renae Mantooth, 470, *Systems Thinking and Transdisciplinary Learning through Community-Based Engagement Projects Integrated in Landscape Architecture Pedagogy*

Contemporary practices in landscape architecture education aim to equip students with varying skill sets to develop into more reflective and systemic thinkers as practitioners. Due to the emerging social, economic, and environmental challenges that we are experiencing in our societies, more holistic design and planning approaches are increasingly on demand. There are also growing expectations among design students to "improve the quality of life in communities", while "putting creative abilities to practical use" (Boyer and Mitgang, 1996). Hence, engaging students in transdisciplinary community design conversations about emerging environmental and societal grand challenges facing in communities is becoming more crucial. This study investigates systems-based thinking and transdisciplinary learning through community based projects integrated into landscape architecture education. It builds on the DesignWeek effort led by the NC State Department of Landscape Architecture since 2017. The intent of the recently organized DesignWeek 2018 was to serve as a catalyst for transdisciplinary discourse, debate, and action around the future of the Neuse River watershed and the development of new environmental design strategies for creating healthier and resilient communities. In order to sustain and promote the health of the watershed, systemic thinking was implemented confronting issues of urban growth, land use practices, increased pollution in watershed and drinking supply, rising sea level, and the realities of destruction stemming from extreme rainfall, flooding, and wind events. This week-long event allowed landscape architecture students to engage with local communities; collaborate with students in architecture, city and regional planning, and bio-agricultural engineering; research and propose different design strategies; and learn from experts in the aforementioned fields. Working collaboratively, 12 interdisciplinary teams identified and developed innovative strategies and techniques to address known and anticipated future socio-environmental issues, and proposed strategies to communities that promote the health, safety, and welfare for all. To determine the effectiveness of this effort, data were gathered from students' surveys conducted before and aftermath of the DesignWeek event. Results suggest that students cultivated deeper awareness of climate change and development impacts on the watershed systems and communities, gained greater sensitivity of transdisciplinary viewpoints and importance of engagement efforts with communities, and expanded their technical knowledge and design problem solving abilities.

Lora Martens, 436, *Community Focused Design on Campus: A complex and safe place for examining tough subjects and testing ideas in community design*

Working within our communities can be a rich way for students to see the impact of their work and tackle complex subjects first hand. Socially aligned studio practice that explores the deep issues of how the issues of diversity, othering, justice and racism overlap with our feelings of community in public space can be overwhelming for faculty to take on with students. This presentation provides an exploration of using the campus as a testing ground to discuss the complex ideas behind community exclusion and inclusion. Campuses are not as ethnically diverse as the general population, but their and their homogeneity of shared value of education and campus community leads us to consider campuses as a good space to teach the basics of diversity and inclusion. This presentation examines a curriculum for a second year undergraduate landscape architecture studio, which focuses on issues of inclusivity and community design with an on-campus project. We compare the diversity of the college campus at Arizona State Univeristy to the general population of Phoenix as a starting metric. The student design process incorporates case studies examining different community based projects, learning about the cultures and customs of different populations through research and interviews, observing student activities in the campus space before design. In the

design phase we ask the students to use what they have learned and chose a value and a behavior they are designing for in their final project. We examine the challenges and successes to this methodology and compare it to similar community based studios of this academic year.

Max Marschall, Jacob Lindsay, and Jane Burry, 54, *DataScapes: A landscape architectural workshop incorporating environmental data capture into the design process*

Data capture and analysis through embedded sensors are becoming more prevalent in many industries. Increased amounts of available data are enabling designers to produce more customized solutions based on observations and numeric analyses of real-world phenomena. One such set of phenomena are microclimatic conditions. Microclimate data capture and analysis has the potential to influence design for human comfort and well-being in urban landscapes. This paper reports on a 7-week intensive university seminar on environmental data capture for landscape design. Beginning with a specific framing of a design hypothesis in the form of a "How might we…" statement, the student groups conducted data capture surveys by constructing sensor devices, then capturing, processing, visualizing and analyzing the data, in order to inform specific design decisions for proposed interventions in the Victoria Harbour precinct in Melbourne, Australia. These included structures to reduce wind tunnel effects, urban gardening initiatives that matched vegetation types to varying microclimates, and informing the positioning of artificial lighting to boost social interactions and perception of safety at night-time. Based on these student projects, this paper seeks to address the question of how data-driven design may be conducted in practice, and how to prepare design students for a data-driven future. This class focused on story-telling as the key method for achieving meaningful results efficiently. We mandated students to set up an aim and hypothesis before capturing any data, and to channel their efforts into short, narrated animations to learn how to engage audiences.

Iryna Dronova, 154, *Inspiring Urban Design Innovation with Microclimate Research Tools*

Warming of globally expanding urban environments represents one of the critical risks to human well-being in the 21st century, as global population is shifting to predominantly city dwellers. Mitigation of emerging thermal risks is an increasingly important task for urban design and planning at multiple scales; yet, it poses unique challenges in regions where water scarcity limits the portfolio of outdoor cooling measures. Furthermore, informing heat mitigation strategies requires an understanding of comparative microclimatic performance across different landscape contexts and design scenarios, which may be difficult and costly to obtain through real-scale experimental approaches. Alternatively, such comparisons may be enabled by novel cost-effective monitoring tools and computer-based modeling techniques; however, their applications to date have not been yet frequently integrated in landscape architecture pedagogy or research-by-design activities. This presentation discusses key insights and lessons from introducing field- and computer-based research tools on microclimate analysis to graduate and undergraduate courses within the landscape architecture major at the Department of Landscape Architecture and Environmental Planning, UC Berkeley, USA. Both courses experimented with predicting and comparing thermal outcomes of site-level urban green space design scenarios using Envi-MET software, which provides a three-dimension simulation modeling environment for analyzing microclimatic interactions between buildings, surfaces and vegetation. One of the courses additionally included a suite of field microclimate measurements in predominantly built-up and predominantly vegetated environments, using a range of instruments from portable hand-held tools to digital sensors and OnsetHobo weather station. Collective experience from these exercises highlighted an important promise of these research tools for enhancing the understanding of microclimatic performance of urban spaces and inspiring their design innovation, as well as key challenges that need to be addressed in the future. Main benefits of the considered field methods and software included relative ease of their operation and implementation without an extensive prior training in climatology, the ability to cost-effectively collect and process large amounts of data or different test scenarios, and possibilities to work with different data formats and outputs for subsequent visualization and communication. In turn, key challenges included

resolving software-specific technical issues, conceptual balance between site realism and simplification required by modeling procedures, and difficulties with some quantitative analyses and environmental science concepts. These challenges highlight the need to foster a greater interaction among curricular components focusing on design, environmental concepts and different research methods, and to promote comprehensive discussions of their coupling with socio-economic context of urban design and heat mitigation efforts.

Natalie Yates and Peter Ellery, 150, *Drones In (and Out of) the Classroom: Experiences and outcomes of a UAS technologies course and beyond*

It has become apparent over the past few years that drones and drone technology can provide landscape architecture with a new set of tools for field investigation. With their affordability, agility and relative ease of use, we can acquire aerial imagery, topographic information, multispectral imagery and vegetation health, detailed feature imagery and measurements, and experiential video. Although this tool is especially suited to landscape architecture, there are few institutions teaching students how to harness this tool for design research and analysis. In spring 2018, Ball State University Department of Landscape Architecture offered an elective seminar called Exploring the Use of UAS Technologies. The course was offered to all upper-level undergraduate and graduate students. The course itself included UAS operation instruction that included training in both manual and GPS-based flight control, theory covering Part 107 of the U.S. Federal Aviation Authority certification requisites, high resolution video and photographic image data capture in the field, and data processing and presentation. The inaugural run of this course also exposed a number of issues in addition to the usual problems associated with implement a new course within the curriculum. These issues included university policy and regulations concerning the flying of drone campus property and the safety and security issues associated with this happening, liability and insurance issues that would need to be addressed by both students and the university, the ability to still deliver the practical aspects of the class during inclement weather, the availability of drone equipment and resources, issues related to software selection, software costs, and the instruction of drone data analysis software in the course, the engagement of community and professional resources, partnering with community entities and organizations for potential drone use projects for the students, and the selection of introductory level projects that would give students their first opportunities to incorporate drone technology into their studies. In this presentation, we will discuss some of the obstacles we encountered at the department and university level, how we overcame these obstacles, and the future potential for courses like these. The presentation will also provide examples of the course content students received and show examples of the students' work both from the course and outside of the course.

Drew Hill, Benjamin George, and David Evans, 394, *How Virtual Reality Impacts the Landscape Architecture Design Process at the Site-scale during the Phases of Analysis and Concept Development*

In the field of Landscape Architecture, virtual reality (VR) is increasingly being adopted as a tool for visualization and presentation in the late stages of the design process. Many of the benefits that make VR valuable in the later stages of the design process suggest that VR may be equally valuable when used in earlier stages such as analysis and concept development. However, the present body of research does not provide a detailed study of truly immersive design within VR during those early stages. Virtual reality facilitates the understanding of spatial concepts and the research illustrates the value of interaction and immersion in VR (Portman, 2015; George, 2017). Recent developments in virtual environments, and the availability of high bandwidth networks, have the potential to bring significant changes in the way that design-related professionals collaborate and design (Gül, 2006). While VR tools for designing and planning are increasingly being adopted, there is insufficient research addressing the precise benefits of VR, what unique capabilities VR provides, and what are the limitations in its use (Orland, 2001; Portman, 2015). Research by George, Sleipness, and Quebbeman (2017) demonstrated the efficacy of VR as an early stage design tool, but noted that additional research was needed on the impact that VR has on design decisions, especially on complex projects. This study utilizes a case study approach of a student design project to

test the impacts of VR when used in the analysis and concept development stages of the design process at the site-scale. A series of surveys and a focus group discussion were used to gather feedback from participants. The students reported that VR improved their ability to understand complex issues and relationships such as existing site conditions, opportunities, and constraints. Students also reported having an improved spatial understanding and awareness of the three-dimensional nature of both their early and later refined design concepts. Additional materials apart from those required for the traditional design process were needed to facilitate VR design such as a drone, photogrammetry software, a VR platform, and a high-performance computer. However, the results of the research demonstrate the value and benefits of VR as a tool for analysis and concept development. The results also suggest that VR can enhance the early phases of the landscape architecture design process and effectively be integrated into a workflow at the site-scale.

Deni Ruggeri and Ellen Fetzer, 30, *The Digital Classroom as Landscape Democracy Arena: Toward a socially transformative pedagogy in design and planning*

Hope Hasbrouck, 422, *Volume Reboot: A framework for fundamental design exercises*

PURPOSE: This paper brings to conclusion a multi-year exploration in creating fundamental design exercises that emphasize volumetric space in the landscape architectural project. The exercises are adapted from the compositional exercises traditionally found in architecture programs. The exercises are essentially a melding of projects once taught and possibly still taught within schools of architecture. Variations of the exercises are found at Cornell University, the University of Texas at Austin, University of Tennessee, University of Virginia, and Washington University. The sequence of exercises develop spatial literacy while introducing design vocabulary and craft in relation to contemporary representation techniques and materials. BACKGROUND: The author previously delivered a paper at CELA describing the initial phase of this exploration. The paper raised the concern that the illustrative plan, or section perspective replaced the diagram. The exploded systems diagram are adequate in identifying the landscape systems present in the project but the separation of systems are unable to denote significant spatial relations and the subsequent structuring of place that Robin Dripps' description of the diagram implies. Broad strokes and grand gestures (sprinkled with good intentions) expressed by generic detailing lacks the precise definition of spatial volume and material experience that is at the core or landscape architecture. The presentation flirted with the notion that as the discipline, embraced indeterminacy the landscape architectural project became an assemblage of movement and flows leaving behind spatial rigor. Spatial rigor is essential to delineating, as Dripps once said, the "place that accommodates and promotes the rituals of dwelling." That is if you accept, as I do, that dwelling is within the domain of landscape architecture. METHODS: The paper is divided into three parts. The first describes the pedagogical intent behind the exercises supported by the literature review. The second part describes the sequence exercises in tandem with learning objectives. The third section defines criteria for evaluation and a grading rubric. FINDINGS/ LEARNING OUTCOMES: The findings will be presented as a side by side comparison of student work with landscape architectural precedents. The pairing of project with precedent is a technique to demonstrate how the exercises produce form suitable for landscape architectural education. IMPORTANCE: Design students must comprehend the fundamentals of space and volume distribution in landscape architecture before challenging spatial perception in the landscape architectural project. AUTHORS' BIO The author has taught landscape architectural design for twenty years. The focus of publication and instruction has concentrated in digital representation techniques.

Bambi Yost and Jon Hunt, 423, *Helping Students Overcome Fears and Obstacles in Beginning Design Classes*

"I can't draw." "I don't know what you want." "I don't know where to start." "I can't do this." "I'm just not artistic." We have all heard students say these things and more when they are starting to learn to see, to draw, and

to create in beginning design studios and drawing classes. What can we do to help students gain confidence and new design skills when self-doubt, fear of failure, perfectionism, anxiety, and other personal obstacles get in the way? Psychologists have shown that metacognition, self-regulation, self-efficacy, and personal agency may increase resilience and academic performance when students possess motivational and behavioral processes to put these self-beliefs into effect (Zimmerman, 1990; Zimmerman, 1995; Zimmerman, 2002). Metacognition, simply put, is the ability to think about thinking. Self-regulation is the ability to manage one's own emotional and behavioral responses and to act with one's long-term best interests and deepest values in mind. Self-efficacy is belief in one's ability to influence events that effect one's life (Bandura, 1994; Haines & Smith, 2012). "Personal agency refers to one's capability to originate and direct actions for given purposes. It is influenced by the belief in one's effectiveness in performing specific tasks, which is termed self-efficacy, as well as by one's actual skill (Zimmerman & Cleary, 2006). All of the factors listed above contribute to student success; however, little research has been conducted with landscape architecture students. In this session, the authors will provide a literature review of metacognition, self-regulation, self-efficacy, and personal agency as these psychological terms relate to design and landscape architecture studios and drawing classes in particular. Plus the authors will share case studies, examples, and illustrations on the following topics: helping students start the creative process when faced with blank paper; building students' frustration tolerance while limiting premature closure; addressing and working with students' fear and anxiety; and helping students move forward when frozen. In addition, the authors will share techniques from psychology which may be helpful for students trying to overcome fear of making. Students who understand their personal triggers, which can cause anxiety and premature closure when creating, designing, and drawing, are better able overcome these obstacles. The authors demonstrate the need for reflection-in-action (Schön 1983); a mechanism to experience disbelief, uncertainty, or confusion to then reflect on this occurrence in hopes of creating both a new understanding and change in one's thinking. Authors will present various investigative reflective learning processes, such as: journaling, sketching, and talking with others, as well as other innovative approaches, to help students when words simply don't seem sufficient enough. A culture of continual reflection and assessment helps students cultivate new appreciations of one's work and themselves. Unfortunately, very little research has been conducted in this area by landscape architecture and beginning design educators. As a result, the authors argue that more research is needed in this area to empower both educators and students.

Kathryn Nelson, 79, *Assessing Student Attainment of Departmental Student Learning Outcomes through External Review using Qualtrics Survey Responses from Internship Supervisors.*

The Department of Landscape Architecture (DoLA) at Texas Tech University has undergone a major transition in recent years with an eye towards improving educational standards. Central to this makeover is a fresh departmental vision and new teaching model coined the "Semester of Learning" based on a comprehensive set of student learning outcomes (SLOs). The next phase in the process is to assess the impact of these changes using these SLOs to evaluate student progress and ensure the DoLA is meeting its stated vision to "Advance Landscape Architecture". This assessment will inform the DoLA in future efforts for continued excellence. The SLOs created by DoLA are grounded in seven foundational topics: Design, Professionalism, History, Construction, Global and Professional Communication, Technology, Systems and Processes, and Research. The list of SLOs became the catalyst to develop a departmental rubric to assess student progress at any level and to inform the design of each course in the semester of learning. The standardized rubrics have provided a flexible and advantageous workflow for faculty and consistency for the student body. While the faculty evaluation of student abilities based on SLOs has been a success, obtaining outside evaluation of student learning was sought with three specific goals: 1) to further gage student achievement; 2) determine if departmental objectives are being met; and 3) assess whether the department is on target for preparing forward thinking interns/graduates that support the DoLA's vision. A six-month required internship provides the external setting needed and presents an excellent opportunity to evaluate from a "real-world" perspective how well the DoLA is meeting its goals. A Qualtrics survey was therefore developed and implemented in the spring of 2018 to assess departmental SLOs and related rubric measures based on supervisors'

observations of student abilities. External evaluation results will be presented that reveal course strengths and weaknesses and provide direction for future course content to produce forward thinking office professionals. The DoLA strives to prepare students to make valuable contributions to firm project teams by providing the latest in workflows, technology, and production prior to their internships—skills that will advance the profession in an impactful way. The information gathered from the Qualtrics survey has already provided valuable insight to student learning and direction for future initiatives, and will help DoLA to continuously improve the curriculum over time.

Carla Delcambre, Andrew Fox, and Jesse Turner, 283, *Design + Build at a Land Grant University*

North Carolina continues to grow faster than the national average. In 2010, the US Census Bureau recorded that North Carolina's population grew by more than 737,000 residents, an increase of 7.7%. Located in Raleigh, the state's fastest-growing metropolitan area, North Carolina State University (NC State) is the state's largest university with a population of 42,000 students, faculty, and staff. Green Infrastructure (GI) offers sustainable approaches to rapidly densifying regional and campus development trends. It does so through a strategic focus on site-specific methods of contextually specific and high-performance landscape practices. This paper introduces a strategy for graduate students to design and build Green Infrastructure projects within the context of a Land Grant University. The authors describe a systematic approach to course development and delivery; stormwater control measures (SCM's) are implemented in an applied learning environment within the structure of a required, 16-week studio at the NC State Department of Landscape Architecture. Departmental faculty have developed a sustainable organizational model with campus and industry partners, collectively resulting in successful studios and projects over the past 9 years. The development of applied learning in landscape architecture is critical for understanding the design process, client relationships, and implementation. The Design + Build studio will incorporate methods for data collection through visual inspection and measuring infiltration rate, soil compaction, soil composition, and moisture levels. The method for data collection will be through using a soil moisture meter, cone penetrometer, double ring infiltrometer, and tubular soil sampler. An interview process determining the educational impact on the campus community will also be integrated into the data collection. In this respect, the design/build teaching model is a form of immersive hands-on learning experience that has the potential to be integrated at other landscape architecture programs throughout the country. In 2015, NC State developed a Campus Sustainability Strategic Plan which emphasized the goals of institutionally integrating sustainability into education, experience, and research. The NC State Design + Build Studio has become a major force in the incremental changes happening to NC State's campus landscapes, which are now designed and managed to promote environmental awareness, plant diversity, pollination, and stewardship. This studio effectively translates conceptual ideas into tangible construction documents that are built by students. The primary objective of this course is to refine each student's ability to accurately assess, design, construct, and manage sustainable environments. Student learning outcomes include: Ability to create environmentally responsive solutions at all developmental levels, concept through installation; Increased awareness of various viewpoints, approaches, and research found in related fields of study and/or professional practice(s); Improved design research skills that better inform the everyday decision-making processes found within the practice of landscape architecture. The combination of critical investigation and hands-on 'making' yields both indelible lessons and tangible results that expand and enrich vital learning processes and outcomes.

Dan Li, Mintai Kim, and Cermetrius Bohannon, 442, *Exploring Education for Sustainability in LAAB-accredited Landscape Architecture Programs*

The purpose of this study is to explore how sustainability is taught in landscape architecture programs accredited by the Landscape Architecture Accreditation Board (LAAB). "Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland & Khalid, 1987, p. 43) On the one hand, sustainable landscapes increasingly emerge in practice

(Calkins, 2011). On the other hand, achieving sustainability is significantly associated with the leadership of education. Thus, it is important to conduct high-quality studies which focus on sustainable landscape education. However, current studies on sustainable landscape education are fragmentary based on the literature review, because most of them emphasized how sustainability was taught in individual courses (Albert, von Haaren, Vargas-Moreno, & Steinitz, 2015; Nikezić & Marković, 2015). That results in a gap in the general view of how sustainability is taught in landscape architecture programs. To fill this gap, we raised the following research questions: 1) How do the LAAB-accredited landscape architecture programs address sustainability in their mission statements and program descriptions? 2) How is sustainability reflected in their curriculums? 3) Does the way how landscape architecture programs address sustainability in their mission statements affect the design of their curriculum? A two-phase sequential exploratory mixed methods research design using quantitative and qualitative data was used to explore the research questions. In the first phase, mission statements from LAAB-accredited landscape architecture programs are collected and analyzed using content analysis. In the second phase, curriculums of the LAAB-accredited landscape architecture programs are collected and evaluated using the Sustainable Landscape Teaching (SLT) Rubric. The SLT rubric was developed by the researchers based on the importance level of different kinds of sustainable courses. After accomplishing the second phase, focused codes from the first phase were compared based on the curriculum evaluation. The findings of the study include that, although some LAAB-accredited landscape architecture programs claimed to emphasize sustainability in their mission statements, their curriculum evaluation varied a lot. By revisiting the qualitative codes, themes, and memos based on the curriculum evaluation, the researchers discovered the way how landscape architecture programs address sustainability reflected their attitude and affected the content of the curriculum. The outcomes help us better understand the current situation of sustainable landscape education and help improve it in the future.

Frederick Lutt, 107, *Co-operative Education for Master of Landscape Architecture: Challenges and opportunities*

After 33 years as a practicing registered landscape architect (RLA) and certified planner(AICP), I entered academia in the fall of 2015. My position with the University of Cincinnati (UC) as a co-op advisor involves traditional classroom teaching, individual advising, maintaining employer relations, and seeking new employer partners. For my first two years at UC I advised undergraduate and graduate planning students. I inherited about 100 co-op employers for planning students. Beginning Fall 2017, MLA students were added to my responsibilities. This presentation will focus on the challenges and opportunities in creating a new co-operative education program for MLA students. I will look at the history of co-operative education at UC. The program has evolved over the last 80 years, especially since the creation of our online system PAL, which links students seeking co-op positions to employers, and tracks student and employer reports. I will review my classroom teaching which focuses on preparing MLA students for their co-op experience. A discussion of the challenges will include the following topics: gathering student input on desirable and obtainable co-op positions; reaching out to new employer partners in a variety of practice areas; working with a variety of employers from large multi-disciplinary firms, small landscape architecture firms, to community focused NGO's; and setting realistic expectations for students with a wide range of technical skills. The first cohort of five students sought co-ops for Summer 2018, yet several were frustrated that their lack of AutoCAD and/or InDesign skills hampered their ability to find meaningful work. MLA students will only co-op in Summer semester, which places them in competition with more skilled undergraduates also seeking work at that time. Based on historic trends at UC, our goal is to have two potential co-op positions for each student. With five students that means establishing ten co-op positions. The extra number of jobs takes into account year to year changes in demand, and student preferences regarding location and firm type. A discussion of the opportunities will include the following topics: partnering with firms in new areas of practice such as pop-up design and temporary urban design installations; partnering with firms who are do not require advanced AutoCAD and InDesign skills from co-ops; leveraging some of the student's more advanced transferable skills such as photography, video production, editing and writing skill, fund raising for non-profits, and business management.

Kristopher Pritchard and Maria Bellalta, 136, *Building Relationships Between LAAB-Accredited Programs and Community Colleges*

Enrollment in landscape architecture education in the United States has struggled to see a recovery since the economic recession of 2008. According to data collected through the Landscape Architectural Accreditation Board (LAAB) Annual Report, student enrollment has dropped roughly ten percent in the last 5 years, hitting the undergraduate programs hardest due to an almost 20% decrease in domestic students. In an effort to support the accredited programs, the American Society of Landscape Architects (ASLA) Committee on Education conducted research to better understand and promote a two-way dialogue between LAAB-accredited programs and educational institutions offering two-year associate degrees, such as community colleges. With enrollment numbers decreasing in landscape architecture education over the last decade, landscape architecture educators and practitioners collaborated to create an infographic to promote successful best practices gathered from an array of accredited programs throughout the US who identified as having a relationship with a community college. By providing a better understanding of why to have a relationship, how to set up the relationship, and what activities to host to establish and strengthen the relationship, the goal is to encourage more accredited programs to create an affiliation with one or more community colleges as another effort to recruit more students into their programs. This initiative parallels with ASLA's efforts to grow the profession and raise awareness of landscape architecture as a career path to diverse student groups. This presentation will discuss the research conducted and data collected to help inform the committee's work, review and share the document which shows the results of ASLA LAAB-Accredited Programs and Community College Feeder Programs Collaboration Survey, and provide fellow educators and other participants actionable items to complete upon returning to their home states and institutions.

Ann Hildner, 336, *Engaging Landscapes with Words: The use of language as a design tool in landscape architecture education*

As educators in the field of landscape architecture we are most focused on teaching students to think and communicate graphically. Within the broad spectrum of curriculum demands, we rarely have the opportunity to deliberately exercise and develop students' verbal and written skills. What is lost in this circumstance is the fact that a command of words and language is an essential skill not only in allowing students to think and communicate about the design of landscapes and place but, even more significantly, in allowing students to gain access to language as a potentially powerful design tool leading them to enhanced creativity, greater expressive content, meaning, and sense of place in their design work. As an educator seeking enhanced creativity in landscape architecture education, I am primarily focused on using language to influence students' thinking about landscapes and place within the ideation stage of the creative process. Fundamental to this educational objective is the development of visual-verbal fluency with the intention of helping students build the "conceptual bridge" that allows the transformation from verbally-described to visually-portrayed material to occur. The instructional approach employed toward this end relies on delving into the realm of powerfully descriptive landscape and place-based language that includes the use of metaphors and manipulative verbs in generating ideas, as well as the use of literary place narratives as prompts for abstract designs. Some of the strategies have been used within the context of design as a process of exploration and inquiry, while other methods used have occurred with more traditional studio-based problem-solving. The methods employed expand upon established scholarship on the use of language in the design process and the question "how does this work compare to this established work" will be addressed. All of this word play is ultimately intended to bring students to a stronger connection with and understanding of context while deepening their understanding of the art of making engaging places with distinct identities. The broader educational significance of incorporating these techniques is that it develops the language-based skills often overlooked in the design curriculum. In order to assess the outcome of the methods used, student output was measured against the degree of descriptively significant words and language used in their design process. Students

who engaged in a descriptive design process with greater visual-verbal fluency exhibited higher quality design work as evaluated by both students and instructors, illustrating how the use of these techniques in teaching design warrants consideration.

Rosalea Monacella and Bridget Keane, 359, *'Landscape' / 'Architecture' | 'Seeing'/ 'Acting:' Structuring disciplinary dichotomies for rhizomatic learning*

detachable, connectible, reversible, modifiable, and has multiple entryways and exits and its own lines of flight'. (Deleuze and Guattari 1987) Historically landscape architecture has drawn from practices of 'seeing' for example, landscape painting, mapping and GIS. At the same time forms of action have been modified from gardening, architecture, painting and other fields. Taking this idea of multiple lineages as a starting point, a teaching practice was developed that actively used the tension between processes of seeing and acting in landscape architecture to establish a dynamic frame of reference for analysis and positioning, in which the act of positioning is always in motion and capable of producing multiple threads of connection. This oscillating framing of seeing and acting became a way for students to explore ideas using multiple intelligences and establish a suite of tools for students to position their own work and the work of others. In the Discipline of Landscape Architecture creative forms of intelligence are discussed in teaching and learning environments, however rather than arguing for an either-or-model, in this paper we suggest that multiple forms of intelligence may be engaged, which we title as a 'practice-based model' for teaching and learning. This is explored as a model to enable multiple forms of engagement and learning capacity which is inherent in the process of learning for the discipline. The articulation of these processes of positioning within modes of practice were developed to equip students with the ability to engage in a 'practice-based' learning process and develop an awareness in creative intelligence, in which students are empowered through a process of creative critical thinking and connecting the 'act of seeing to the act of thinking and doing'. The aspiration is to develop a pedagogy of practice-based learning that has the ability to empower students to think and act critically and demonstrate that holding multiple articulated positions creates a productive discourse which contributes to disciplinary understandings. This paper aims to discuss how three dynamic ' design research-based teaching' models; 'the conference', 'the design laboratory' and 'the expedition' were developed for the purpose of engaging multiple intelligences in order to develop both lateral and linear thinking. This is an expansion of what is commonly understood as the 'studio learning model', into a 'collaborative and cooperative' learning model which suggests a pedagogical structure customised to various types of disciplinary learning and doing.

David Zielnicki and Daniel Roehr, 412, *Topographic Literacy: Outreach, innovation, and accessibility in contemporary grading & drainage education*

Grading & drainage is the most fundamental skill for nearly every intervention in the built environment and remains one of landscape architecture's defining skillsets. Its knowledgeable practice has extensive benefits for improving public and environmental health, safety, welfare and for engaging new audiences with landscape. Simultaneously, the scale and complexity of grading design makes this toolset one of the most challenging for students to visualize and learn. In addition, the relatively limited exposure of landscape architectural education and its advocacy prohibits a wider audience from making use of and contributing to grading & drainage knowledge. The "Topographic Literacy" project addresses these issues by developing internationally-accessible web content including course-integrated visualization, presentation, fabrication, analysis, and computation tools. Using principles established from contemporary research on best practices in making educational videos, the authors are working towards the creation of web content which best explores grading & drainage concepts in the form of "blended learning" content.1 Videos demonstrate core concepts which are then applied with integrated, downloadable 3D and scripting examples.2 Currently, parametric tools related to key grading & drainage concepts have been successfully integrated with traditional, core landscape architecture studios and courses. The authors have found the introduction of parametric content written in the visual scripting language of Grasshopper for Rhino

3D to be an effective teaching tool for graduate- and undergraduate-level design students. Specifically, these tools have aided the teaching of core grading & drainage concepts related to the challenges of visualizing, analyzing, and generating landform. The authors will share their work-in-progress on educational videos and computational tools towards creating effective "blended learning" grading & drainage content. They will also share their first observational findings applying the videos to courses taught in 2019 and spring 2018.

Joern Langhorst and Leila Tolderlund, 291, *The Deep Read: Towards a cross-cultural immersive understanding of place*

Place and Landscape are concepts that are notoriously elusive and hard to define in a conclusive, non-axiomatic matter (e.g. Jackson 1975, Ingold 2001 and 2011, Tilley 1994, Tuan 1974), yet they are inescapably potent and central to understanding the relationships between people and the locations they inhabit. There have been many attempts to develop protocols for understanding place and landscape in the context of imagining place change, such in site analysis and site planning, but they have many limitations. This paper proposes an expanded pedagogical framework to develop a deeper understanding of place for students, using experiences from an "immersive" experience in a cultural context different from the students'. The prototype for an "immersive semester", taught by the presenters in the Fall of 2018, is combining an advanced design studio and three seminar classes, and looking at issues relating to urban public space and green/blue infrastructure in Denver, Colorado and Oslo, Norway. The approach expands on field study pedagogy, which has had a place in Landscape Architecture curricula. Field studies provide opportunities to become immersed in new contexts dissimilar to those which students and faculty are accustomed to, and expose students to the richness and diversity of the people and landscapes where they study. The socio-cultural benefits of being in the field are intrinsic, in particular if engaging places that are outside cultural contexts the students are familiar with, yet similar enough to be relatable – they provide opportunities for students and instructors alike to reflect on their individual and collective expectations and assumptions in relation to the perceptions and actualities of what they experienced. The combination of immersive field experiences that facilitates an experiential understanding of the particularities of place, involving affective aspects generally neglected in curricula, the confrontation with the readings of place by local and non-expert communities, and the deep research opportunities provided by combining 12 credit hours allows for students to engage in and reflect on not just what a place or landscape is, but the processes and actions that are used to made sense of it – a necessary, and in the age of instrumentalism often neglected – precursor to making decisions on how to "design." The proposed framework probes the pedagogical significance of immersive cross-cultural field studies combined with a cross-course topical focus, incorporating research from relevant literature and educator experience. The ambition is to highlight the value of such deep studies as a pedagogical necessity and provide reflections on best practices.

Rennie Tang, 73, *Human Scale at Play: Agency of the moving body*

The temporal and expressive attributes of the human body as a dynamic spatial entity within the urban landscape, transcend its familiar role as a static scalar symbol and cultural signifier deeply embedded within representational conventions of design pedagogy and practice. The authority of the term 'human scale' along with its associated 'place making' formulas found lingering within the lexicon of contemporary urbanism, relies heavily on narrative and representational tactics. For example, the ease by which the human figure is pasted into architectural renderings speaks to the glossing over of spatially rich nuances of human movement that deny the agency of the moving body. This point is reinforced by Frascari who is critical of Cartesian rationality and its mathematical constructions devoid of human presence . In light of our current digital reality, the need to recast the role of the human figure calls forth alliances with disciplines that specialize in movement, such as dance. This research examines how architecture, landscape architecture and dance might join forces to advance questions of human scale through the interweaving of choreographic and material modes of construction. Situating a dynamic interplay across disciplines, this research examines the work of dance scholars Rudolf von Laban and William Forsythe

through the lens of Cartesian and plastic architectural space respectively. Laban's use of geometric figures within which expressive movement is organized , and Forsythe's more sculptural approach to the shaping of negative space offer playful modes of being and sensing . The theoretical underpinnings of these two artists offer useful points of comparative translation from movement to material that dig deeper into the question of human scale. Investigated through a sequence of landscape design studios that focus on materially driven modes of spatial production, the implications of wood and plaster as form generators are explored and interpreted. The cartesian tendencies of wood construction lie in stark contrast to the plasticity of poured plaster both of which engaged the body through the act of making while positioning human scale as something to be searched for through play, rather than merely given. Students were asked to inhabit their material constructions, both physically and digitally, as a means of disrupting familiar associations with scale. Moving between analog and digital worlds generated further complexity that invited inventive forms of play and creative exploration. Scalar attributes of the wood and plaster, as related to architectural structure and landscape topography respectively, begin to dissolve as the cohesive force of human bodily encounter is heightened. Moving fluidly across the disciplinary lines, it becomes clear that conventional definitions of human scale are no longer viable.

POSTER ABSTRACTS

Jericho Bankston, Daniel Roehr, 26, *International Communication, Education and Relations on Low Impact Development for Water Mitigation*

Climate change has led to an increase in rain event frequency and intensity; this combined with rising world population and migration into cities is leading to rapid urbanization in once permeable environments that allowed water to move freely through the landscape. The effect is the increase of flooding in cities, resulting in billions of dollars of damage every year. This is an international problem; while each country adopts its own policies and strategies to deal with the changes little is done as an international community to address flooding. Currently students in higher education are taught LID but lack the ability to apply the knowledge in a technical and informed manner, this is often left to hydrological engineers, rather than those who design LID in architectural, landscape architectural and planning positions. Planners especially need to be trained as they are often found responsible in many countries for zoning open impervious space where LID needs to be applied successfully at initial development stages. In response greenskins Lab at the University of British Columbia has developed a LID workshop aimed at international education on stormwater management strategies and sharing of resources and data. The purpose of the workshop is to develop student's knowledge on the technical application of sizing LID systems rather than just designating areas of the site as "LID". The method is to teach students in higher education technical conventions regarding LID strategies and best practices specific to their regions climate, focusing on stormwater runoff reduction. Students learn about LID systems and their application to stormwater mitigation, given examples from all over the world and how individual cultures tailor designs based on climate and regional needs. They collaborate on the collection of site-specific data and analysis in order to address rainfall intensity and storm events. Using basic algebra to calculate runoff intensity they compare both local and North American storm event models to help them understand LID systems and the changing impact given different climates. The outcome is intended to create skilled designers on sizing and implementation of stormwater management practices in hopes of reducing urban flooding internationally. By training in this manner students walk away with the ability to size and link LID systems relevant to a specific climate type. Greenskins Lab has completed a workshop at Beijing Forestry University using an LID calculation application, the initial outcome suggests students are reaching more precise LID systems and reduced stormwater runoff.

Meixian Wang, Robert Brzuszek, 42, *Using Service Learning to Improve Planting Design Pedagogy*

Using plants to create a beautiful ecological environment is one of the basic skills of the landscape designer, and most universities with a landscape architecture major offer planting design courses to cultivate professional talents. Recent studies found that a typical process of teaching planting design include teacher teaching theory and designating a site for students, students investigating the site and conducting a planting design, teachers reviewing the students' design works (Xu, et al., 2018; Zhou & Zhou, 2017; Lin, 2014; Shao, et al., 2009). An increased level of learning, however, occurs when the students had have a chance to install their design woks onto a real site, and learned the vital issues of the actual planting construction. By just using hypothetical projects, it was found by Luo that students were insufficient on commanding the design scale, planting construction and realistic budget, often lacking design-build expectation, community service awareness and client feedback(Luo & Hsu, 2018). Service learning in planting design that uses real sites and clients allows students an educational approach combines learning objectives with community service in order to provide a pragmatic, progressive learning experience(Nitavska, et al., 2016). This study explored a case study analysis of service learning planting design in the college of Landscape Architecture of Beijing Forestry University between 2016 and 2018. Three teaching case studies involved projects for the "International flower border landscaping competition of TangShan international horticultural exposition, 2016", the "Flower border design of 'BJFU-YiCai Cup', 2017", and the "Bamboo pavilion garden design: The 1st BJFU international garden-making festival, 2018". The results from these studies concluded that the practice of service learning were of great importance to students' training in the planting design course and competition. By utilizing service learning, it has allowed students to conduct planting design for different projects, to study planting design process from survey, design to construction, to realize design scale and master different depth of planting design drawings, to learn different plant species and its habit, and to study planting construction and budgets. The students improved ability to apply what they have learned in planting design in "the real world", has demonstrated the ability of problem analysis, problem-solving, critical thinking, cognitive development and communication skills. Through a class questionnaire administered to 86 students involved, 69 students (80%) prefer to design actual projects in the course, and 81 students (94%) want to have a chance to construct their own planting design works on the ground.

Eric Ellingsen, 66, *Dialogue of Doing*

Sherlock Holmes says that a good detective doesn't make the crime fit the facts, but rather the facts fit the crime. In the USA today, the crime is that we often make students fit into disciplinary models, rather than fit disciplinary models to students. In landscape architecture, we teach emergence, process, indeterminacy, situational de jure, critical play and social complexity, yet we produce mono-crops of students trained to fit into institutionalized practices. Today our design departments want what risk generates without wanting to take real risks. We priorite plants over people, rendering skills over experiencing the messy field. In the end, there is no way to think oneself out of ‘THE BOX’. Only doing things in the shifting dynamics of the world breaks free of the box. Only doing corresponds to the inherent ‘field’ conditions of the landscape discipline. Only by a dialogue of doing will landscape departments force faculty from stepping in the same comfortable syllabi twice. It is through a DIALOGUE OF DOING where students can learn to render the world more real, rather than merely make renderings of the world. How can we learn how to learn, in the words of Paulo Freire? We must, as he says, make the road by walking. This presentation will propose case studies for how we as landscape designers, as artists, as students, as educators and administrators, can have more agency in creating the conditions for learning out of which new options emerge. CASE STUDIES: 1) Institute for Spatial Experiments, University of the Arts, 2009-1014 (directed by Eric Ellingsen with Olafur Eliasson and Christina Werner); funded by the Berlin Senate and the Einstein Foundation. The purpose of the institute was, like the Bauhaus 100 years before it, to produce alternative learning methodologies for the 21st century by engaging project based learning. 2) Radical Imagination Community (DARK MATTERS), Iceland (Eric Ellingsen with deans from the Art Academy and engineering department at the University of Iceland. Phase I: Jan 3-25 2016 Phase II: summer 2018-2021. Supported by European Union. 3) Radical Imagination Community (PERCEIVING ACADEMY), Greece: June 2016 -July 2019, a three year collaboration working on social learning

structures in collaboration with Hyperwerk Post-Industrial Design, Basel and ArtBox, Greece. PERCEIVING ACADEMY is funded by EU, Nairchos Foundation, Goethe, ARTE, +; supported by the mayor and municipality of Tessaloniki, Greece.

Lolly Tai, 67, *Temple University Ambler Campus Revitalization and Integration: A case study of community engagement in an undergraduate senior design studio*

This presentation describes the process of community engagement in an undergraduate senior design studio. The focus is on the revitalization of Temple University Ambler Campus (TUAC), a satellite suburban campus located in Ambler, Pennsylvania and the integration of a new land use on the campus. TUAC has experienced decreased vitality in the last decade through the loss of campus housing and food services; degradation of campus facilities through deferred maintenance; and loss of student life due to decreased enrollment and course offerings. More recently, attention on the campus has been sparked with new administrative leadership. Our students took on the task of re-envisioning the campus by developing goals and objectives to create a master plan that integrates Leg Up Farm, a facility focused on users with special needs. The proposed plan is anticipated to increase the campus population with Leg Up Farm patients and staff; Temple University health sciences students, faculty and staff; neighborhood residents; and other potential educational programs. To embark on the project, students researched case studies focusing on campus planning, green infrastructure, and facilities for users with special needs including hippotherapy; undertook an extensive inventory and analysis of the campus, the surrounding neighborhood, and region; produced four alternative master plans and a 374-page full-color hardcover book documenting the entire design process. The studio faculty member organized discussions and reviews between the senior studio, TUA administrators, faculty, students and staff, Leg Up Farm administrators, and professional landscape architects who served as jurors. Feedback were gained from TUA and Leg Up Farm during the site inventory and analysis; visits to Leg Up Farm; interviews; and presentations. TUA administrators verified site information and refined their goals during the presentations of the site inventory and analysis work. Leg Up Farm administrators guided students through their current facility located in Mount Wolf, Pennsylvania which gave students firsthand knowledge about the program and specifications of their facility. Landscape architecture jurors knowledgeable about the campus provided helpful insights about campus planning and design. Students presented their master plan drawings, the book, and 3-D Lumion fly-throughs to explain the synthesis of their newfound knowledge. This presentation will summarize the design process. It will provide suggestions for how to effectively conduct a community engagement project and to generate effective designs, drawings, and a book in one semester.

Aidan Ackerman, Jessica Canfield, 131, *Digital Terrain Modeling in Landscape Architecture Education: Workflows and strategies for beginning design students*

As the profession of landscape architecture evolves to become a more digitally-based practice, graduating students of landscape architecture will not only need a broad range of technical knowledge but an approach for continued learning. Walliss and Rahmann argue that teaching digital technologies needs to occur directly within design studios, as part of the design workflow (2017). Three-dimensional digital modeling of terrain is an essential skillset which most landscape architecture educators wish to teach their beginning design students. There are several software applications, plugins, and workflows available, as well as a multitude of books and video tutorials for self-paced learning. These learning resources vary in their quality, cost, and datedness, and educators are often the ones who sort through them to identify which are most applicable for their students. However, many of these educators are re-learning or updating their own skillsets, and frequently find themselves without the time or background knowledge to decipher a clear set of practices for which software applications to use and what data sets are best. Moreover, many of the software programs are designed primarily for architecture, and landscape architects often find themselves creating workarounds for the software to meet their needs. Despite these challenges, structured guidance is essential for beginning design students in order for them to establish a digital design foundation. This

research presents an overview of approaches to integrating digital terrain modeling into beginning design studios. The rationale for exploring digital terrain modeling skillsets comes from the authors' own challenges with integrating digital terrain modeling into design studios, as well as discussions with landscape architecture educators which confirm that these challenges are common. Central to this issue is the lack of a standard workflow to acquire digital terrain information and structure an iterative 3D modeling process appropriate for early design students. Additionally, learning design skills and digital software in parallel can, more than other methods of representation, impact the cycles of design process which are often taught in the studio setting. In support of these questions, the benefits and drawbacks of certain software applications, datasets, and digital workflows are illustrated. Of particular focus are the applications of generative design tools, GIS data integration, and the early stages of Building Information Modeling (BIM). Findings are informed from the teaching and observation of different pedogeological approaches and outcomes of student learning, indicating patterns and trends about the ways students best learn digital terrain modeling

Dietmar Straub, 139, *Learning from Bauhaus by Operating a Snow Academy at -40°C*

Preliminary courses at the Bauhaus in the 1920s thoroughly prepared students for professional design careers. The teachers shared a desire to use pedagogical means and programmes to encourage holistic and creative modes of thinking. Inventive experiments with a wide range of materials such as glass, wood, metals and ceramics were at the core of the Bauhaus education. They placed great emphasis on innovatively combining crafts and fine arts techniques. The Bauhaus design education with its workshop centered concept still works as a timeless inspiration for passionate design education. An extremely cold winter in Manitoba provided the ideal climatic framework for an experimental design studio taught by the author. The students were invited to gain hands-on experience by building and designing a fleeting landscape using snow, ice and fire as their construction materials. What could be more suitable for upcoming landscape architects than to study this "cool" environment in a Snow Academy? Initially snow was gathered from parking lots, mainly due to the fact that this building material is cheap and abundant. Tons of this snow was poured on a riparian clearing in an elliptical form. A field of 'seeding columns' as well as a generous 'dining room' complemented the peaceful setting. Shaping, stepping back and refining was a way of dialoguing with the real scale space. Experiments with light and darkness, with sound and silence, and with fire and colors were conducted throughout several night studios. This slow process of becoming was an almost magical experience, with students becoming very proud of their work as they emerged in three-dimensions. The standard professional procedure of 'idea - plan – mock-up – concrete object' was radically reversed. This experimental studio began by sculpting the landscape to 1:1 scale which then inspired the design, and helped the students in making their design decisions. Constant rigorous reflection and precise observation skills demanded intensive physical interaction and presence. The production of architectural models, site plans and detailed working drawings followed later. The Snow Academy demonstrates that -40°C can be interpreted as an inspiring workshop setting. Students learned through experience how humans developed skills, designs and techniques in order to survive in extreme winter climates. This educational experiment applied the enduring Bauhaus ideas and linked them with the climatic conditions and design context of a Canadian prairie city.

Sarah Little, 163, *Utilizing Design Fundamentals to Teach Critical Thinking and Ideation*

Design Basics by David Lauer and Stephen Pentak effectively explains design fundamentals in terms of design principles and design elements. Design principles are guiding themes that influence design: unity, emphasis and focal point, scale and proportion, balance, and rhythm. Design elements form the building blocks of design: line, shape, pattern and texture, illusion of space, illusion of motion, value, and color. While the examples within Design Basics focus on composition within works of art, parallels to the built environment can be drawn. Teaching design fundamentals at a graduate level has always presented a challenge in reconciling the notion of 'busy work' assignments with teaching the fundamental concepts within design. 'Busy work' assignments tend to focus exclusively on production at the cost of critical thinking. The compromise to teaching design fundamentals while

developing critical thinking skills appeared in a study model building exercise. Students were instructed to explore design principles and elements as defined by Lauer and Pentak in 6" x 6" study models. Students were to make 12 models being sure to number in order of production and present their best 6. Models were crafted mostly from scavenged cardboard, utilized horizontal and vertical space, and contained color and materials other than cardboard. A due date was given with instructions that details regarding presentation would be forthcoming. At the time of presentation, students were asked to present the best 6 by describing the type of experience the model represented as if it were a physical place. Connecting design fundamentals to the experience of place required critical thinking. For example, recognizing how the experience of a straight pathway and a curvilinear pathway differed. Teaching design fundamentals for the sake of students knowing design fundamentals seems like a 'busy work' assignment. Teaching how design fundamentals influence the experience of place seems more appropriate for the graduate level. At the end of presentations, students were asked to select their best model. A tally was created documenting the order of production of the top 6 models and the best model. From the tally, a pattern emerged. The order of production predicted quality of model. The majority of the best 6 models and the best model occurred between model numbers 6-12 in order of production. Students saw firsthand the importance of ideation. The more ideas that are generated the better the ideas get.

Carter Crawford, 218, *Analysis and Interpretation of Teaching Studio Episode 13: Can creativity be taught?*

The creator of documentary series Teaching Studio: Conversations with Landscape Architecture Professors has built a research program around the study of the philosophy and history of western design education. The goal of Teaching Studio is to discern the extent to which the portrait of the philosophy of design education created by the historical research is reflected in current practice. In Summer 2016, video-recorded interviews were conducted with thirteen landscape architecture instructors at institutions across the country. The experience levels of the instructors varied broadly. All the interviewees enjoyed widely acknowledged respect among their colleagues. The interviews were open-ended conversations and usually included these questions: • Do you have a project (or strategy) that you feel is particularly successful? • Have you done a studio project that was a complete disaster? • Did you have notable role models? • What is effective/ineffective about the studio model of teaching? • How has studio teaching changed during your career? • Has digital technology impacted the effectiveness of the studio? • Do students sometimes take projects in completely unexpected directions? • What is the goal of the studio method of instruction? • Can creativity be taught? • How does a person learn to teach studio? • What's the hardest lesson you've learned in your studio teaching career? Episode 13 of the series, Can Creativity Be Taught?, was screened at CELA 2018. The proposed presentation and paper are the analysis and interpretation of the interviewees' responses to that question. The interviewees were consistent in that they had clearly given the subject serious thought and had strongly-held views on the matter. However, the open-ended style of questioning led to responses that covered a wide range of perspectives. For instance, there were varying opinions on the role of innate creative talent and the efficacy of creativity-enhancing exercises. There seemed to be general consensus that creativity exists in many forms and that each individual's creative process is unique. Initial interpretation reveals that much of the substance of the interviewees' responses does exhibit the influence of documented philosophical currents in the history of design instruction. It also shows that there are many other influences at work, including varying awarenesses of the very large body of work on the nature of creativity that has been carried out by psychology researchers. Most of all, the interpretation validates the primary premise of Teaching Studio: Design educators and their students will benefit from ongoing self-reflection and discussion.

Alberto de Salvatierra, 237, *Landscape Architecture Pedagogy at a Make-A-Thon: Rapid prototyping the future of food through service learning and community engagement*

Borrowing (from computer programming) the hackathon model of ideation and production and merging it with the distinct practice of making from the design disciplines, yields the "Make-A-Thon." A relatively new practice compared to its older sibling the hackathon, a Make-A-Thon has the potential to serve as a catalyst for interdisciplinary cross-pollination whilst tempering outcomes to be socially-driven services or products for a specific community. Therefore, participants (young designers et al) are empowered to be their own-problem solvers and are taught the value of collaboration with other disciplines in the process. This paper therefore documents the results of UNLV's first-ever Make-A-Thon where—with the "future of food" as guiding theme—landscape architecture was positioned in equal footing to engineering and entrepreneurship, joining an oft exclusive method of pedagogy and community engagement traditionally reserved for disciplines adjacent to business and computer science. The event brought together design (landscape architecture), engineering and entrepreneurship students to hack, make and create innovative solutions using programming and rapid prototyping techniques featuring Arduino. All making was done in an open and collaborative studio environment to incubate creative ideas. As a result, this paper also outlines the benefits of developing such cross-modal and interdisciplinary educational models of innovating—with the make-a-thon as vehicle to adapt landscape architecture pedagogical tools to a technical curriculum that can be used not only by students, but community members regardless of background or skill set.

Lori Catalano, 252, *Designing Meaningful Program Assessment*

Standards three and four in the Landscape Architecture Accreditation Board's requirements have sections asking each program to identify the knowledge, skills, abilities and values it expects students to possess at graduation, and to evaluate how effectively the curriculum is helping students achieve these learning objectives. In addition, many universities have internal requirements related to assessment of student learning. Resigned to the fact that this process required by universities and accrediting bodies is not going away, how do we as landscape architecture faculty design assessments that are more meaningful and useful to faculty and students? The University of Colorado Denver's Master of Landscape Architecture program began their outcomes assessment practice in 2006 as a requirement of the university. Programs across campus were mandated to develop learning outcomes, implement a plan and submit annual reports in preparation for the university's accreditation. The faculty developed five learning objectives with a series of measurable learning outcomes for each objective. The outcomes were mapped across the curriculum, and the faculty began collecting and reviewing data each year. After leading this process alongside the department chair for ten years, I can confidently say that this process, while at times cumbersome and flawed, resulted in beneficial faculty conversations leading to improvements in student learning. The review of this information led to improvements ranging from faculty coordinating efforts for improving writing skills across the curriculum, to the development of a shared language and goals among the faculty. As this process continued faculty went through the motions and benefits diminished. The question was raised, how can we make this process more meaningful? In response, the program developed and implemented a reflective portfolio to be submitted by each student midway through their academic career with the intent of making the evaluation of an individual's performance more holistic and meaningful for the student. The goals for the reflective portfolio are to: • holistically review students' performances midway through their career to assess whether the program is successfully implementing the program learning objectives; • provide a formative assessment to students; • provide students with the opportunity for self-reflection; and • assist students in the development of a professional portfolio. With this change, the conversation was no longer internal to the faculty; students were introduced into the assessment process, and the dialogue expanded to include the student's entire body of work, their reflection on their personal development, and vision for their future.

Muntazar Monsur, Carla Delcambre, 286, *Immersive Virtual Reality (VR) Technology to Teach Construction, Materials and Methods in Landscape Architecture*

Immersive Virtual Reality (VR) Technology to Teach Construction, Materials and Methods In Landscape Architecture This study aims to investigate the effectiveness of using realistic immersive VR environment to teach construction methods and materials to landscape architecture students. Better education media has constantly been sought by researchers in the educational technology domain to assist teaching (and learning) in more effective ways. Virtual Reality (VR) has been identified as one of them (Lee & Wong, 2008). The advent of highly immersive VR technology has created opportunities for educators to innovate engaging learning tools in many disciplines; especially in the fields of aviation, computer science, engineering, and medicine. In K-12 education settings, VR was found to be effective in improving learning outcome gains (Merchant, Goetz, Cifuentes, Keeney-Kennicutt, & Davis, 2014). However, there is limited understanding of how VR could enhance the learning outcomes in the fields of design. One of the core challenges in architecture and landscape architecture education is to teach students the conceptual connectivity between abstract design/drawings and the concrete realities of dynamic design practice. Field trips to construction sites are most effective ways to teach construction techniques by giving students the opportunity to learn directly from the real scale construction. However, field trips are time consuming and expensive and it is challenging to cover the vast array of topics on construction materials and methods by site visits only. To address this challenge, Department of Landscape Architecture and DELTA (Distance Education and Learning Technology Applications) at NC State University collaborated to create a VR based learning tool. The new tool consists of a computer-generated immersive environment where students would be able to walk through and interact with different construction elements. Students can choose to see real-life construction videos or 2D construction drawings of that particular type of construction. They can also choose to experience different phases of construction being three dimensionally immersed in that space. Videos and 2D construction drawings combined with the VR environment will allow students to get an inclusive experience about different landscape construction methods. Effectiveness of the tool will be measured by student surveys (in Fall 2018 and Summer 2019), user data and software analytics. Preliminary findings will be presented in CELA 2019. One of the main reasons why VR has been used for educational and training purposes is the support of high interactivity and the abilities to resemble the real world. This study may create an opportunity to test the effectiveness of VR technology in the context of design education. Lee, E. A.-L., & Wong, K. W. (2008). A Review of Using Virtual Reality for Learning. In Z. Pan, A. D. Cheok, W. Müller, & A. El Rhalibi (Eds.), Transactions on Edutainment I (pp. 231-241). Berlin, Heidelberg: Springer Berlin Heidelberg. Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. Computers & Education, 70, 29-40. *This study aims to investigate the effectiveness of using realistic immersive VR environment to teach construction methods and materials to landscape architecture students. Better education media has constantly been sought by researchers in the educational technology domain to assist teaching (and learning) in more effective ways. Virtual Reality (VR) has been identified as one of them (Lee & Wong, 2008). The advent of highly immersive VR technology has created opportunities for educators to innovate engaging learning tools in many disciplines; especially in the fields of aviation, computer science, engineering, and medicine. In K-12 education settings, VR was found to be effective in improving learning outcome gains (Merchant, Goetz, Cifuentes, Keeney-Kennicutt, & Davis, 2014). However, there is limited understanding of how VR could enhance the learning outcomes in the fields of design. One of the core challenges in architecture and landscape architecture education is to teach students the conceptual connectivity between abstract design/drawings and the concrete realities of dynamic design practice. Field trips to construction sites are most effective ways to teach construction techniques by giving students the opportunity to learn directly from the real scale construction. However, field trips are time consuming and expensive and it is challenging to cover the vast array of topics on construction materials and methods by site visits only. To address this challenge, Department of Landscape Architecture and DELTA (Distance Education and Learning Technology Applications) at NC State University collaborated to create a VR based learning tool. The new tool consists of a computer-generated immersive environment where students would be able to walk through and interact with different construction elements. The*

3D environment was designed and executed by a team of architects, landscape architects and 3D artists using Auto CAD, 3D Max and Unity 3D. Students can choose to see real-life construction videos or 2D construction drawings of a particular type of construction. They can also choose to experience different phases of construction being three dimensionally immersed in that space. Videos and 2D construction drawings combined with the VR environment will allow students to get an inclusive experience about different landscape construction methods. Effectiveness of the tool will be measured by student surveys (in Fall 2018 and Summer 2019), user data and software analytics. Preliminary findings will be presented in CELA 2019. One of the main reasons why VR has been used for educational and training purposes is the support of high interactivity and the abilities to resemble the real world. This study may create an opportunity to test the effectiveness of VR technology in the context of design education.

Justin Parscher, 306, *Designing the Global Landscape Survey*

It has been argued for decades that an education in the history of landscape design should be framed as an ethical project (Harris, 1997). Such an ethics may be framed explicitly around fostering social consciousness: a commitment to justice and care, an attention to cultural context, and a belief in the ability to change a situation for the better (Brown and Jennings, 2003). The landscape survey can be a key part of this effort both in how it expands a student's library of models for how people can relate sustainably to landscape, as well as how it accords with and abets its students' moral development. Following this, it can be established that a global history of landscape design should care for the needs of the students – it should reflect their diversity and concerns (Gürel and Anthony, 2006). It should not elevate formal matters in a vacuum, but examine form's interdependence with social and cultural context (Riley, 1995). It should foreground the examination of discourse as a way for students to understand how truth claims are constructed, and work toward a truth that is more just and precise (Davis, 2015). Moving toward this approach leads to some difficulties. The criteria for what constitutes an important landscape might multiply the field of objects of study beyond our ability to consider them effectively. Uncritically using a standard lecture format to deliver the material may subvert the intended message by shutting out student contributions and foreclosing debate (Crysler 1995). How can a course successfully navigate these dilemmas and model an ethical approach for the landscape student? To construct an effective curriculum that reflects ethical values, it is necessary that the operation of the class reinforces the intended message instead of undercutting it. A course can be understood as a procedural rhetoric (Bogost 2007), demonstrating its message as much through the way in which it is conducted and designed as through the discursive information it imparts. An effective course will accordingly distribute responsibility without abolishing it, value personal experience while critiquing it, and situate authorship without discarding it. Building on seven years of teaching a global landscape survey, this talk discusses a suite of integrated approaches to bring together learning goals and methods for landscape history surveys. Techniques from immersive scenario-based planning to collaborative drawing are used to form a learning community that engages the diversity of landscape creation throughout human history.

M. Elen Deming, Rebecca Sanchez, John Gordon, Arthur Earnest, 314, *Interdisciplinary Research in Action: How designers learn*

A new distance education initiative at NC State University, the Doctor of Design (DDes) program serves professional and intellectual development of established design practitioners. Housed in the College of Design, the DDes program is logistically supported by DELTA, the online curricular unit of NCSU. The mission of the DDes program is, in part, to foster professional and disciplinary transformation through applied design research. DDes program objectives include: 1. To focus intensively on ways that designers think, confront problems, and project solutions, in local and/or global contexts. 2. To employ educational innovation to meet the intellectual needs of

practicing, mid-career professionals 3. To use professional experience, case studies, and shared goals to define design research protocols and agendas To address these objectives, the August 2018 launch of the program showcased a College-wide symposium. Symposium speakers included three 'change agents' in interdisciplinary design research: Aly Khalifa (industrial designer, environmental activist, social entrepreneur), Lesley-Ann Noel (Industrial designer, elementary school teacher, Fellow of the D-School, Stanford), and Karen Lewis (architecture professor, designer, author of Graphic Design for Architects). All three are 'hybrid practitioners' working synthetically across disciplines and industry sectors on thorny social and environmental problems. Part of the challenge in advanced interdisciplinary design programs is to identify shared conceptual and design terminology. DELTA videographers and the DDes Program Director interviewed the speakers in order to understand their working terminology, methods, and design values. During a 60- to 90-minute recorded interview, informants were asked ten questions overall. Edited results comprise three condensed videos (~5-8 minutes), each focused on a linked subset of these questions, for online instructional purposes. This paper frames, highlights, and analyzes the first video in that series, focusing on the topic and processes of how professionals learn. Q. As a designer, how do you learn? How do you build relevant knowledge with which you work? Q. What is your process for addressing emerging issues or challenges in your field? How do you stay aware and what methods do you use to evolve your practice? Q. Do you tend to translate external research to enrich or guide your design work? Or do you use design itself as a method for identifying new possibilities, for asking new questions? Results of the edited discussion reveal similarities and key differences in the scale and methods of design thinking across various disciplines. These offer provocative material that is instrumental for online discussion.

Wolfram Hoefer, 325, *Jumping Scales*

The ability to work at different scales is a core topic of landscape architecture education. Teaching at the site scale as well as at the regional scale is required in accredited LA programs. Students need to understand, how scale is linked to the questions addressed in the design and planning process. At our institution, we believe that undergraduate students need full working knowledge of the relationship between scale and topic for advanced studio work. Therefore, our undergraduate program makes the jump from site scale to region scale already in the junior year, before returning to the urban design/neighborhood scale in the senior year. This approach is overall successful and further allows us to have an integrated studio sequence between our BSLA and MLA programs, allowing for a successful 4+1 program. However, throughout the years, we have noticed that students have difficulties to make the jump from site design to regional scale between the sophomore and junior year. These difficulties are rooted in the link between scale and the exploration of form. The aesthetic education in our sophomore year studios teaches students "a concise form building language adaptable through repeated practice" (Dee 2010, 22). Using contour drawings, sections, and explorative models, students gain confidence in exploring design solutions at the site design scale. The regional scale instead "flattens" the experience; maps challenge the designer's relationship between place and form (Waldheim 2016, 140). When our students return to studio after the summer, they have to adjust to different approach to innovation and creativity. This paper will critically discuss three methodological approaches to help students managing that challenge: (1) Start the regional studio with a design charrette of numerous sites linked to the regional topic. (2) Start the regional studio with a site visit linked to the regional topic. (3) Start the regional studio with an exercise that creates a link between the students and the region. These three approaches evolved from opportunities seen in the regional studio topics that were identified for each class in three subsequent years. The overall framework of each class had to follow the required teaching goals for the environmental planning studio but allowed for variations in teaching methodology. The goal of comparing the three approaches is to trigger a discussion about the role of the regional scale in design education.

Anna Wik, Jules Bruck, 338, *Community Engagement Informing Programmatic Priorities and Assessment of Learning Objectives: Green infrastructure for community change*

In Fall 2018, students in the University of Delaware Bachelor of Science in Landscape Architecture program will participate in a workshop entitled "Green Infrastructure for Community Change" hosted by the UD Center for Community Research and Service (CCRS), through the Department of Urban Affairs and Public Policy (UAPP). This charrette-based workshop, geared toward community members, non-profit partners, and local businesses, will focus on three urban sites in Wilmington. Faculty members from the landscape architecture program will give short presentations about storm-water best management practices, urban forestry, and creative placemaking, after which small groups will consider challenges and opportunities for introducing these solutions to specific sites. With students, participants will brainstorm strategies for implementing green infrastructure, with an emphasis on equitable design and inclusion of community in decision-making. As Boyer describes, "the scholarship of engagement ... means creating a special climate in which the academic and civic cultures communicate more continuously and more creatively with each other."(19) Through this multidisciplinary effort, we hope to engender change both in the communities we are engaging with and in the skill sets of the students. Three of the strategic priorities guiding curriculum development in the BSLA program (established 2016) at University of Delaware are the preparation of students for leadership in the field, provision of real-world professional experiences, and demonstration of positive impacts to the local community. Faculty developed a series of assessments that map students' accomplishment of the strategic program priorities. The assessment for advocacy requires "the articulation of personal values and ethics, related to evidence-based facts, to persuade and educate others in the practice of sustainable landscapes." Key actions associated with this learning objective include Articulation, Application, Demonstration of Best Practices, and Effectiveness of Message. Requiring participation in the community engagement process integrates educational goals into real world experiences. Through this event, we provide an opportunity for students to meet our learning objectives for leadership and community impact. We will evaluate the effectiveness of this approach through: - student self-assessment of advocacy skills - pre and post evaluation of community participants' awareness of green infrastructure/design practices - faculty evaluation of student learning and integration of community desires (including reflection/ design projects) Through these methods, this paper will evaluate the ability of the Community Development Talk to accurately apply the assessment for advocacy to the student learning experience and consider its effectiveness as an example of the scholarship of engagement.

Sean Rotar, David Barbarash, 393, *An Integrated Design Process: Reflections and lessons learned*

The Junior year of the Purdue landscape architecture curriculum contains a series of courses that move students from the theoretical to the real and practical. Specialty courses in grading and stormwater management, advanced planting design, and construction documents provide new and specific knowledge and skill competencies. A studio in open space and recreation design acts as a design laboratory to test and develop concepts from these and previously completed coursework. Faculty who teach the aforementioned courses saw an opportunity to combine content and learning objectives into a single focused educational vision instead of the typical "siloed" standalone process common in parallel coursework. The efficacy of an integrated course process has been demonstrated with significant improvements in student perception of abilities and in faculty perceived robustness of final design products (Rotar, Barbarash, et. al. 2014; Rotar and Barbarash, 2015) though professional mentors during a managed co-op internship did not see improvements with in-office production or capabilities. This paper outlines the integrated project process and discusses lessons learned from both faculty and students who participated over the past six years in an integrated course process. Reflection topics include difficulties inherent in the process, project planning, learning outcome alignment between disparate courses, and timeline scheduling. Quantitative and qualitative data shows that the process has value, though it is not without its challenges. Design programs wishing to attempt an integrated course or project structure can learn from previous successes and mistakes in order to better prepare students for the realities of an increasingly complex professional environment with multifaceted design projects.

Simon Bussiere, Lance Walters, 435, *A-posteriori Ecologies: Models for engaged assembly*

Why do design students seem to focus so much effort on making models as a way of rationalizing a-priori ideas? How can educators instead encourage them to emphasize material experimentation as a critical element of their process of discovery? In teaching landscape architecture students about core principles of landscape ecology, Richard T.T. Forman defines a model as "the simplification of a complex system to gain understanding." (Forman, 2014) His simple yet elegant definition situates two important and distinct issues addressed in this paper: tactile simplification toward tacit understanding, and the rational or logic-based challenge of diagnosing design opportunities within complex large- scale systems. Forman, like other ecologists uses a modified scientific process to break down what initially appears to be chaos into legible and discernable patterns for the sake of recognizing their broader relationships and in order to anticipate how they might accrue and self-modify over time. In practical terms, this form of anticipatory learning is arguably well suited in the earliest stages of design education. James Corner reinforces the early-introduction of such foundational concepts, stating that "the process by which ecology and creativity speak are fundamental to the work of landscape architecture. Whether biological or imaginative, evolutionary or metaphorical, such processes are active, dynamic, and complex, each tending toward the increased differentiation, freedom and richness of a diversely interacting whole." (Corner, 1997), arguing convincingly that ecological comprehension is a fundamental challenge in the training of beginning design students. This paper discusses a series of projects that extend this argument into the classroom, challenging students to read fine and course-grain patterns in nature while fostering design experimentation through mechanical instrumentation. Testing and probing first-hand with physical, non-representational material including water, soil, plants, bacteria, yeast, and simple machines, students learned to recognize fundamental dynamic patterns and processes. Next, traced through a series of critical projects that demonstrate learned anticipation of key temporal aspects of environmental systems more broadly, the projects track material changes, each with their own unique time frame, within complex and dynamic natural systems. Analog and digital models, photography, video and subsequent diagrams break down the composite accretion of material[ity] in each experiment. This enables a replicable form of open-ended exploration, and due to the infinitely-scalable nature of the mediums used, provides corollaries with and reflective discoveries of material arrangements in much larger systems. The culmination of the work was organized in a multimedia exhibit.

Raffaella Sini, 439, *Participative Cultural Landscapes? Two case studies from Singapore*

The research explores two recent participatory projects undertaken by Singapore's government to address design and management of urban cultural landscapes in a holistic and participative manner. Asian cities' exponential growth of cities raise challenges in urban planning and management. Singapore's debate concerns striking a balance between urban growth versus city-identity and community-cohesion, goal recently achieved by preserving structures and sites that promote continuity of place (Yuen 2005). Evolving preservation policies, Singapore's city planning evolved from conserving single artifacts to areas of cultural significance. Recently the government promotes active participation of citizens and stakeholders in design processes, to share values and significance of place, and address some of the challenges in management of cultural landscapes in Asia (Black & Wall 2001; Yeoh and Kong 1997). Research presents participatory methodologies used in on-going Singapore's Rail Corridor Project, which means to repurpose a disused railway track into green, cultural and ecological corridor. Government initiated the project in 2011 as conversion of former Keretapi Tanah Melayu (KTM) Railway Line, built in 1903 and dismantled in 2011 (URA, 2015). Secondly the research presents Pulau Ubin Project, initiated in 2014 to preserve Singapore's last undeveloped offshore island, lying north east of Singapore along Straits of Johor (MND, 2016. It addresses the following question: - Are participatory methodologies successful in broadening understanding of what heritage values are (establish what to conserve and for whom; evaluate and expand on what and whose history is told) Presenter recollects her experience as course leader at the Department of Architecture of the National University of Singapore. NUS involved in the Pulau Ubin Project 2/3 of students enrolled in architecture. With insight on processes and actors, it was noted that, started as grassroots initiatives, with groups of interested parties building a 'critical mass' of discussion around the cited historical areas, debates on values and conservation policies were consequently assisted by the government. The students engaged participatory

methodologies supported by governmental authorities: group discussions with community; on-site events and exhibitions; on-line archive to collect oral history; design ideas competitions; survey of cultural landscapes and development of management/design proposals. Lessons learned informed students' involvement and their learning, use of combination of participative methods, insights on how participation can relate to heritage.

Dan Li, Terry Clements, 443, *Improving Students' Designer Values through Landscape Architecture Studio Teaching Innovation*

The purpose of this study is to explore the landscape architecture studio teaching activities' impact on students' designer values. Designer values refer to people's characteristics as the designer. As for landscape architects, designer values mainly included the following aspects-attitude towards nature and people, preferred working style, preferred role in the design team, and preferred communication style with coworkers and clients(De la Pena, 2017). The literature review suggested that design studio works implicitly through ordinary interactions and perceptions (Powers, 2016), and it has the potential to apply communication design pedagogy (Vodeb, 2015). Thus, the researchers designed new studio teaching and learning activities drawn from communication science. Communication science deals with processes of human communication to deepen human interaction, strengthen empathy and awareness of others, and develop the collaborative team and leadership capacities. New studio activities include hosting a communication science workshop, having students use directed self-assessment to understand their working style, and applying teaching activities such as presenting in the small group, providing direct peer feedbacks and so on. These new studio activities were intended to help students increase their self-awareness as a designer, understanding of others, and communication skills, and influence upon their designer values. This study uses the mixed-methods research design by collecting and analyzing qualitative and quantitative data. The subject pool included undergraduate students taking the third-year landscape architecture studio course. Two rounds of survey were conducted to capture students' self-perceptions of their designer values before and after incorporation of the teaching activities introduced above. The first-round survey consisted of multiple choice questions to measure students' designer values. At the end of the semester, the second-round survey measured students' designer values again and included open-ended questions to collect qualitative data about students' perceptions of the teaching activities. The findings identified the students' perception of change in their designer values as well as their perception of which activities influenced them and how. So far, the researchers saw the possible changes in preferred working style and preferred role in the design team, which would relate to the self-assessment teaching activities. And possible changes preferred communication style with coworkers and clients would have a strong connection with the communication science workshop and other teaching activities. This pilot study identifies the effective teaching activities that are warranting further research and help improve students' designer qualities.

4. DESIGN IMPLEMENTATION

PAPER ABSTRACTS

Bruce Dvorak, Niti Tataria, Karishma Joshi, Ahmed Kama Ali, and Panwang Huo, 77, *Plant survival trials on a custom living wall system**

Green walls consist of a variety of techniques to establish live plants on vertical surfaces. Green facades are a type of green wall to establish twining vines on cable or on wire mesh panels. Hydroponic living wall systems make use of shallow rooted plants, fabric and nutrified irrigation water to feed plants. Each of these types of systems have limitations. Most vines have vertical growth limits and hydroponic systems may not be adaptable to climates with extreme heat or cold. Modular living wall systems attempt to grow plants vertically in small PVC boxes or containers. Many modular systems have limited space to provide for growing medium and root growth, and some position plants in unnatural orientations. Initial performance of some of the market based modular systems demonstrate a limited application outdoors in extreme climates. During the 2017-2018 academic year, faculty, students at a university in collaboration with private industry trialed a new approach to address the limitations of these systems in a hot climate. Students and faculty designed and tested a modular container living wall system with deeper soils and natural orientation for plants. The purpose of this study was to pre-test plant species that may be viable to the custom modular living wall. One-hundred living wall modules were fabricated from reused galvanized sheet metal, painted and installed on a south facing building façade on campus. Irrigation drip emitters, planting modules, growing medium and six species of plants were installed the first weeks of May, 2018. Dichondra argentea, Yucca 'Color Guard', Phyla incisa, Agave lophantha 'Quadricolor', Hesperaloe parviflora, Hechtia texensis were placed in the modules and watered. Modules were placed in groups of three vertically on the wall hanging system. Irrigation was set to two minutes every other morning. Plant health was visually monitored during the summer and fall to make minor adjustments to watering frequency. Plant survival will be measured by recording live plants early spring 2019. This research is needed to help establish a baseline for plants on vertical walls in climates where summers air temperatures are typically hot and dry.

Taryn Borelli and Amir Gohar, 114, *Guidelines for a New, Floating Open Space**

For centuries, humans have used artificial floating islands (AFIs) to meet their physical needs. The Uros people have built villages on AFIs fabricated from reeds on Lake Titicaca 1,8, and native Marsh Arabs have traditionally built reed villages in the Mesopotamian Marshlands 1,2,8,13. In recent decades, AFIs have been recognized for their ecosystem service of water remediation. Typically, manufactured AFIs are planted with aquatic or terrestrial plants whose roots are constantly submerged in the water column 3,4,5,6,7,9,11. The roots absorb excess nutrients and convert them into biomass that can later be harvested 4,5,6,7,9,11. Now, AFIs are being implemented along urban waterfronts as ecological strategies and, sometimes, as public open spaces. For example, the Chicago Riverwalk incorporates AFIs that are interspersed between piers 12. These spaces are used for fishing and ecological education 12. AFIs have also been implemented in Singapore's Punggol Reservoir for water remediation, community gatherings, and ecological education 1. These and other AFI designs have demonstrated success for their primary ecological objectives, but they may not fully accommodate the social activities of public open spaces. For example, Rotterdam's "Recycled Park" is a series of modular AFIs constructed from recycled plastic found in the Nieuwe Maas River 14. Two of the modules include seating for visitors. With only two spaces designated for social activity, the possible uses for the "floating park" are limited 10. Because the primary goal of this design is to increase the health of the river, the focus is more on the ecological aspect than the social. My research aims to create a set of design guidelines for AFIs as public open spaces along urban waterfronts. The resulting AFIs will accommodate social and recreational activities while maintaining their ecological goals and contextual

appropriateness. Through precedent studies and interviews with project experts, I am developing a set of guidelines to inform the design of social/recreational AFIs and to develop a new type of public green space. To measure the effectiveness and demonstrate the applicability of the developed guidelines, I will use them to conduct a projective design. For further validation, I will share the guidelines with experts specializing in ecology and the design of outdoor social environments. In this way, I will develop a set of effective design guidelines for social/recreational AFIs.

Wonmin Sohn, Hyun-Woo, Jun-Hyun Kim, and Ming-Han Li, 260, *Assessing the capitalization effects of retention and detention ponds on single-family housing values**

Water bodies in a neighborhood are important amenities that promote aesthetic quality of community and serve as cooling sources by creating a thermally comfortable environment. Hedonic models have been developed to attest capitalization effects of neighboring regional-scale water features on home values, such as rivers, lakes, bays, etc. Those studies have consistently supported the positive contribution of waterfronts to increasing housing values. Meanwhile, the demands for neighborhood-scale water features have recently grown since the early 1990s with increasing awareness of green infrastructure (GI). A stormwater retention or detention pond, one of the most typical GI integrated into residential areas, which functions to control and treat stormwater runoff, is often designed to enhance aesthetic values and a sense of security for communities. However, limited research has assessed the monetary value of retention or detention ponds in housing markets. Inconsistent results from a few studies have challenged implementation of GIs at the neighborhood level. The purpose of this study is to assess contributions of retention/detention ponds to housing market values in four subdivisions located in Houston, Texas, USA. The retention ponds in a subdivision were previously detention ponds but were retrofitted in 2011 by incorporating recreation and aesthetics. Detention ponds in other three subdivisions were maintained since 2004 only for treatment purposes during major storm events. Their storage volume reached the full capacity during Hurricane Harvey, reducing flooding risks in the study area. 327 and 430 single-family houses neighboring detention/retention ponds were selected for analysis, and individual hedonic models were developed with each group of observations. While controlling a set of housing structural and locational variables, the impacts of environmental attribute variables such as distance and view to ponds were assessed. The housing market value in January 2016 and its change from January 2007 to January 2016 were used as dependent variables. The preliminary results show the positive effects of retention ponds, whereas close walking distance to detention ponds decreases housing values. A control of spatial lag in autoregressive models reduces the impacts of distance-to-pond variables but slightly improves model performance. In the longitudinal analysis, retrofitting detention to retention ponds also contributes to reducing decreasing trends of housing values over 10 years. In contrast, keeping detention ponds has negative capitalization impacts on market changes. This study demonstrates the need of encouraging the use of retention ponds in a neighborhood because their capitalization effect outperforms that of detention ponds in the long run.

5.HISTORY, THEORY, AND CULTURE

PAPER ABSTRACTS

Mary Padua, 365, *Trees and "Greening:" The lexicon of political freedom and modern nation-building in China*

China's modernity is considered a complex subject with various dimensions that include temporal, political, socio-economic, cultural and spatial contexts (Levenson 1968; Kang 1996; Zhang 1997; Spence 1990). However, one narrative argues the decline of Qing dynasty's last imperial court combined with the presence of foreign colonizing powers contributed to domestic disorder within China at the turn of the 20th century. This enabled China's 1911 Revolution, the downfall of the Qing government and thousands of years of imperial governance that was guided by Confucianism and dynastic time. Led by the foreign-educated, native-born Chinese, Sun Yat-sen, the 1911 Revolution toppled the Qing government and was eventually replaced by the Republic of China (ROC) in 1912. Building a unified modern nation proved to be challenging (Spence 1990). Nevertheless, this study reveals ways that trees, tree-planting and "greening" or open space strategies became emblems of modern nation-building and were directly linked to Sun Yat-sen's Three Great Principles, Sanmin Zhuyi: nationalism (minzu zhuyi); rights of the people (minquan) or democracy; and the people's livelihood (minsheng) sometimes referred to as socialism or social welfare (Lu 2017). It is important to note that Sun conducted in-depth studies of the French, American and Russian Revolutions. As a world traveler, he toured Haussmann's Paris and London while seeking support for his revolution. His studies led him to understand the symbolism of trees as part of the lexicon of political freedom and revolutionary praxis. The so-called liberty tree was an American symbol of freedom from the British colonizing forces circa 1765 and in France, "arbre de la liberte" symbolized the people's freedom from the monarchy (Schlesinger 1952; Harden 1995). This study explores the inter-relationships of Sun's Three Great Principles, modern nation-building, trees and "greening" during the Nanking (currently known as Nanjing) Decade, circa 1927-1937. Soon after the ROC government was established in 1912, China devolved into civil war during the so-called warlord era. It wasn't until Sun's death in 1926 that the Nationalist (Guomindang) party gained a foothold and honored Sun's desire to relocate the nation's capital to Nanjing, a city in southern China(Cody 2001, Musgrove 2013). This historical study draws from the literature and archival research. An analytical discussion of projects (built and unbuilt) in Nanjing as a capital city will reveal the significance of "greening" as a nationalist undertaking and build the logic for Nanjing as an emergent case study for modern landscape architecture in the ROC.

Anna Wik, 343, *The Gambacorta or Town Marsh in New Castle, Delaware: Harnessing and transforming a natural resource*

This project explores the shifting relationship of humans to marshland over time in Delaware. Specifically, it links the development of the city of New Castle, Delaware to the Gambacorta or Town Marsh, which includes the urban, industrial site of the historic Tasker Iron Works and neighborhood of Dobbinsville. Proximity and access to marshland have profoundly influenced settlement and land use patterns in the city of New Castle, and human development and attitudes towards nature have in turn affected the marsh. While current attitudes recognize that, as a functional ecological system, tidal marshland provides a myriad of ecosystem services, such as habitat provision, storm surge protection, and carbon sequestration, humans have not always looked so favorably upon the marsh. By

its very nature, marshland acts as a barrier, and does not lend itself to ease of development; humans are required to put in significant effort to manage or modify this landscape and as such, marsh has dictated land use patterns. Through interdependent relationships, based on input and extraction, to age-old methods of diking, banking or filling, agricultural and industrial practices in Delaware have harnessed and transformed this abundant natural resource. Historical research using the scholarship of vernacular architecture guides this investigation. Written and oral accounts over the years provide insight into different methods humans have used to control and manage marshland in this region and the Gambacorta Marsh in particular. The themes of agriculture and industry play an important role in the early development and subsequent transformations of this marshland. The lens of class provides another view of the marsh, as it functionally segregates neighborhoods of the town of New Castle from one another. Historically a repository for industrial waste, the marsh represents issues of environmental injustice and changing notions of ecological awareness. The overriding theme of landscape and townscape coalesces these investigations into a clear picture of how the marsh shaped the town of New Castle shaped and vice versa. Methods used to understand this relationship include examination and comparison of primary resources, such historic maps, as well as review of secondary source materials such as HABS and National Register Nominations. Ultimately, the goal of this project is to lay the historical groundwork necessary to examine the potential of the marsh in modern efforts to establish coastal resilience. While methods of management and notions of stewardship have reformed over time, the current trend of marsh restoration and environmental sensitivity, especially in the face of resiliency concerns, will figure into this study and its applicability to future approaches to conservation and development.

Annette Freytag, 287, *Dieter Kienast (1945–1998) and the Topological and Phenomenological Dimension of Postmodernism*

Swiss Landscape Architect Dieter Kienast (1945–1998) brought a reorientation to the profession of landscape architecture in Europe in the 1980s and 1990s after a period of iconoclasm triggered by the environmental movement and the critique of planning practices. In the context of CELA´s new test track "research by design" this lecture will focus from the history and theory of landscape architecture: First, I want to show how Kienast reflected on material quality in his different modes of analysis and representation that he used for his works, namely hand drawing, collage, photography and video, and the reciprocal effects that can be observed between these media and his designs. Second, I want to show how the concept of "transparency" as a strategy of form-organization developed by the "Texas Rangers" (Bernhard Hoesli, Colin Rowe, John Hejduk, Robert Slutzky and Lee Hirsch) between 1953 and 1958 coined landscape design und urban planning projects in Switzerland in the 1980s. Both of these special aspects of Kienast´s work have been at the core of the above stated reorientation of the discipline of landscape architecture in Europe. They also address the topological and phenomenological dimension of Postmodernism and thus show why we should not condemn this crucial period for landscape architecture. With today´s challenges such as urban sprawl, we can draw a great deal of lessons from this time.

Richard Hindle, 8, *Learning From Venice: An environmental and urban innovation model from the lagoon city*

Innovation in physical urban infrastructure is a pressing issue as cities face the challenges of climate change, sea level rise, and increasing development pressure from rapidly urbanizing populations. Environmental change and technological innovation are perennial forces in urbanization, making historical precedents valuable as we consider strategies for the next generation of urban infrastructure. A look back at the history or patent law and urbanization reveals that a unique model for urban and environmental innovation was pioneered in Venice in the 13th and 14th century, through the integration of inventor's rights (i.e. patents) with urban and territorial development. This history obviates a dynamic relationship between sociotechnical processes, urbanization, and environment that is particularly salient today as we develop the innovative infrastructure of the next century. This presentation explores the history of patent law through the lens of urban and territorial development. It will include analysis of primary

historical sources, an analysis of secondary sources, and case studies that span from Venice, through Europe, to North America. Innovation in specific dredge, drainage, and land building technologies will also be discussed in relationship to the broader framework of patents as a sociotechnical mechanism for innovation employed by the Venetian state. Venice is a city built on innovation. The city was founded in the estuarine landscape of the Leguna Venata on March 25th, 421 AD. Venice's watery refuge was defensible, but presented a challenge to conventional land-based forms of urbanism. Prospects of building a thriving metropolis in a dynamic lagoon environment required technological and social innovation to remain competitive in global trade and manufacturing, but also to reconcile the inherent conflict between city building and the environmental contingencies of sedimentation, fluctuating water levels, and miry soils. Robust historical accounts exist of Venice's ingenious building practices and advances in hydrologic engineering are widely documented; yet many accounts overlook the legal and sociotechnical tools employed in Venice to incentivize innovation in industry and physical infrastructure. The coevolution of city building and inventors rights suggest that a distinct urban innovation model was created, and later emulated, as patent rights spread from Venice to Europe and the United States - evidence of which can be traced through fens, lowlands, rivers, and cities around the world. The venetian model for innovation will be discussed in relationship to currently accepted innovation models, and their potential adaptation to environmental design and the professional practice of Landscape Architecture. Might we learn from the Venetian model from urban and environmental innovation to address the challenges of the future?

M. Elen Deming, W. Lake Douglas, Kofi Boone, Harriet Jameson Brooks, and Nicholas Serrano, 281, *Symbols of Division: Deploying narratives and counter-narratives in public space*

This panel discussion explores the roles and responsibilities of landscape architects, architects, artists and urban designers in the construction and reconstruction of symbolic narratives in public places. The goal of the panel is to offer constructs for addressing morally and socially challenging questions in order to engage equitably constituents who may hold complex social values. Affect and reception for symbolic design is particularly relevant in the cases of dominant historical narratives that are contested by changing contemporary values. Especially in the South, the legacy of the American Civil War (1861-65) remains entrenched in social conflict. To honor Confederate war dead, hundreds of monuments were erected in the South during the Jim Crow era, an overtly racist period beginning a generation after the war ended, up to the passing of the Civil Rights Act in 1964. Quite recently, the white supremacist-motivated assassination of nine people (June 17, 2015) at Emanuel AME Church in Charleston, SC, sparked a growing number of anti-racist demonstrations focusing on perceived threats posed by Confederate symbolism (e.g. flags and monuments) extant in public landscapes in the American South. Bitter conflicts over the fate of Confederate monuments in public landscapes have since erupted, pitting coalitions of neo-Nazis and white supremacists against leftist anti-racist counter-protesters. Some argue that Confederate monuments are neutral historical markers that simply honor those who died for their beliefs; others argue that they encode and empower intolerable racist ideology. Should such divisive "objects of remembrance" be allowed to remain in public places? This panel examines such dilemmas faced by designers who purport to represent a broad and increasingly diverse constituency, as well as the function of public memorials in constructing narratives and counter-narratives that may serve to heal a divided society. Panelists offer a variety of perspectives on a range of monuments and public responses to them in North Carolina, Louisiana, and Tennessee, among other places. Case studies will describe cultural controversies surrounding Confederate monuments, as well as offer humanistic theories (master narratives; narrative and counter narrative; symbolic accretion) that may be applied for analysis and evaluation of design interventions. This panel discussion contributes to greater understanding of the imperatives for acknowledging inclusivity and empathy when designing with—or in response to—charged symbols in public spaces.

Jacqueline Margetts, 458, *Plantspace: The monocot-driven designs of Ted Smyth*

Ted Smyth is New Zealand's most recognized garden designer, having spent over 55 years in the field. His first garden was published in 1962 and since then his work has appeared in numerous magazines and books, both local and international, including the cover of the Harvard Design Magazine in 1997. At his retirement in 2017 at age 80, he left a profound and lasting influence on garden design especially in Auckland. He is recognized not only for his innovative, modernist approach to space and materiality, but also for the range of plants he introduced into common usage. Auckland's climate had an enormous influence on Smyth's work as it allowed sub-tropical plants to be cultivated, vital to the formal and spatial expression of Smyth's gardens. He created gardens that could not be reproduced elsewhere in the country. In his designs Smyth generally eschewed shrubs – their sprawling, nondescript growth form did not hold any interest for him. It was his fascination with structural plants, which he deployed as specimens to anchor and structure space, that led to his extensive use of exotic tropical and subtropical plants, completely uncommon or unknown in gardens at the time he commenced his experimentation. Smyth's search for specimens with strong, predictable forms led him into contact with a number of specialist growers and enthusiasts with considerable knowledge – and he capitalized on their expertise in the selection of plants within his gardens. This paper argues that of all the many tropical and subtropical plants introduced into NZ, one group of plants can be particularly distinguished as being synonymous with Smyth's work, that being the monocotyledons, especially the arboreal species of the group. The growth forms which attracted Smyth to these plants is a direct function of their internal anatomy which leads to precise, predictable and distinctive morphologies that he fully exploited.

Xiao Yao, 464, *Plant Landscape and Management System of Beijing Royal Gardens, Qing Dynasty*

The management and operation of royal gardens in Qing dynasty are essential to its existence. On the basis of the regulations of the royal household bureau of Qing dynasty, this paper organize and classify the management information about royal gardens and their attached land in the royal court literatures. This paper uses definitive method to explore the attached lands' usage, business operation and economic values to its gardens.Studies have shown that Fengchen Yuan and Yuanming Yuan were two centers to the entire royal garden management system in Qing dynasty. The major part of the royal garden operation activities was land lease. Land use planning was the primary method to oprate plant landscape in a royal gardens. The administrative unit was responsible for the land revenue management to support garden maintenance. At the same time, it is responsible for capital management and revenue geneeration based on systems of reimbursement, appropriation, and investment. This paper can play a supporting role in the classification of the management and operation frameworks of royal gardens in Qing dynasty.

Pablo Pérez-Ramos, 229, *The Expanded Field of Botany: Agronomy and ecology in the Bordeaux Botanic Garden*

Since the earliest examples of gardens that, following the age of explorations, were deliberately designed for the study of plants, the landscape architecture type of the botanic garden has historically synthesized influences from the aesthetic canons of landscape gardening and the scientific codes of botany. Today, however, botanic gardens often incorporate ambitions that go beyond pleasure and the base research program of plant collection and classification. They seek to better engage the general public, to provide information about current environmental issues, and to educate about the values that have guided the relationship between humans and the botanic world over history. Two specific galleries of the Bordeaux botanic garden—the Fields of Culture and the Gallery of Environments—designed by Catherine Mosbach and built between 1999 and 2007, constitute a clear example of the capacity of landscape architecture design and scholarship to successfully integrate the scientific and research objectives intrinsic to any botanical garden with the establishment of a strong public and educational program. Through the Fields of Culture, Mosbach conceives the garden as an ethnobotanical demonstration that represents the different cultural roles of plants across different geographies and historic periods. The fields follow a regular organizational framework made of long, straight, and narrow planting beds, borrowed from agronomic patterns and techniques. The rotating collection is not organized in accordance to taxonomic connections nor morphological

expressions, but in accordance to social values. In the Gallery of Environments, different geomorphological conditions found across the Aquitaine region are reproduced in a series of amorphous "promontories," where management is kept at a minimum, so that the plant communities on top develop along successional processes with no major human intervention. The exposure of the substrate not only allows to read the geomorphology of the region, turning the garden into a synecdoche of its environment, but also reveals that the vegetal formations we perceive on the face of the land are also an expression of the underlying abiotic components of the environment. Through a detailed analysis of the Bordeaux botanic garden, this paper will discuss Mosbach's use of agronomy and ecology as a way to expand the scientific program of the modern botanic garden, and as a way to ultimately emphasize the capacity of landscape architecture to internalize, help advance, and make publicly accessible current conversations about the very constitution of the natural order.

Sungkyung Lee, 469, *How did the Western Ideas of Public Parks Travel through Japan and into Korea?*

The paper investigates the history of public parks in Korea during the colonial period (1910-1945) by focusing on the role of Japan, both as a non-Western intermediary and colonial power, in transmitting the Western spatial concept to the country and shaping the early 20th-century Korean park into a unique colonial landscape.

Parks, paved streets, railways, hospitals, and other modern urban facilities were introduced to Korea through colonial modernization. Despite the advantage of being exposed to modern city infrastructure and technologies, many urban scholars criticize the exclusionary nature of the colonial space because it was intended to benefit the colonizer, creating ethnic divisions in living quarters and helping the Japanese colonial government take a greater political, economic, and social control of Korea (Son 1982, Son 1996, Jeong 2001, Park 2008, Hong 2008,). A similar postcolonial point of view, constructed by taking the binary distinction between the colonizer and colonized, can be found in the characterization of the colonial period as "the dark age of the Korean park history", in which parks were seen as the by-product of colonial modernity used to reinforce Japanese nationalism (Kang and Jang 2004, Son 1996).

This research attempts to add a new dimension to the current postcolonial interpretation by shifting its focus from the synchronic reading on the early 20th-century Korean park to the process of how the Western ideas of public parks were consumed and reproduced by a non-Western intermediary in Korea since the mid-19th century. This transnational process involving the Western powers, Japan, Korea, and their hybridized socio-political contexts is illustrated in a comparative case study on foreign settlements established by the Western powers in port cities of Japan in the 1850s and, later, by Japan in Korea after 1876. Using historic maps, photographs, and literature, this research illustrates how public parks and other modern urban facilities set these foreign settlements apart from the pre-modern landscapes of Japan and Korea at the time. Furthermore, the comparative analysis attempts to examine the role of Japan in transmitting the Western ideas of public parks to Korea by analyzing how the design and functions of public parks were different between these foreign settlements.

Soyoung Han, Joong Won Kim and Yoonku Kwon, 446, *The Concept on the Contemporary Publicness of Architecture and Urban Space of South Korea*

The notion of publicness is not an established terminology in the existing literatures. Rather than having a universal meaning, the notion of publicness has varying degrees of meanings across different disciplines (Akkar, 2005). Each

of them emphasizes slightly different, although overlapping, dimensions. To account for the public outcomes of publicness, the theoretical framework of dimensional publicness in public administration field offers potential insight (Antonsen and Jorgensen, 1997; Bozeman and Brestchneider 1994; Goldstein and Naor, 2005). In this study, we posit the notion of spatial publicness to investigate the way to evaluate the public outcomes of space. The purpose of this study is to explore the recognition of the contemporary publicness on architectural and urban space of South Korea through the content analysis. We have focused on South Korea since they often use the term of publicness more officially and academically compared to other countries. As a usage of the official form, they use the term of "facilitating" publicness on purpose for social policies in public space. The concept of publicness in South Korea has been emphasized in terms of institutional aspects intertwining with living space. The minimum rights of social and cultural spatial publicness were established law as a basic direction of the architectural policy. The articles for contents analysis were selected from January 1, 2010 to May 31, 2018, as publicity articles on the media listed above for the past seven years. We used the KINDS database (www.kinds.or.kr) provided by the Korea Press Foundation for data collection. A total of 582 articles related to the spatial publicness were included in the analysis. It has not been long since the spatial publicness as a subject of social discussion has been active in South Korea. This has been raised with the debate on the environmental problems caused by reckless development with economic growth. Recently it is spreading with the discussion about the historical context and the social role of architects and planners. Although the scope and background of questions surrounding South Korea's recognition of contemporary publicness is different from that of Western countries, a similar debate has emerged about what publicness means in the context of architecture and urban space. By doing so, this study will provide basic data for the ways of facilitating the publicness of architectural urban space by deriving the new concept of contemporary publicness.

Chad Lorentzen and Daniel Cronan, 461, *The Problem of Designing Public Spaces: Iconoclasm, anti-monumentalism and opening narratives*

Monuments stand as sentinels of the past. They commemorate the best of humanity, and occasionally the worst. These historic forms scatter the globe and show the fundamental human desire for spaces that commemorate the conspicuous nouns of the past. However, many monuments have an inherent narrative flaw: they propose a myopic worldview of the people or events they commemorate. Additionally, the original context of the monument rarely translates to future contexts and users. These static monuments can lead to many implicit and explicit biases– political, economic, cultural, and ethnic to name a few– through the arrangement, materials, and uses of the space. Confederate monuments pose acute design challenges that illustrate both the limitations of traditional monumental spaces and the narrative power of revision. These static forms exclusively, and often problematically, suggest the communal values of the place and can fail to adapt to social dynamics. When these monuments' controversial narratives come to light (through transitional moments like Charlottesville's white nationalist rally) the public reclaims ownership of the space and authorship of the narrative. However, the decision to retain, cover, or topple the contentious monuments of the past creates a new exclusionary narrative that redefines the area's physical and cultural landscapes as well as its collective memory. To avoid the contentious, exclusionary narratives written by retaining, covering, or toppling confederate monuments, designers should consider the lessons of Krzysztof Wodiczko. His public art projections, installed throughout the world, reanimate public spaces with minimal editorializing to acknowledge the past and stimulate meaningful, progressive discussion. As a result, these monuments can become instructional and allow users to define their own heroes and villains.

Behnaz Avazpour, Paul Osmond, and Linda Corkery, 35, *Transition from Private Gardens to Public Space*

The urgent need driven by urban development to provide a secure water supply is a challenging task for governments globally (Ahuja 2016). Governments and professionals are exploring innovative water management

approaches, which leads them to improve traditional techniques and reconcile these with the changing environments of our rapidly growing cities (Romero et al. 2017). Most of Iran falls into the semi-arid or desert climate zones (Gholikandi et al. 2013). Consequently, Iranians have always applied innovative techniques to realise opportunities for conservation and responsible utilisation of water (Abbaspour et al. 2009). The Persian garden is one of the most important elements in Iranian agriculture and landscape (Manuel et al. 2018). In these gardens, implementing various techniques to collect, distribute, and retain water, has led to water use in various forms such as Qanats, diverse types of streams and techniques to collect and evaporate water that creates a unique microclimate and provides comfort to occupants (Yannopoulos et al. 2015; Fekete and Haidari 2015). As water scarcity gives rise to growing global socio-ecological impacts, there are lessons to be learned by reviving traditional water management systems in urban spaces. Approaches developed for a specific environment, can often translate to successful ideas in other locations such as the United States as global warming advances. Thus, the main aim of this research is to improve understanding of the role of traditional and local urban and landscape design in rainwater management and re-conceptualising them in the context of contemporary public space in arid and semi-arid cities. Case study analysis has been used in urban and landscape design disciplines to link practice and theory (Francis 2001; Steiner 2014). By a combination of scientific and 'grey' literature review and site visits, this paper explores and defines strategies to apply water management methods of Persian gardens to urban areas. Three projects have been used to validate the strategies. These case studies were selected based on their particular water management strategies, literature, and climate. Finally, the paper outlines a basis for water management at the urban landscape planning scale – derived form traditional water management in Persian gardens - that improves water management infrastructure and provides ecological and social benefits for semi-arid region communities. It is important to note that the research focuses on urban and landscape design in the context of their environmental performance. The governance or policy aspects are outside the scope of this paper.

Ran Zhang, Bo Zhang, and Xun Zhu, 214, *Evolution of Dalian Urban Squares*

Since the end of the 19th century, Dalian has experienced dramatic social and physical changes. At the beginning of the 20th century, in order to accommodate Western lifestyle, the Russian colonials directly adopted the Paris model for the urban planning of Dalian, and adopted the planning methods of"radiation + diagonal + circular square". City squares became a critical component and framework of city life ever since. This article summarized the planning process of City Squares in Dalian, China .Then it compared and analyzed two of the typical squares that developed in different historical periods, Zhongshan Square and People Square. The study summarized the evolution of Dalian Plazas into different historical periods such as the Russian-Russian lease(1898 to 1904), the Japanese occupation(1905 to 1945), the Sino-Soviet co-management(1945 to 1955), and after the founding of the People's Republic of China. In each period, design intentions and social backgrounds that resulted the built environment changes were explored;In addition, the impact of squares on society were also understood by sorting out historical events taking place in and around those squares. The significance of this study was to clarify the design intentions of Dalian Urban Squares and understand the interactions of design,the construction and society. Morever□it compared two processes of fusion in design — the fusion between Russia and Chinese landscape styles and that between Japan and Chinese landscape styles — via a comparison of the transformations in Zhongshan Square and People Square.Finally,it also provided a reference for the preservation and protection of these parks. This study used literature review, interviews, field research and mapping to interpret the construction and usage of these squares.

Myungjin Shin and Jeong-Hann Pae, 104, *The Role of Landscape in the Experience of Sculpture Parks: The Case of Storm King Art Center and Socrates Sculpture Park, NY*

During the 20th century, outdoor sculpture gardens and parks proliferated across the globe. While there have been numerous studies that focus on the artworks situated in these landscapes, the role of landscape is oblique in comparison. Hence, this study re-courses the focus onto the landscape and explores the role of the landscape as the active agent in the aesthetic experience of the sculpture park. First, histories of garden, parks, sculpture, and land art are considered. Of interest is the convergence between art and landscape since land art movement in the 1960s. Based on the theories of reception and environmental aesthetics, this study believes that the fluctuating relationship between art and landscape has culminated in the indispensable role of landscape in modern and contemporary art world. In order to support such claim, two case studies, Storm King Art Center (SKAC) and Socrates Sculpture Park (SSP), are considered. These sites sit on the opposite ends of a spectrum in terms of management, types of artworks, programs, landscape imagery, etc. However, both sites have successfully integrated the landscape into the overall spatial experience and continues to reinterpret the sites' industrial histories. SKAC owes its landscape scheme to William A. Rutherford, landscape architect who envisioned the SKAC as the "one great artistic landscape" that is clearly distinct from a park. On the other hand, sculptor Mark di Suvero, the founder of SSP, intended the SSP to be "a cultural facility" as well as a successful waterfront development. In both cases, the sites were considered as integrated landscape that is artistic in their overall experience. Hence, this paper argues that the case studies show aspirations to reconfigure the relationship of art and landscape in terms of artistic experience. While the theoretical and historical analysis is supported by literature review of the examined parks and the related art and landscape history, the analysis of the aesthetic experience as conveyed by each case is interpreted based on direct observation and archival research. Finally, this study will seek for ways to extend the reconfigured relationship between art and landscape to our contemporary world; in so doing, the role of art in landscape design, and vice-versa, is illuminated. As the fields of art and landscape continue to expand and overlap, understanding their relationship will expose the under-realized potential of the artistic landscapes and seek to imagine new ways to integrate art and culture into our existing environment.

Kevan Klosterwill, 18, *The Animal in the Landscape: From Image to Agent*

Landscape architecture is unique as a design practice, in its engagement with living nonhumans as instrumental media. But beyond calls to provide and preserve habitat, landscape architecture theory has more often focused on the horticultural dimensions of design, masking the role of fauna, rather than flora, as components of the designed landscape. While wildlife habitat represents perhaps the most significant emergence of an interest in the animal, there is an earlier current of references that includes both domestic and wild animals, regarding them as a "design material" (in the words of Garrett Eckbo) that has aesthetic significance. References to animals can also be found in early writings on the picturesque landscape. More recently, landscape designers have imagined new roles for animals in the landscape. No longer are they passive objects or mere visitors or inhabitants, blindly providing ecosystem services. Increasingly, a number of designers have explored the role of animals as active agents shaping the landscape, in ways that reimagine relationships of domesticity and subjectivity. Provocations for "animal-aided design" are emblematic of this novel take on the animal in the landscape. Recently, there has been a turn toward the nonhuman in the Environmental Humanities, most notably in the form of Critical Animal Studies and Multispecies Studies. These efforts benefit from post-dualist arguments in Science and Technology Studies and interests in the rights of animals drawn from Environmental Ethics. Collectively, these literatures have much to offer to theorizations of the designed landscape. In this paper, they are employed to interpret references to animals in landscape architecture as contributing to a general trajectory within the theorization and practice of design—from sceneographic object to environmental system component, and more recently as specific individual subjects within more-than-human socialities. In addition to revealing a discounted aspect of design that has been under-developed theoretically in comparison with less-mobile plants, the presentation offers an opportunity to reflect more generally on the ethical implications of landscape architecture's engagements with nonhumans, floral or faunal. In particular, multispecies scholars have reckoned with the instrumental and biopolitical dimensions of animal practices,

arguments that could also apply to the manipulation of plants, which are so often taken for granted within landscape design.

Susan Herrington, 43, *Objects of Affection: Beauty in the work of Claude Cormier + Associates*

Much landscape architectural scholarship today would surely have little patience for the yummy bling of Sugar Beach, the enchanting canines of Berczy Park, or the willful designer, Claude Cormier, who rose from obscurity on a remote Québec farm to imagine and realize these resplendent projects. However, as urban areas continue to grow and densify, public landscapes that offer play, fun, and beauty are desperately needed. In North America, the percentage of urban residents has risen steadily with approximately eighty-two percent of the population living in cities today.1 The following argues that Cormier's landscapes are beautiful, and leavened by humor this beauty brings joy to the countless people who use them. The word "beauty" may seem naïve to some, but in the past few decades the concept of beauty has witnessed a revival and this recovery has also influenced conceptions of beauty in landscape architecture.2 The revival of beauty has provided explanations that are not exclusively formalist–i.e., one based on color, line, or form. In other words, a landscape does not have to look beautiful to be experienced as beautiful. That said, many of Cormier's landscape are formally beautiful. Building upon conceptions of beauty put forth by Elaine Scarry3 and Alexander Nehamas,4 this paper demonstrates how beauty functions in Claude Cormier's projects. These examples include, Blue Stick Garden in rural Quebec, Lipstick Forest in Montreal, Blue Tree in California; and Teddy Bears, Pink Balls and the TOM series in Montreal. Indeed, Cormier's projects evoke formalist ideals of beauty, but they also express Nehamas's conceptions of beauty that build upon interpretations and evoked feelings, and Scarry's theory that beauty prompts replication and social understanding. One of Cormier's chief techniques in attaining this beauty comes from his fondness of objects and their transformation, particularly with painting techniques such as illusion, color balance, and pointillism. From colorful balls to painted stakes to temporary overlay markers (TOM), Cormier has employed some unlikely objects as design features in his gardens and landscapes. By understanding how Cormier has achieved beauty in his work, students and scholars of landscape architecture may discover new-found contributions made by the landscape.

Anette Freytag, 270, *The Gardens of La Gara – An 18th century estate in Geneva with contemporary gardens designed by Erik Dhont and a labyrinth by artist Markus Raetz*

I would like to present a publication project I worked on as an editor with other authors from six European countries. The book resumes the revitalization of an 18th century country estate near Geneva, Switzerland, that started in 2001 after the estate was abandoned for 30 years. At the heart of the book is the present´s inquiring of a historical estate and the manner in which it has been restored and developed – with the restauration works advised by Swiss architect Verena Best-Mast and with contemporary gardens by Belgian landscape architect Erik Dhont. The purpose of these contemporary layers was to create a respectful "mise en scène" for both the historical substance of the estate and the story it tells. The interventions follow André Corboz´s understanding of reading the land as palimpsest and using the vestiges and transformations as elements, as reference points and as stimulations for the new designs. The manor house of La Gara is surrounded by fourteen acres of gardens and 86 acres of farmland. The book is a case study to explore, through the prism of the La Gara estate, all aspects of garden culture: Woven into the discussion are elements of the social and religious history of the region. The estate served as a refuge for well-to-do Huguenot refugees from France, who were instrumental in developing it. The account of how the gardens of La Gara changed over the years sheds light on the evolution of the forms and functions of garden theory and practice generally, from the French concept of the ferme ornée and the English landscape garden to the orangeries and mixed-shrub gardens with meandering paths that became typical of Swiss villas, the contemporary garden designs with which Dhont responded to the historical givens of the place. In addition, the book also addresses specific questions, such as how a historical orchard dating back to the seventeenth century and eighteenth-century espaliers can be reconstructed in the present, and how the biodiversity was enhanced. It also

examines the technical aspects of garden design, including irrigation systems and the perennially controversial question of whether it is ever legitimate to add a contemporary layer to a historical ensemble. The lecture shall not only present the concept and content of the book but also its design whose compositional theme is once again the palimpsest and the inquiry of the past through a contemporary perspective.

Hans Klein-Hewett, 58, *The Changing Visions of American Sublimity*

This presentation will discuss the need for a dynamic definition of landscape sublimity. Utilizing the lens of American landscape tourism – specifically Watkins Glen State Park in central New York – the presentation will illustrate how American tourists' values of the landscape have changed the definition of sublime. The presentation will start with a brief historical sketch of Watkins Glen then place it in context to national trends, illustrating how the definitions of sublimity have changed. Design history has long utilized Edmond Burke's 1757 definition of the sublime: a landscape scene filled with infinite, overwhelming, yet pleasurable Nature. This description fit the eighteenth-century landscape and tourists well, when the pleasure travel included sedan chairs and coaches. However, as transportation technology advanced, industry and colonists invaded the wilds, displaced Native Americans, and removed the sense of fear. Tourists, who still desired infinite and overwhelming spaces, quickly swapped the desire for fear with the desire for awe. Luckily, the sense of awe still worked with the primary embodiments of the sublime American landscape: divine presence, freedom, and abundant potential. By accepting this collective change in expectations, tourists created a multifaceted vision of the sublime. As an example, Watkins Glen State Park was envisioned as a complement to the sublime destinations of the American Grand Tour – specifically its neighbor to the northwest, Niagara Falls. However, by the time the site opened in 1830, its elite patrons were looking farther afield for their source of sublime. The managers of Watkins Glen quickly pivoted to attract the newly-formed middle-class tourist. The monstrous sublimity of its narrow canyons was supplanted by a focus on relaxation (1870s), then recreation (1890s), then automobile-based freedom (1930s). More recently, the search for adrenaline became the impetus for travel – a topic not lost on Watkins Glen, which is now known more for its NASCAR race track rather than its eponymous glen. Watkins Glen illustrates how landscape narratives such as the sublime are continually in flux. Changes in technology, economics, and environmental ethics transform collective descriptions and value systems, leading to new concepts of tourist value and the literal reshaping of our toured landscapes. Understanding the dynamic transformation of the sublime removes it from history and places it inside modern landscape architecture, allowing for its continued evolution and discourse today.

Fernando Magallanes, 303, *The Dying Hand: Between biology, psychology, and the future of the environment*

The Dying Hand: Between Biology, Psychology, and the Future of the Environment ABSTRACT The hand has been credited as responsible for contributing to the evolution of our brain (Napier, 1996) – but its future contributions are questionable. In this paper, the author will explore the necessity for continued use of the hand in design and drawing while reporting varying perspectives about how the computer and technology is slowly removing the hand from a full range of impact in designing and drawing. Questions are surfacing as we move to an exclusive focus of using digital tools in design. How is the hand losing its influence in design to the computer? Will the hand be hybridized with digital media? Are digital programs and hardware restricting the hand? (Lanier, 2010). Are human qualities in our designs lost without the hand? (Linden, 2015). Discussing these questions, we can glance back to look at the historical contributions of the human hand in shaping environments and begin a current reappraisal of how the hand may or may not be associated with making design in the future. We can turn our questions to the critical lenses of recent research found in neuroscience, evolutionary biology, psychology, architectural theory, and philosophy which are revealing new sources of information. The escalation of technological development and its existence in all aspects of our daily lives, creates a scenario that makes it opportune to leave a critical record of our

thinking on this subject. In view of today's technological growth, arguing for the validity of the hand to make or not make contributions to our future environments is important to us as designers. The author positions his argument on his experience teaching landscape architecture, the education of students, the development of designs, and the practice of environmental decision making for the future. As we plot our future values about the hand, our choices will leave a mark on how we relate to our environment, how it impacts its use as a thinking tool, its ability to ground us to our environment, and how it drives the education of nascent designers (Bloomer and Moore, 1977). Research for this paper revolves around the writings of: Frank R. Wilson (neurologist), John Napier (paleoanthropologist), David Linden (neuroscientist), Lucia Capacchione (art therapist), Jaron Lanier (computer scientist), Ashley Montagu (anthropologist), Carla Hannaford (neurophysiologist), Thierry Lenain (philosopher), Machio Kaku (futurist and physicist), and others. This paper is not to defend or attack the use of cybernetic introductions into the body but to ask what we are losing and what we are gaining as we move towards computer augmented systems in our designs? The questions engaged are those that require discourse about how the 'human' elements resolve their relationship in creating designed environments with 'human qualities' with new cybernetic mechanisms?

Alberto de Salvatierra, 230, *Landscape Architecture Theory as Children's Storybooks: Educating the youngest generation of designers*

If one were to ask a child what they want to be when they grow up, one might get one of three types of answers: something traditional (doctor, lawyer, engineer), something "cool" and adventurous (firefighter, astronaut, zookeeper), or uncertainty ("I don't know"). And yet, an overview of the foundational literature they are exposed to during their formative years—like TIME's 100 Best Children's Books of All Time, for instance—reveal surprising themes: the most excellent adventures are had outdoors, trees are a recurring anthropomorphized character/friend, and nature is full of wonders. Given the landscape-heavy nature of these works, the question therefore remains: why don't more children grow into aspiring landscape architects? What if—in a manner similar to the pictorial narratives that valorize growing up to become a doctor or an astronaut—landscape architects were positioned in such a way to inculcate an early awareness of the profession and its aims? Beginning with an extensive catalog and inventory of the themes and topics of the best-selling and most popular children's books, this paper seeks to make a compelling case to introduce landscape theory—and descriptions of landscape architecture practice in general—into children's literature. Subsequently, this paper will also document the semester-long work (undertaken during the Spring 2018 offering of LAND 455: Theory in Landscape Architecture) of a small group of students who examined seminal writings of landscape architecture theory, and re-adapted them through more accessible language and vivid visuals for better diffusion among a younger constituency. This paper thus endeavors to demonstrate an initial method for adapting landscape architecture theory as design exercise, while sharing the results of such an initial exploration. Much work is being done to educate young designers at a collegiate or graduate level. However, a targeted and strategic educational campaign early in life could have lasting impact for the profession—especially in an age marked with uncertainty, scarcity and growth where aspiring to become a landscape architect should not be a matter of personality, but a prime necessity to collectively tackle the challenges of today.

Eunshin Son and Jeong-Hann Pae, 106, *Expanding the Definition of the Contemporary Memorial Designed for the Public Memory*

According to a dictionary definition, a memorial is a statue or structure established to remind a certain person or event. In other words, memorials are constructed to honor a person who has left some achievements, such as Lincoln Memorial, or to commemorate and mourn for a certain event, such as the 9.11 Memorial. In addition, memorials recently built in cities function as open spaces, called 'memorial park'. In order for memorials to function as urban parks, the public has to agree that the memories which are represented by the memorials are worth remembering. Memorials that do not gain public consensus are difficult to sustain in urban space. What

memories can be left as memorials? What kinds of memories are more important for the public? This is one of the major challenges to contemporary landscape architects. There is much controversy in the process of selecting a certain memory as of greater importance at a specific place. Also, because urban public space is not private property, the memory cannot be determined according to a personal intention. This study discusses the shift in the contemporary memorials that are designed in cities and function as open spaces or parks. This shift is due to the changes in memory visualized in a memorial. There are two major changes to the contemporary memorial addressed in this study. The first is a case of the memorial for remembering the socially marginalized minority groups. As an example, this study examines the Irish Hunger Memorial in New York City and the changes in the social needs of Irish American immigrants since 1990s. The second change in the contemporary memorial has an influence over a larger scale: the memories represented by the memorial should be recognized as worthy of the resident or the larger public. That is, the memories should be accepted as meaningful public memories. When a specific memory represented is judged to be valuable for those who use this space usually, the memorial in the urban public space can be constructed and sustained. In fact, all contemporary urban memorials are constructed under an agreement based on public memory. In a particular case, this study examines the making of a place of memory related to the 2014 Sewol ferry accident in Korea. Through these cases, this study seeks to expand the definition of the contemporary memorial designed as an alternative open space in the metropolitan cities.

Yasmin Fozard, 135, *From Slavery to Freedom Hill and Beyond*

The purpose of this study From Slavery to Freedom Hill and Beyond was to increase the awareness of the enviroKIDs Summer Campers to the ideas and activities designers use while working with historical and cultural landscape revitalization. The enviroKIDs summer Campers are high risk and disadvantaged according to social and economic standards. The primary goal of this study is to bring about an understanding of how different cultural and ethnic groups value and use their urban spaces as a part of their social reality. The social reality of cultures can be affected and altered by design activism which is linked to the past as well as the present. At the close of the Civil War, former slaves sought refuge at a Union Troop encampment located in Edgecombe County, Eastern North Carolina. Following the departure of Union Soldiers, in 1865 many of the now freed slaves remained behind in the encampment and affectionately called their settlement of huts and shanties on the Tar River floodplain Freedom Hill. Within twenty years, Freedom Hill was renamed Princeville and in 1885 became the first African American town incorporated in the United States. The establishment of the Town of Princeville is an example of design activism by free slaves in the past. Today the Town of Princeville continues to struggle to survive. Princeville has experienced many defeating efforts in its struggle to survive including the legal and discriminatory effects during the Jim Crow Era, denial of its effort of annexation into the City of Tarboro and several devastating hurricanes throughout history. One of Princeville's revitalization goals is to encourage visitors to come and learn about its heritage. The enviroKIDs revitalization efforts used social design thinking and design activism as they explored a proposed Heritage Trail in Princeville. The enviroKIDs used a Virtual Reality device called an HTC Vive to walk through two Sketch-Up models in the digital Princeville's Heritage Trail. They then provided positive feedback on different ways to improve the Heritage Trail experience. The final outcome of the study resulted in enhancing the proposed Heritage Trail by using interactive theater as participatory art along the trail. The participatory art element along the trail is design activism which will link the past to the present into the future of Princeville.

Martin Holland, 479, *Problematic Statuary in the Canadian Context: The legacy of Sir John A. MacDonald.*

While the ongoing controversy regarding the display of Confederate statuary across America has had sustained national press coverage, north of the 49th parallel, Canada has also struggled with regards to the role of controversial statuary in the public sphere.1 Unlike the United States, the Canadian concern involves the embodiment of the national government itself, specifically Canada's first Prime Minister, Sir John A. Macdonald

(1815 -1891). This presentation details the continued vandalism and the ultimate removal of statuary of Sir John A. Macdonald in cities across Canada, and details the role that Macdonald played in inflicting violence on Canada's indigenous peoples. The Truth and Reconciliation Commission of Canada has referred to the establishment of residential schools, and the forced removal of indigenous children from their families and communities as "cultural genocide." 2 This presentation also briefly explores the difficult issues involved with the historic preservation and conservation of the former residential schools, as indigenous communities struggle whether or not to obliterate these facilities or to preserve them as warnings to future generations.

Zhe Li, Kaiyu Shao, Feifei Chen, and Xiao Han, 105, *On the Design Concept of Commemorative Landscape Based on the Teenagers' Cognitive Features in Contemporary China: A case study of Mashan Martyrs' Park*

A commemorative landscape is of material and spiritual significance, and the performance of a commemorative landscape is inextricably linked to people's psychological cognition on site. Under the strong influence of contemporary non-mainstream cultures such as pop culture, electronic culture and consumerism culture, the psychological and cognitive characteristics of current Chinese adolescents have also changed significantly. This is gradually manifested in their ambiguous collective memories of historical events as well as in their weak perception of cultural connotations. Meanwhile, traditional design patterns of commemorative landscapes have been unable to adapt to contemporary adolescents' psychological changes in China, and failed to gain broad and deep sympathy from them. This phenomenon is particularly prominent in the revolutionary commemorative landscapes built after the foundation of New China. Nowadays, it is necessary for us to analyze from the perspective of adolescents' cognitive characteristics and landscape designers' concepts and methods. Based on the relevant study results of adolescent psychology and sociology, this paper analyzes the psychological characteristics such as independence, sociality, extensiveness and implicitness of contemporary Chinese youth. With the landscape design of Mashan Martyrs' Cemetery as the research object, the paper gives the priority to the space construction of commemorative environment in high Chinese cultural context. After the discussion about culture organization, event awakening, axis deduction, element resonance and place experience, the paper delves deeply into the concepts and methods of commemorative landscape design, trying to promote the interaction between inner spirit and places and finally to lead the adolescents' landscape cognition to a positive direction. To be specific, culture organization emphasizes the highly composite use of cultural landscape design languages to produce a strong commemorative historical atmosphere, and to stimulate the adolescents' multi-faceted logical thinking and collective memories at a subconscious level. Event awakening means using typical commemorative events to create a spatial atmosphere that can guide adolescents to experience deeply, thus awakening their deep memories of historical events. Besides, axis deduction relies on the spatial axis to organize the tour route and guides the gradual changes in adolescent emotion, while element resonance uses commemorative elements to express typical cultural connotations and guides the explosive changes in adolescent emotion. In the end, place experience can promote the generation of psychological belonging and identity of adolescents, achieving the purpose of spiritual construction for the commemorative landscape.

Costis Alexakis, 364, *Landscape Architecture and Advocacy in the Early 1900s*

The early 1900s are the nascent years of the profession of landscape architecture in the US, yet they have been overlooked by landscape historians. This presentation examines a specific facet of these early years of professional practice: public advocacy. 'To advocate' means to support, or to plead a particular cause or policy, and this presentation will focus on the ways in which Warren Manning, a landscape architect professionally active in the late nineteenth and early twentieth centuries, supported or pleaded causes related to land development and other environmental issues. The primary sources used are Manning's published texts and public presentations. What is of

value here is that Manning sought to steer public opinion by publishing extensively in a variety of popular and professional periodicals, and by speaking at a host of different conferences and public meetings. Some of the causes he supported were directly related to his professional activities, while others were only tangentially related; nevertheless, he sought to steer public opinion on: the use of native plants, the value and beauty of uncultivated scenery, landscape preservation, the foresightful planning our living communities, and the provision of adequate open spaces for all people. This presentation shows how Manning fashioned himself as a public advocate, and how his advocacy gradually assumed two distinct forms: one emphasizing the embodied experience of landscape; the other relying on environmental functions of landscape.

Virginia Russell and Sadaf Khalil Zare, 366, *Current Position of Women in Landscape Architecture Profession. (With emphasize on women principals)*

During the last 30 years, there have been few studies on gender issues in landscape architecture. Several lectures and symposiums have been held by different organizations like the American Society of Landscape Architects(ASLA), or the Council of Educators in Landscape Architecture (CELA) and Academic institutions have also mentioned and published on gender issues, and women's contributions to landscape architecture and their professional statues in different periods of time, but very little of this discourse has been studied, published or compiled in accessible formats. This research examines the status of women in landscape architecture, and shed light on the anecdote about low number of women principals in the profession. The major goal of the research is,not only to get to a number but also find out the factors that influenced it. Furthermore, it attempts to identify major issues facing women's practice in today's profession. This study reviews the past literature and examines current practitioner's perspectives over the profession, based on their position at their work place, their professional focus, their role models,impediments and advantages through out their career because of their gender, their firm policies, etc. Moreover, it explores insights of pioneering women principals and their reasons of success as well as insights of non-principal women professionals to find out the impediments in approaching to the principal level. Finally, by touching the cultural aspect of landscape architecture profession, I hope this study brings attention on women's impediments in passing through different stages of their career and gives ideas and inspirations to newbies in their career path. Moreover,I hope it inspires firms to have more gender and family cautious policies.

Kris Fox, 322, *Forty Years of Trends in Technology and Materials Columns in Landscape Architecture Magazine: 1978-2017*

This study examines the development and evolution of the landscape construction column as a staple component of Landscape Architecture Magazine (LAM) over a 40 year period from 1978 to 2017. This represents the first longitudinal study of technical columns focused on materials, technologies and construction methodologies and their contributions to the discourse of trends with within the profession. Through this study, several questions will be addressed: How have the columns changed and evolved from 1978 to 2017? Has the content of the materials columns paralleled the value systems of the profession and in some cases predicted future trends? Has the content of the materials columns accounted for the "materials explosion" that has swept through the building industries over the last two decades? Finally, how has LAM presented itself through the lens of materials? From new and sustainable materials and approaches to construction, how has LAM documented this evolution in the profession to help establish the values associated with these new materials and technologies? By answering these questions, the column runs will be redefined through the focus of the content into 'eras' of focus illustrating the impacts and trends of materials columns from 1978 to 2017. Among the factors that delineated the 'eras' were the current editorship of the magazine, the subject matter category of the column (materials, construction or technology / software), and if the approach to materials and construction was based on traditional materials and/or construction methods versus sustainable materials and/or construction methods. These 'eras' of focus are 1978 – 1995 the "Traditional Materials and Construction Era", 1996 – 1998 the "Non-Material Era", 1999 – 2004 the "Sustainably Influenced

Materials Explosion Era", 2005 – 2010 the "Sustainability Era" and 2011 – 2017 the "Assumed Knowledge Era". The study concludes with summarizing the impacts of 40 years of forward thinking technology columns as an integral part of Landscape Architecture Magazine.

Gabriel Diaz Montemayor, 226, *On the Shaping of a Latin American Landscape Architecture*

The purpose of this study is to characterize the current moment in the emergent shaping of a Latin American Landscape Architecture. This, as manifested by the analysis of finalist and winning projects of the past two Latin American Landscape Architecture Biennales. The third consecutive Latin American Landscape Architecture Biennale happened in 2018. It highlighted how the discipline is just recently gaining independence from architects who dominated the field. It also reveals how the discipline has evolved from the fundamental references of Luis Barragan and Roberto Burle Marx. There are few surveys and books of the state of the art of Latin American Landscape Architecture in the early decades of the XXI century. Two of the available books demonstrate the coexistence of contradictory presences in the region's approach to the discipline. While editor, and architect, Miquel Adria curates a collection of projects mostly developed by architects interested in landscape in the book "New Latin American Landscape Architecture" (2009); author Jimena Martignoni describes landscape architecture in Latin America as an almost heroic endeavor, fueled by attitude, illustrated by a series of case studies mostly developed by trained landscape architects in "Latinscapes: Landscape as Raw Material" (2008). This last approach is prevailing over the other. The study is executed through a comparative analysis of the 43 case studies compiled in the two referred books against the 17 finalist and winning projects of the last two biennales, happening about 10 years later. The analysis weighs on the project typologies, cultural, economic, political, social and environmental contexts, techniques and technologies employed, materiality and quality of implementation, and a basic assessment of the social and environmental performance as identified through design publications and journalism. The study demonstrates that Landscape Architecture in Latin America is progressively acquiring a disciplinary identity, with an academic and practice context of its own. Enabled by specialization, it is separating itself from domination of the fading tradition of polyvalent architectural practices. With a growing number of landscape architecture academic programs in the region -and a growing number of returning foreign trained landscape architects- a landscape architecture focused mode of practice is being strengthened. The projects recognized in the last two Landscape Architecture Biennales provide with a landscape architect curated collection of projects describing this change. The collection also reveals, however, areas of improvement to remediate, including the dilemma of the preeminence of social and cultural stimuli over ecological issues and opportunities.

Yujia Zhong, 342, *The Influence of Traditional Ecological Water Conservancy Facilities on Landscape Patterns of Cities and Regions: A case study of Linfen Basin Area*

The Influence of Traditional Ecological Water Conservancy Facilities on Urban Landscape Patterns: A Case Study of Linfen Basin Area Water conservancy is an important factor affecting the survival and development of ancient cities and towns. It is also the core cause of the regional landscape of agricultural society. Its development has driven the evolution of human settlements and affected the construction of urban landscapes. Nevertheless, with the rapid urbanization process, the urban construction projects have sharply increased. The regional characteristics and traditional landscape features in the human settlements have gradually disappeared. At the same time, due to blind construction, the destruction of the surrounding ecological environment has become more serious. This paper takes the Linfen Basin area in Shanxi as an example to explore the impact of traditional ecological water conservancy projects on urban landscape pattern. The Linfen Basin covers three types of landforms: mountains, hills, and valley terraces. Seasonal storms, topography, and soil conditions make the local ecological environment very sensitive and fragile. Unique geographical environment determines that the local water system needs to adapt to different natural topography and adopt different scales of facilities construction. By combing the historical

history of the water system in Linfen Basin, this paper summarizes the traditional ecological water conservancy facilities into three types: dam, lake pond and irrigation canal. It summarizes the suitable sites and characteristics of each facility and analyzes its utilization mode of river water, mountain torrents, and the regulation of local hydrology. At the same time, by combing the basic conditions of the natural environment, water network, agricultural construction and urban construction at different stages of history, the paper summarized the urban site selection, the evolution process of human settlement pattern in the Linfen Basin and the landscape pattern of the cities and regions, which are under the influence of water conservancy facilities. It also analyzed the unique urban public place culture formed by the distribution of water resources. The paper explored transformation of traditional ecological water conservancy facilities and the changes of landscape pattern in the modern Linfen Basin. Through exploiting the historical, ecological and aesthetic value of traditional Chinese ecological water conservancy facilities in Linfen Basin area, this paper aims to re-use the important drainage system in the planned towns in the process of rapid urbanization. The paper connects the human settlements and natural elements in series and provides a new perspective for cities features and style protection.

Bo Zhang, 410, *Codifying McHarg's Aesthetics from Six Projects*

The year of 2019 marks the 50th anniversary of Ian McHarg's seminal book Design with Nature. While the significances of Ian McHarg legacy, the book Design with Nature, the landscape suitability approach have been reconciled for decades from various scales, angles, and disciplines, this research aims to thoroughly understand McHarg's aesthetics. The meanings are two. First, while popularizing the landscape suitability approach that opened an ecological era, McHarg also generated confusions about design practice against an ecological backdrop. He proposed an ecological determinism rationale, suggesting that if a project is designed and planned with ecological principles, it will be automatically beautiful (Treib, 1999). This rationale methodologically excluded aesthetics from landscape design and generated crisis about site design methods as well as landscape architects' professional status. Second, from the 1970s, theoreticians and practitioners have proposed a new realm of ecological aesthetic, in order to bridge the gap of regional-scale ecological planning and site-scale design. The achievements of ecological aesthetic suggests a need to trace back to its originality. Both needs suggest a study of Mcharg's own aesthetics. Examining McHarg's major projects (mostly through Wallace and McHarg Associates, and later Wallace, McHarg, Roberts and Todd) could materialize his visions, and reveal the design process in which aesthetics and ecology inevitably overlapped. The six projects under study are Delaware River Park (1962), the Valleys (1963), Princeton I-95 Highway (1965), Medford (1972-1974), Amelia Island (1971), and Wilmington and Dover, Vermont (1972). Among them, Delaware River Park and Amelia Island are not well covered by scholars, nor by McHarg himself. In addition to McHarg's major publications, this researcher visited twice the McHarg Papers at Architectural Archives at the University of Pennsylvania, conducted four interviews with McHarg's former students, and visited three project sites (the Valleys, Princeton, and Amelia Island). For each project, not only the space, form, and image were categorized, but also the design process was investigated to reveal the ecology-form relationships at different design stages. Also, McHarg's aesthetics were weaved into the historical threads of Muir, Thoreau, Leopold, and Dewey. The study reveals that McHarg did have his own aesthetics. Recluse aesthetic and pristine aesthetic constituted two major aesthetics in his practice. In a design process, his aesthetics were not necessarily an outcome of, but sometimes can be a layer on top of, the landscape suitability method and other ecological considerations. Though McHarg advocated English Picturesque as an ideology, this aesthetic was treated more likely as a pristine landscape type, rather than a proposed development vision, therefore rarely applied.

Ann Komara, 480, *Civilian Conservation Corps: Landscape documentation in the Allegheny National Forest*

This paper presents a cultural landscape documentation of Civilian Conservation Corps Camp ANF-1, located within in the Allegheny National Forest near the hamlet of in Duhring PA. This award winning site documentation and narrative history completed by CU Denver faculty and students led to public documents and presentations for local residents and constituents. The work resulted in a Nomination of Eligibility recognizing the site's national historic significance. This presentation showcases this CCC camp, one of only a dozen extant camps in the nation, and local projects the CCC enrollees constructed proximate to the camp such as Twin Lakes Recreation Area. The local works exemplified landscape architecture in the service of recreational and environmental needs in the state and nation. The Civilian Conservation Corps [CCC] operated across the United States under the administration of President Franklin D. Roosevelt as part of his efforts to address economic and environmental issues facing our nation and its citizens during the era preceding World War II. Nationally, between 1933 and 1941 there were approximately 2600 active CCC camps; at least one existed in every state. Over 100 camps operated in Pennsylvania, and thirteen existed in the Allegheny National Forest. The CCC constructed roads, bridges, dams, and built cabins and pavilions in many of our nation's state and National Parks and forests. The U.S. Forest Service oversaw the projects, often with landscape architects as team leaders; their efforts typically utilized the signature "rustic" style so common to these projects. Environmental revitalization projects were also a focus of their work, including erosion control, planting trees and fighting forest fires – a prime goal for this Pennsylvania camp. As Pennsylvania's governor, Gifford Pinchot was a leader in the environmental conservation effort, and he initiated a program of labor camps designed to improve environmental conditions in rural areas. One of the early sites identified by Pinchot became Camp ANF-1. Located close to the site of the Bear Creek Fire as well as within a heavily timbered area of the state Camp ANF-1 thus addressed concerns about forest fires. Camp ANF-1's opening early in 1933 marks it as one of the first operative CCC camps in the nation; its presence highlights the impact of the Corps and their work in the Allegheny National Forest.

Stefania Staniscia, 347, *Challenges of Adapting the Landscape Character Assessment Method to a Case Study in West Virginia*

Mountaintop removal (MTR) is the practice of mining coal blasting mountaintops, removing the layers of rock that lay on top of the buried coal seams, recovering the coal, and disposing the removed soil and the broken rocks in adjacent valleys (US EPA, 2018). The impacts of this practice on human health and the environment have been extensively investigated while there is a gap in knowledge regarding the impacts – both past and future – on landscape. Impacts consist not only of the loss and disappearance of mountaintops, of cherished views and horizons, it also entails the loss of solace and sense of belonging (Albrecht, 2005), of cultural resources – old coal towns, industrial archeological remnants, cemeteries, etc. – of everyday practices such as berries picking or hiking in the woods. Also, if we look to the future, there are several threats implied in MTR practice and, more generally, in surface mining: the possibility that mines would remain unreclaimed and that the reclamation process would create further unwelcomed changes to the landscape. It is important, though, to create a landscape inventory in the areas where MTR is happening. This inventory would serve to account for what is missing and lost and for what remains. It would also assist to establish the baseline condition against which the assessment of the impacts of further changes could be performed. In the US, the existing approach to landscape classification is mainly "based on valuation and designation of specific places, not a characterization of the whole landscape" with an "emphasis on scenic protection and environmental impact assessment" (Palmer and Smardon, 2018, p. 131). This method, though, can't be applied to the areas of interest. A systematic character-based approach would be more suitable for accounting for ordinary and even spoiled landscapes. The Landscape Character Assessment (LCA) method, developed in England and Scotland in the late 1980s, is the most recognized approach to landscape characterization and it has been extensively applied outside of national borders. However, it hasn't been applied yet in the US context. The subject of the prospective presentation is the first step in the landscape characterization method the author is performing in the Coal River Watershed (WV) within the EPA defined MTR region. The author will describe how the method has been adapted to the context highlighting some of the main challenges encountered, for

example, the social context and resistance of local people toward participatory process that is perceived as top-down and useless.

Zheng Li, 50, *Regulating Hillside Development in Metropolitan Areas: The Los Angeles experience*

Hills and mountains establish the fundamental structure of the earth and, as the world continues to urbanize, rapid hillside development surrounding major urban centers has been dramatically changing the character of these unique natural landmarks. Without control, hillside development can cause natural hazards, watershed deterioration, and scenic degradation. As such, cities around the world have been regulating hillside development through plans, ordinances, and guidelines. Since these documents contain clear expressions of purposes and strategies, summary studies can help to understand the relationship between city and mountain, synthesize what has been previously accomplished, and provide common lessons as references to develop new local policies. Previous summary studies (Chewning 1974; Thurow 1975; Olshansky 1998; Hillside Trust 1991; Houck 2005; ALAS 2008) examined the range of issues concerning hillside development in the United States. However, as these studies focused on identifying the categories and frequencies of regulation purposes and strategies, they failed to reveal spatiotemporal patterns of hillside development regulation. We don't know how such regulations occurred in the real world and how they have evolved over time. We conducted a single case study of the Los Angeles Metropolitan Area (as defined by the US Office of Management and Budget) to gain a deeper and more holistic knowledge of the subject. We reviewed 45 plans, ordinances, guidelines, and studies collected from five relevant governments, including the City of Los Angeles, the Los Angeles County, the Orange County, the State of California, and the Federal Government. Other relevant literature, such as local chronicles and newsletters, were also referred. The textual analysis was facilitated by mapping based on open GIS data from governmental and NGOs' websites. Results showed that hillsides' elevation and its governmental level have a positive correlation, hillsides' distance to the urban center and its management complexity also have a positive correlation, and relevant government bodies have been increasingly paid attention to urbanization-induced problems. The four-level government bodies took three types of policy tools—protected area, overlay zoning, and joint Powers authority—successively to intervene the regulation of hillside development, which tended to be increasingly open and inclusive on the one hand and comprehensive and detailed on the other. The Los Angeles experience is potentially transferable to hillside metropolises with similar conditions.

Terry Clements and Aylin Alisan Yetkin, 499, *Impact of Contemporary Agriculture on Cultural Landscape Change*

As agricultural economics and practices evolve, regional landscape patterns and their associated cultural heritage and social habits are at risk of dilution and of loss. The agricultural landscapes of Findikli, Turkey are changing due to the rapid introduction of large-scale tea production for global distribution. The region's tangible and intangible cultural heritage is vanishing as local family-owned and managed farm plots are being replaced with a mono-culture of tea fields tended by a new agricultural class. This study reveals how new agricultural practices in Findikli are changing the traditional agricultural landscape of Findikli and connections between long-time local communities, their landscapes, and their social customs associated with agricultural practices. Traditionally, land-use patterns, cultural traditions and social activities have been defined by locally scaled agricultural corn and hazelnut production. As agricultural practices changed from family-based planting, harvesting and food processing, social interactions between families and friends also changed. These social changes are reflected in the physical landscapes of Findikli. For example, traditional farming settlements and village populations declined as residents abandoned family farm production and as newcomers were hired to tend the new tea fields. Tea related agricultural activities have created a new culture in the region. As traditional agricultural activities have declined, social farming practices have been remade into more nostalgic family-centered rituals that are reminders or remnants of

past activities and social interactions. Community-based methods –survey, oral history interview, cognitive mapping– were used to collect qualitative and quantitative information about the local community members, and their past and current agricultural practices and landscape perceptions. National and regional archival resources as well as locally held photographs were compiled to document physical landscape and land use changes. Subsequently, the larger study produced guidelines to document relationships between people and their physical landscapes, agricultural practices, and associated cultural rituals and social activities.

Roxi Thoren, 263, *The Unknown Unknowns: Lessons from the anthracite trail*

Donald Rumsfeld famously philosophized the Iraq war in terms of risk awareness, describing "known knowns," "known unknowns," and "unknown unknowns…things we don't know we don't know." Despite public ridicule of the phrase "unknown unknowns," the concept is essential in assessing proposed activities; we must evaluate known factors, predict unknown elements, and acknowledge that conditions exist or phenomena will occur that we can't yet predict. Philosopher Slavoj Zizek warns us of the fourth, unstated, term in Rumsfeld's structure – "the 'unknown knowns' - the disavowed beliefs, suppositions and obscene practices we pretend not to know about, even though they form the background of our public values." Landscape architects can illuminate this fourth realm – the realm of suppressed awareness – through research and creative practice. Using interviews, field research, and archival materials, this essay presents some "unknown unknowns" that emerged in northeastern Pennsylvania's anthracite coal mining. These unknowns led to environmental disasters and contributed to the regional coal industry's collapse. It also describes the current conditions of fracking in the region and suggests that that industry's unknowns, not publicly acknowledged by the gas companies, may lead to landscape-scale disasters as well. This essay presents three unnatural disasters: coal mine fires that forced the evacuation of Centralia, Pennsylvania; the Knox Mine disaster, when the Susquehanna River collapsed into a coal mine; and abandoned mine drainage, which coats the Lackawanna and Susquehanna Rivers in iron particulates, suffocating aquatic life. No one could have predicted when the first commercial load of anthracite coal was shipped down the Susquehanna River in 1809 that the same river would be irrevocably ecologically altered by the fuel industry. The development of hydraulic fracturing, fracking, has allowed the oil and gas industry to access deep reserves of natural gas in the shale beds of the region, resulting in a familiar boom: natural resources, new technology, and sudden, rapid wealth generation. The landscape impact is similar: small well-pads mask the scale of extraction beneath the surface; pipelines cut through forests. We know the benefits of fracking: cheap, abundant electricity, and economic benefits to landowners and communities. We know some things that we don't fully understand: the risk to groundwater of cracked pipes miles underground, the environmental impact of waste fracking fluid, the possibility of earthquakes around fluid disposal wells. And the enduring impacts of long-ceased coal extraction warn us of the unknown risks of site-scale intervention into landscape-scale systems.

POSTER ABSTRACTS

Mary Padua, 49, *Ecological Civilization and Green Revolution: Re-imagining China's 21st century post-socialist society*

Since 2011, the People's Republic of China (China) has held the position as the world's second largest economic power. Four decades of unbridled economic growth and hyper-urbanization has reduced poverty levels significantly; and all sectors of Chinese society have been modernized. A consumer-oriented, automobile-owning middle class has grown and China is known as the world's largest consumer of building materials. Most significantly, China has irreversibly damaged its natural resources. The 2018 World Health Organization report indicated six of India's cities were listed in the top ten most polluted cities with Chinese cities absent. This may signal improvements to China's air quality. However, water quality remains poor along with soil toxicity of arable lands designated for agricultural purposes. Since 1949, China has been ruled by a single political party, the Communist Party of China (CPC) and demonstrated its capacity to readily act on major concerns hindering the nation's development. In this context, China has reimagined itself as an "Ecological Civilization (EC)" and ratified this concept into their Constitution at the18th National Congress in 2012, a national meeting held every five years. EC represents the CPC's goal to transform China's mode of thinking away from traditional industrialization or modernization to one that prioritizes the environment – from an industrial civilization to a reimagined ecological civilization with the promise of an environmentally-friendly, sustainable future. This paper explores China EC concept and related "green revolution" through an investigation of recent design and planning initiatives and China's Five-Year-Plan (FYP), a national development policy apparatus. While analysts critique President's Xi's EC as subliminal to a commercial and capitalist-oriented post-socialist society – blurring the boundary between environmental and commercial interests, this paper suggests EC's vision of "environmentalism with Chinese characteristics" is utopian. Eco-cities, sponge cities and the use of terms like "low carbon" and "smart" will be examined. Currently 30 cities are engaged in China's Sponge City Pilot initiative and 285 purpose-built eco-cities are in development (Shepard 2017). Much of the current literature is preliminary and the research goal is to formulate a broader interpretative narrative for EC that traverses national identity and imagined communities (Anderson1991). It speculates that China's re-imagined EC is a recycling of an earlier pre-modern philosophy on harmony with nature. As a preliminary study, this research lays the groundwork for understanding China's green revolution, its emergent 21st century socio-cultural environmental history and convergence of western "liberal environmentalism" in China's post-socialist society.

Tongxi Gao, 108, *Identification of Landscape Character Types Based on Local Historic Landscape Characterisation for Landscape Resources Integration in Chinese "Shanshui" Cities*

The construction of modern cities has caused the conflict between urban development and the natural environment, along with the disruption of spatial structure of traditional cities, monotonous of urban cityscape and the loss of urban characteristic. This phenomenon is attributed to two aspects: (1) Neglecting the analysis of the relevance between urban natural environment and urban cultural context leads to the fragmentation of urban waterfront cityscape elements in the spatial dimension. (2) Ignoring the analysis of evolution and developing mechanisms of cities leads to the disorder of urban cityscape elements in the time dimension. Apparent differences are revealed on the impact mechanism of "shanshui" on cityscape in various stages. The construction of traditional Chinese cities utilize "shanshui" as the skeleton to form an organism with coordinated development of "mountain-water-city". HLC is a systematic and comprehensive tool for managing landscape changes. HLC is a systematic and comprehensive tool for managing landscape change, which focuses on historic layering and correlativity, for identifying the evolution mechanism of the "mountain-water-city" organism, providing a way to identifying landscape

characteristic types and integrating the cityscape elements of "shanshui" cities. Therefore, the aim of this paper is to explore the possibility of integrating cityscape elements under the influence of "shanshui" based on HLC methods at the local scale in China. This paper will take an empirical research in the wuhan waterfront area which is a typical space emerging by the natural and cultural landscape resources. The steps for identification of Landscape character types based on local HLC as following: Firstly, analyzing the characteristics of the natural and cultural context and the spatial evolution, along with selecting the cultural and natural factors , such as mountain, water, landform, vegetation, climate, soil, land use, lifestyle and other essential factors. Secondly, identifying Landscape character types in different period by superimposing and clustering the data using GIS and SPSS. Thirdly, integrating and describing the personality and common characteristics of a typical area.

Xinyi Shu, Yun Wang, Pei-yao Hao, Li Dong, 202, *The Characteristics of Plant Landscape in Classical Gardens on Yangtze Delta – A case study of Jichang Garden, Wuxi, China*

In the context of singleness and formularization being prevalent in the contemporary plant landscape, Chinese classical garden with a venerable history and a distinctive character is an extraordinary school of its own worldwide. Jiangnan classical gardens as the combination of Chinese traditional art and technology are the representative of Chinese classical gardens, in which plant landscape have the profound artistic conception, special design skills, and outstanding characteristics. Every flower and tree in Jiangnan classical gardens shows the infinite vitality. Jichang Garden, established and managed by the Qin family for 5 centuries (1527 A.D.- 1952 A.D.) has experienced long-term culture heritage and has been the representative garden on Yangtze Delta since the Ming Dynasty. It is famous for its landscape elements such as the natural rockery, ingenious water, original trees, and exquisite views. The plant landscape of Jichang Garden that is representative of the relatively high level in Jiangnan classical gardens has high research value. Based on the literature on plenty of documents including 293 poetries,5 history records, 4 local chronicles and a variety of landscape paintings, research has been done on the plant landscape about its ideological variations, overall layout, material selection, and disposition characteristics. This study would help us find the hidden rule of plant design and deepen the cognition of Chinese classic garden so that we could inherit the essence of plant design to guide the Chinese temporary plant disposition and avoid singleness and formularization during the design process of plant landscape.

Catherine De Almeida, Caitlin Smith, 208, *Greening Wastelands: Historical lineage and future prospects*

Waste is ideologically constructed as the antithesis of value. The word is embedded with negative connotations retained by a long lineage of cultural attitudes towards undesired material excess. This perception has resulted in the inefficient handling, storage, and regulation of potentially valuable waste products, which should be embraced as desirable, cheap, readily available resources with latent benefits for producing new economies, ecologies, and cultural landscapes. The materials and landscapes associated with waste, excess, and the undesired create vulnerability within and surrounding their sites, which are typically relegated to the peripheries of urban environments along with marginalized communities. These conditions are often associated with terms such as "blight," "eye-sore," and "undesirable," resulting in approaches that move these conditions elsewhere, or attempt to disguise them. Such shared cultural [mis]perceptions have become embedded in passive design approaches, driving unconscious aesthetic decisions to fix and hide waste rather than engage with it. Modern shifts toward sustainability and redevelopment quietly promised change in marginal landscapes, reclaiming them as public places, museums, and parks, but subsequently hiding their former functions and cultural history. These design strategies are particularly apparent in adaptive reuse and brownfield reclamation projects over the last fifty years. Landscape architecture has overlooked the creative opportunities of waste and failed to develop nuanced approaches to the redevelopment and transformation of waste landscapes. No matter the previous use, these landscapes have been similarly reclaimed "under a thin green veneer" of asphalt and lawn. To discuss such failures, three iconic projects are used to take a cross-section of the profession's history in redesigning brownfields:

Gas Works Park (1975) designed by Richard Haag, and Byxbee Park (1991) and Crissy Field (2001), both designed by Hargreaves Associates. With differing former uses, each project was selected as representative of a different era and paradigm in landscape architecture, while also having ultimately failed in achieving their original design intent over time—long-term remediation and equitable access. Additionally, these three projects represent a repeating pattern to approaching wastelands as a landscape type—they must be greened in order to be functional. In arguing for a more nuanced approach to waste landscapes that results in distinctively different outcomes that engage with waste conditions and former uses, Brick Works (2010) designed by DTAH and Claude Cormier+Associates and Landschaftspark (2002) designed by Latz+Partners were selected to illustrate the potentials for actively engaging with waste conditions, generating highly performative landscapes. These projects demonstrate the importance of integrating multiple uses and bringing visibility to processes of remediation and site histories as aesthetic and performative components of brownfield reclamation. These projects reveal opportunities for developing a new design-research framework, landscape lifecycles, which advocates for transforming underutilized spaces by reactivating waste materials.

Christopher Nelson, 333, *The First Amendment and U*

The Free-Speech Movement of the 1960's saw energized student activists leading sit-ins and protests garnering national attention through scrutinizing media coverage. Over the course of academic year (1964-1965), 800 students were arrested demonstrating opposition to the prohibition of political activity on campus highlighting a strain between a generation of creative, radical thinkers and the dogma of the Johnson Administration. Extending into the 1970's where attentions turned to the ethical and moral dilemma of the Vietnam War, university campuses dissolved in hostility leading to the shooting deaths of four students at Kent State by the National Guard. Over the last 40 years, the university has proven a substantial platform for student engagement and political agency with the role of free-speech on college campus being challenged even into current generations. Universities across the U.S. are redeveloping to address a series of increasing expectations while attempting to preserve their unique character. Additionally, campuses are faced with the challenge of keeping their populations safe while promoting public engagement and respect for civil liberties. With growing acrimony for the current political agenda, there is an increased demand for spaces to accommodate the types of civic engagement that universities have come to be associated with. The development of a university campus landscape master plan is no small matter involving a great deal of effort, participation and contribution across a wide range of seemingly separate disciplines. In building a modern university, it is imperative that we acknowledge the vital role we play as landscape architects in creating spaces that allow for those voices to be heard and for those ideas to be exchanged, challenged, and respected as part of the college experience. First Amendment and U through in-depth interviews and surveys of students, faculty, planners, and designers identifies trends and adaptations of campus planning that encourages free-speech on campus and promote meaningful, safe design to nurture cultural experiences. This study is focused on four Florida universities who are growing their campuses and developing landscape master plans to promote their campus culture and this study examines the role that free-speech defines the college landscape. While the study is focused on Florida, the study's outcomes have broader applications for colleges nation-wide. Additionally, this study demands that these spaces, which are central to the student and university identity, function in a way that resonates beyond the college border. This research is not just in understanding the campus landscapes that have seen conflict, but to gauge the success and egregious failures of designed responses and the adoption of standards for college landscapes. To know and share this critical information can help protect students and promote the types of civic engagement that positively impact the college culture and the larger community.

Anna Maria Vissilia, Joseph Reed, Matthew Kirkwood, 372, *Creating Contemporary Narratives for Cultural Heritage Ruins: A Chaco Canyon, New Mexico case study*

This study focuses on creating new narratives to cultural heritage sites by comparing concepts of ruins from cultural heritage sites and post-industrial landscapes. Both landscapes share that unifying feature of ruins and the historical and cultural significance that comes with them. Such methodology has been the subject of many recent papers on the complex challenge of reclaiming post-industrial landscapes beyond an environmental engineering approach. In landscape design literature there is an approach to focus on industrial ruins as settings for parks worldwide. We propose a similar attention to cultural heritage ruins as parts of a new genre of parks. The Chaco Canyon World Heritage Site and National park, a three-unit mixed-use complex representative of Pueblo historical and cultural heritage will be used as a case study to investigate how the creation of meanings and narratives can enhance the qualities of this emerging genre of parks containing cultural heritage ruins. Examining how Chaco Canyon ruins are perceived as elements of emotional attraction and historical meaning, we aim at developing a design framework to guide the landscape of these sites. By revealing the sublime qualities of post-industrial ruins, we aim to answer how their qualities are linked to scale, materials, function, and power, as well as to understand their fundamental attraction in order to provide an example of how to support the development of this new framework for design that can better capture the competing narratives of cultural heritage ruins. To answer our research topic, we review extensive literature about landscape narratives, landscape ruins, and post-industrial design approaches. We also analyze post-industrial landscapes evolved into ruins over time, the landscape design approach and challenges, and how their landscape revitalization schemes created a new narrative. In addition, our research is based on site visits, field work and gathering of photographs, site measurements, and sketches in order to better understand the site features, needs, and opportunities. Cultural Landscapes and Historic Sites hold important cultural and historical significances and are often underutilized. Exploring innovative landscape approaches to revitalize these ruined historical sites through a series of story-telling landscape components provides a great challenge to landscape architects. Issues of memory, historical background, narration, preservation, accessibility are looked anew. Such complex narratives and their linkage to perceptions of both ruins and cultural sites may serve as a powerful instrument for landscape architects to shed light on ways to improve the design of this new genre of parks.

Soyoung Han, Joong Won Kim, Jumg-min Choi, 445, *Spatial Publicness: A study on multi-dimensional characteristics of contemporary public spaces*

This study is attempts to reinterpret the characteristics of contemporary public space. The blurring of the public and private sectors has penetrated the study of public space in the last 30 years (Banerjee, 2001; Oldenburg, 1999; Zukin,1991). Therefore, the notion of "publicness" has been subject to its conceptualization and operationalization. Through a dimensional understanding of publicness, we define and delineate the spatiality of what is authentically considered, or more precisely, what is more attuned to "publicness." to investigate the characteristics of contemporary public spaces. Hence, the purpose of this study is to explore and redefine the concept of spatial publicness, and subsequently, to find ways to apply it to public spaces. In order to establish the concept of spatial publicness, we examine the discourse and issues of modern public space in its current, as well as past, scholarship. We employ a comparative case study with data deriving from media and participant observations. We primarily analyze the cases which are currently putting spatial publicness into practice, such as New York City. As a metropolitan hub at the center of all thing culture, New York City is a relevant and suitable case for our study. For example, Halle and Tiso (2016) elaborates that the terms "new" and "innovative" have often been used to describe the characteristics of New York City. There are many examples of the size, type, composition, management, and operating system of public spaces in New York City. This all coincides with a relatively large amount of data and research accumulated in comparison to other cities. Among them, we chose five cases which fits the traditional, orthodox definitions of public and private spaces: (1) Bryant Park and High Ling Park as the public space; (2) Sony Plaza and Paley Park as the privately owned public space; and (3) Time square as the street. Our discussion illuminates a new concept spatial publicness that is deduced to overcome the defect of the conventional concept of publicness. We contextualize the conventionally operationalized notion of publicness to the complex, fluid, and

polysemic existence in which we find in contemporary urban phenomena. Furthermore, we find that a development of a new theoretical and conceptual trajectory is needed in order to articulate the inherent nature of indeterminacy, instability and temporariness which may disclose the vibrant, but long-overlooked potential in urban public spaces.

Paula Neder, Peter Aeschbacher, 473, *Between the Small Scale and the Big Change*

Recently, much has been discussed about bottom-up approaches, smaller-scale actions towards broader impact. In the name of social change, various groups of practitioners and scholars have formed different strands with similar claims. They are 'tactical urbanists,' 'DIY urbanists,' 'guerrilla/insurgent urbanists,' 'small scale,' 'interventionists,' 'everyday urbanists,' 'pop-up urbanists,' to name a few. Professor Neil Brenner says that these groups are bottom-up, small-scale, self-organizing interventions in which "those who are most directly affected by an issue actively mobilize to address it" (Brenner, 2017, p. 115) instead of having a passive stance. Furthermore, their claims are to promote social changes that can emerge from these small actions; they carry big responsibilities to challenge the status quo. Although examining urban interferences from various perspectives may be valuable, how can nuanced groups on smaller scales make an impact on urban societies at the larger scale? Is it a form of reclaiming the space, of resistance, or is it just a superficial way that reproduces the dominant model? I argue that such small-scale projects have unfounded claims and that an intermediate scale is necessary between the small scale and the big change. Therefore, if there is a middle line between the claim and the action, this means that landscape projects need to be built-in a broader network. Analogous to tactical urbanist's approaches, the theory of change from the technology field, the multi-level perspective (MLP) theory (Geels, 2002), will help to bridge the gap between the work done by various groups and large-scale impact. The theory regards to analyzing how technological transitions happen and it suggests three levels: the niche, the regime, and the landscape (Sovacool & Hess, 2017, p. 709), where the niche symbolizes the small-scale actions in design, and the landscape represents the big change in the society. The regime, analogously, denotes the intermediate scale proposed to further nourish the debate and promote tangible solutions for such outstanding initiatives of social change. Whereas the non-material part of the design process has been extensively studied, which includes engagement, participatory design, etc.; the material part, that would be the product itself, lacks in analysis. The proposal is that MLP can illuminate the landscape architecture field to reflect the work and predict successful designs that encapsulate the change sought. By analyzing five exemplary Tactical Urbanist's projects through the lens of MLP, we can better understand such intermediate scale and educate students towards a more significant design that promotes social change.

Tobias Levin, Pauline Hurley-Kurtz, 478, *Somethings Old Are New Again: How cultural landscape preservation responds to changing societal needs in the 21st century*

Over the 20th century, the field of cultural landscape preservation evolved to embrace a broader scope of concern, coming to understand landscape as a continuously changing system influenced by both human and natural processes. This evolution continues into the 21st century, driven by the changing needs of our society, the most urgent of which today is climate change. The conflict inherent in responding to a changing climate while preserving the layers of history present in our cultural landscapes can be resolved philosophically by reframing landscape preservation in similar ways to ecological restoration: as a return to historical trajectories, rather than historic states. In practice, however, a great diversity of responses emerge. Designers are finding new ways to apply adaptive reuse, popular as a method of preserving the physical structures of cultural landscapes, to the landscape itself. Pennsbury Manor is the former estate and reconstructed manor of William Penn in Morrisville, Bucks County, PA. Dominated by pasture and estate grounds, including a large vegetable garden, a mini-orchard, and historical trees, the site is surrounded by a naturalized border of mature trees on three sides and the Delaware River on the fourth, approximating the rural feeling of the site when William Penn briefly lived there. The estate was rediscovered and restored beginning in the late 1930's, when landscape architect Thomas Sears was commissioned to design the landscape. Though little is known of the original layout of the property and its buildings, historians

have found many references to the area in the Penn family's writings. Sear's plan approximates the style and traditional layout of estates of the period. A Cultural Landscape Plan was last created in 2008. Managers wish to update this plan to reflect the aging of the landscape and the changing context of a semi-natural space on a major river. Opportunities for green stormwater infrastructure implementation exist in both the large half-paved parking lot and the rip rap-filled detention basin. This paper examines how cultural landscape preservation can and will change in response to the increasingly dire physical and social needs of a society threatened by rising sea levels and a rapidly changing climate.

6. LANDSCAPE PERFORMANCE

PAPER ABSTRACTS

Louise Mozingo and Renata Valente, 132, *Greenstreets in Campania, Italy: Lessons from urban stormwater best practices in the United States*

Like most long urbanized landscapes, the Naples region of Italy, Campania, experiences the deleterious effects of unmitigated stormwater runoff: recurring flash floods, non-point source pollution, and an overburdened combined stormwater and sewer system. This case study concerns an experimental project for the redesign of a street traversing a sector of the Campania region that encompasses the variety of development contexts that typify current problematic stormwater conditions, which only can be expected to increase with climate change. Campania, and Italy in general, has lagged in implementing best practices for urban stormwater management and this project relates to a new initiative, the Piano di Adattamento Nazionale al Cambiamento Climatico dell'Italia (the National Plan for Adaptation to Climate Change in Italy). The study scrutinizes current greenstreet policies, plans, and forms of implementation in American cities (Portland, Seattle, Philadelphia, and San Francisco), assesses their relevance to conditions in the proposed project site, and designs an alternative model for the public right-of-way based on precedent best practices and on-the-ground conditions. The study concludes with a data driven evaluation of the potentials and limitations in the application of greenstreets policies, plans and implementation in the Campania region.

Chensong Lin, Yongyu Chen, and Jialun Yan, 190, *The Research of Stormwater Regulation Efficiency of the Low Impact Development of the Suburban Park based on the SWMM*

Compared with urban park, the suburban park has large permeable surface, which can work with the pipe and ditch to admit the runoff from outside and control the stormwater. This study analysis the research area, calculate the amount of runoff from outside, design the park in low impact development (LID) mode and the no-LID mode through a case study of Longquan Lake Park in Shijiazhuang city. The research use the Storm Water Management Model (SWMM) to simulate the total runoff, peak flow and time of peak flow appearance of two modes in different return periods (1, 2, 5 , 10 and 20 years), and analysis the control efficiency of every single LID facilities in 2 year return period. The result shows that (1) The SWMM can stimulate stormwater management effect of the LID mode park quantitatively, provide the technical supports for park design and construction. (2) When setting the target of the admission runoff from outside, we should plan the catchment sizes of runoff combined the site current situation. (3) The LID mode park has a good effect on stormwater control, especially for the suburban park. It can decrease the total runoff, peak flow and postpone the time of peak flow appearance significantly. In the return periods from 1 to 20 years, the suburban park construction based on the LID mode make the reduction of total runoff, peak flow and time of peak flow appearance at 100%~45%, 100%~55.2% and 30~210min. The rank of the efficiency of LID facilities to decrease total runoff is rain garden□vegetative swale□bio-retention cell□permeable pavement. The rank of the efficiency of LID facilities to decrease peak flow is rain garden□bio-retention cell□vegetative swale□permeable pavement. The rank of the efficiency of LID facilities to postpone the time of peak flow appearance is rain garden□bio-retention cell□vegetative swale□permeable pavement.

Jueminsi Wu and Mary Padua, 361, *Investigating China's Sponge City and the Significance of Groundwater: A review of the literature*

The Sponge City program is a Chinese policy initiative with the goal to ameliorate urban flooding. It emphasizes low impact development and sustainable storm water management best management practices or so-called green infrastructure (GI) systems that have been utilized in the West (Sharma 2008). This filtration approach is based on a systems approach where stormwater is stored, filtered and infiltrated. The "sponge" concept was introduced in 2003 (Yu 2003) and eventually incorporated into China's national development strategy in 2013. Chinese leaders recognized that global climate change combined with decades of rapid urbanization exacerbated nationwide urban flooding, especially along rivers (Yang 2014). China responded by formally launching the Sponge City Pilot (SCP) program initiative and designated 30 cities for the pilot program with the intention to test the "sponge" concept. China's State Council allocated the equivalent of US$ 13 billion to financially support SCP's implementation (MOF 2014). The government objectives for SCP, a GI-based program are focused on: urban hydrology, water quality, water as a renewable resource and water security. According to Zhang one of the most significant factors is groundwater, especially its improvement through groundwater recharge that mitigates pollution and improves overall water quality. (MOHURD 2014). However, the current SCP literature appears to focus on GI strategies to deal with water inundation due to rising river water levels during flood events with little discussion on SCP's impact (positive or negative) on local groundwater. This paper reviews the current literature on SCP, particularly China's urban hydrological process. The goal is to understand this complex process and the importance of groundwater. This study considers three bodies of knowledge SCP; GI; and China's urban hydrology. The following primary research question was formulated to guide the literature review: how is the implementation of SCP affecting the urban hydrological process in China? Secondary research questions include: 1) How has the SCP been realized and implemented on the local level? 2) What is the current situation of groundwater in urban China and what are the factors that impact groundwater in urban hydrology? Preliminary findings from the literature review imply that the Chinese GI application has been expanded and has the potential to restore groundwater recharge and improve overall water quality. As the first step in the research process, this literature review intends to establish a theoretical foundation and verify the knowledge gap in the current literature.

Kirk Dimond, Greg Barron-Gafford, and Margaret Livingston, 14, *Maker Space for Environmental Monitoring*

The first step in developing water, environmental and energy solutions – whether those be in the natural or built environment – is understanding one's space. Different disciplines approach understanding their environment or landscape through different lenses, but we all share a need to understand basics of the micrometeorology. Environmental monitoring provides essential knowledge and information for improving our efficiencies in design and in determining environmental services and landscape performance. High expenses for monitoring equipment can be a limiting factor to gathering important data, but we have initiated a low-cost interdisciplinary Environmental Monitoring "Maker Space" solution for the building of low-cost equipment centered on Arduino's opensource platform. These sensors have the ability to remotely record environmental data, including humidity, light, soil moisture, water, air quality, dust, sound, barometric pressure, and motion with a significant number of data points. Through the making and use of this equipment, faculty and students may partner with local firms and organizations to better evaluate landscape performance to inform higher responsibility in decisions concerning our resources. With more affordable and dispersed monitoring, design strategies can be more sensitive to the opportunities and constraints of resource management in our environment, benefiting clients and communities with lowered expenses and greater environmental security.

Megan Barnes, Catherine De Almeida, Lisa DuRussel, Anya Domlesky, and Susannah Ross, 87, *Designed to Flood: Evaluating the resilience of waterfront parks*

This panel presentation and discussion will report on resilience-focused findings from the Landscape Architecture Foundation's (LAF) 2018 Case Study Investigation (CSI) program, a unique research collaboration that matches LAF-funded faculty-student research teams with leading practitioners to document the benefits of exemplary high-performing landscape projects. As the intensifying effects of climate change call for higher standards of resilience for built projects, LAF's Case Study Investigation program is focusing on metrics and methods that demonstrate related benefits such as flood protection. Ultimately, making tools and techniques for evaluating resilience of built projects more accessible for faculty, students, and practitioners will allow current and future designers to meet the challenges presented by a changing climate. During the course of the 2018 Case Study Investigation program, researchers focused on the resilient qualities of two exemplary waterfront parks: Hunter's Point South Waterfront Park in Queens, New York, and Tom Hanafan River's Edge Park in Council Bluffs, Iowa. To investigate the landscape performance of each site in the context of coastal and regional fluvial flood resilience, researchers used varied methods, such as comparative studies between pre-existing and constructed project conditions, projective and speculative analysis, user surveys, and hydrological modeling. Both projects reveal that when landscapes are designed to flood, not only do they provide environmental resilience, but also social and economic resilience. The researchers and firm liaisons will present their methods and findings, and LAF will present an overview of the CSI program and future program plans in the area of resilience. The researchers will also discuss attempted metrics that did not ultimately provide meaningful results and the challenges presented by representing the unquantifiable aspects of resilience.

Heather Whitlow, Jessica Canfield, and Bo Yang, 224, *Guidebook 2.0: The Evolution of Landscape Performance Evaluation Metrics and Methods*

Since 2010, the Landscape Architecture Foundation (LAF) has worked with faculty-student research teams, designers, and clients to produce over 150 case studies documenting the environmental, social, and economic benefits of high-performing landscape projects. These Case Study Briefs and the methods used to quantify the benefits are part of the online library of resources in LAF's Landscape Performance Series. In an effort to make landscape performance evaluation more accessible to broader audiences and to improve the research rigor and replicability, LAF commissioned a study in 2013-2014. The two-part study involved the coding and analysis of all metrics and methods used in the first 58 case studies published to the Landscape Performance Series. The goal of the second part was to use this information to identify a set of widely applicable metrics and methods for each benefit category and compile the findings into a comprehensive guidebook. The guidebook would serve as a primer for researchers, students, practitioners, and others looking to assess landscape performance of a built project. The guidebook was also intended to encourage designers and clients to consider performance early in the project planning and design process, set specific performance objectives, gather appropriate baseline data, and consider how performance will be monitored over time. As such, the metrics were to be understandable and meaningful to typical land development decision-makers. The methods were to be: (1) relatively easy to use for a non-expert, (2) generally applicable to a range of project types and scales, (3) able to be accomplished in a short timeframe (≤6 months) involving limited site visits, and (4) defensible. The study was completed in late 2014 with a draft of the guidebook containing over 100 metrics in 34 benefit categories Four years elapsed between the completion of the study and the publication of the guidebook in late 2018. During this time, a number methods and protocols came into wider user, new tools were released, and old tools became obsolete. An additional 90 Landscape Performance Series case studies were produced, which had not been part of the original analysis, broadening the body of performance evaluation work to include new geographies, project typologies, and a focus on emerging issues such as resilience and equity. This session will provide an overview of the original study, discuss the challenges in selecting metrics and methods, and explore the ways that landscape performance evaluation has evolved over the last four years.

Phillip Zawarus, 22, *Quality over Quantity: Assessing tree health for higher performance in desert parking lots*

The health assessment of urban tree canopies within the University of Nevada Las Vegas parking lots will serve the evaluation of tree benefits and performance of space beyond the standard utility of parking lots. By studying the existing planter constraints and exploring the values of future healthy trees, UNLV students, faculty, and the surrounding community will benefit through proposed adequate planting space, alternative program use, and performance function within parking lots, supported by the foundation of healthy mature tree canopies. Las Vegas, located in the driest U.S. desert, is experiencing high tree mortality rates due to its harsh climatic conditions, an abundance of impervious surfaces, and poor stormwater management. Most evident in parking lots, tree health is hindered due to improper designs enforced by regulatory codes and poor tree species selection. Through an inventory and analysis of parking lots on UNLV campus, advocacy workshops, volunteer training, and community engagement, this project will collaboratively identify best practices for trees in parking lots that will benefit local communities and establish healthy working forests. Through workshops and training sessions with The Nature Conservancy, the health of urban tree canopies will be assessed within the 12 major parking lots on the UNLV campus. Municipal parking design codes will be compared with inventoried parking lots – notating minimum standards and their environmental, social, and economic impact. Tree performance will be evaluated using the iTree database, the National Tree Benefits calculator, and long-term annual benefits calculators through Excel to determine the optimal environmental, social, and economic benefits that can be obtained through an improved parking lot design and healthy tree crowns. The positive effects of working urban forests have been well documented. Urban tree canopies are particularly advantageous in harsh desert landscapes that lack surrounding forests to mitigate the effects of air pollution, urban heat islands, and monsoonal rain events. The existing municipal codes mandate a tree density in parking lots, however, the overall tree vitality and public health benefits have become an evident issue due to lack of soil volumes necessary to sustain the trees for rainfall capture from impervious surfaces, absorption of carbon emissions, and human outdoor comfort. To establish and conserve working forests and promote the social benefit of trees throughout the Las Vegas metropolitan area, tree planter design codes must consider the environmental benefits and economic value of healthy urban trees. By starting with parking lots as a focus area, this study aims to influence and impact future parking lot development with the implementation of proper tree establishment in the urbanized Mojave Desert.

Jonghoon Park, Jun-Hyun Kim, Ming-Han Li, Dong-Kun Lee, 217, *Spatial Cooling Ranges of Small Green Spaces using a T-type Thermocouple Sensor*

The cooling effects of urban green spaces have been reported in previous studies. Urban green spaces enhance community resiliency by creating more pleasant micro-climate conditions, which improves human well-being from heat-related diseases. Efforts to mitigate summer heat with green spaces have been implemented in many community policies and development plans. However, the spatial range of cooling effects of small green spaces (SGs) in urban areas such as a single tree or a small patch of vegetation at the fine scale has not been fully investigated. Understanding the range and threshold of SGs' cooling effects will contribute to improve community design regulations for reducing heat by effectively developed green infrastructure management plans. The main purpose of this study is to assess the spatial range of cooling effects of SGs using an advanced measurement. The study site was located at a single-family residential area in College Station, Texas and had fourteen SG points. The air temperature and spatial datasets have been collected with three devices by the transect survey: 1) a temperature-sensing unit with a ventilated double-cylinder shelter (TVC), 2) a data logger that records air temperature every second, and 3) a compact video camera recording spatial measuring points to match the temperature data with the locational data. The study has been conducted from spring (Feb. 2017) to early summer (Mar. and Apr. 2017). The preliminary findings show the cooling ranges of SGs were from 4m to 6m based on thermal maps generated by

performing spatial analysis. The difference between the highest air temperature among surroundings and the air temperature at the center of the SG ranged from 1 °C to 4 °C. Our findings support previous studies reporting that air temperature reduction could be expected with even SGs sized with 200 m2. Our outcomes will help researchers, planners, and policymakers to create healthier and sustainable environments by helping choose the most appropriate types and arrangements of SGs to optimize cooling effects. Our findings will also contribute to develop community green space design/planning guidelines to mitigate summer heat stress. Finally, this study will help to develop more advanced tools and protocols to collect microclimate data focusing on air temperature linked to spatial information which can evaluate the heat reducing impacts of SGs.

Stephen Wheeler, John Dialesandro, Yaser Abunnasr, 326*, Dynamics of Heat Islands for Dryland Cities and Implications for Mitigation*

Urban heat island dynamics and mitigation strategies for dryland cities are more complex than for temperate cities. Whereas temperate cities typically form daytime urban heat islands (UHIs) (e.g. Schatz and Kucharik 2014), deserts surrounding arid cities frequently heat up more rapidly than urban landscapes during daytimes, leading to an "urban cool island" effect (Chow et al. 2011). Surrounding arid landscapes may then cool more rapidly than cities at night, leading to nighttime UHIs. Degrees of aridness, extent of vegetation, elevation, latitude, humidity, and typical building types also influence dryland UHI dynamics. Mitigation through urban greening is often difficult due to the scarcity of water and the lack of large native shade-producing vegetation. In this study, we analyze how urban heat island effects vary across 10 dryland urban regions worldwide and potential implications for UHI mitigation strategies. We use GIS to assemble daytime and nighttime satellite imagery for these regions. We then calculate land surface temperature and Normalized Difference Vegetation Index (NDVI) data for all regions, and identify typical neighborhood-scale examples of six land cover types for each region. Finally, we relate temperature and land cover data using standard statistical methods. The 10 dryland metropolitan areas showed a large variation in UHI effects. We found a strong daytime UHI in only one region. Nighttime heat islands were stronger. At a regional scale, vegetation correlated with lower urban temperature within only 4 of the 10 regions. However, at the neighborhood scale sample urban forests cooled local temperatures an average of 5.6° C compared to the metro mean, and some of this effect extended for a kilometer beyond greenspace boundaries. Turf-and-tree landscapes had a lesser cooling effect. Xeriscaped landscapes contributed to daytime heating rather than cooling. Multistory buildings appeared to have a small but substantial daytime cooling effect. These findings suggest that the most effective cooling strategies for arid cities may be a combination of urban forestry using drought-tolerant tree species and shade-maximizing built form using high-albedo surface materials.

Ian McRae, Frank Freeman, and Ana Rivera, 402, *The Effects of Urban Morphology and Meteorology on Building-scale Design in a Changing Climate*

Over half the world's population lives in an urban area and are susceptible to the effects of the urban heat island phenomenon which is projected to intensify due to population growth and climate change. However, alleviating these effects by planning interventions is challenging due to unique compositions of built features among cities which in turn influence distinct meteorological patterns. This presentation will share innovative software and methodologies for urban design/planning in a time of climate change and how that can ultimately influence the development of site-specific strategies. The environmental performance of alternative proposals are tested by simulating their microclimatic outcomes via holistic 3-D modeling. Herein, we demonstrate a comprehensive method that couples broad urban-area meteorological simulations by taking urban land use classifications derived in WUDAPT (World Urban Database and Access Portal Tools) and ingests them into urbanized WRF (Weather Research and Forecasting), a model typically run using topography, in an effort to generate localized weather data for a metropolitan setting. This data is then used to establish simulation parameters for ENVI-met, a software used to generate high resolution 3-D models of complex urban settings to test how different spatial design strategies

perform, for building-scale analysis to characterize the environmental performance of different urban design proposals for a 2017 heatwave event in San Jose, CA, USA. Previous studies have bridged data between select platforms in order to elucidate feasibility of integration and others have shown that the output results of ENVI-met accurately portray measured observations. This study took it a step further by not only bridging data between all three platforms in an effort to compare meteorological data derived from urban form to more commonly used data sets (airport observations), but also used this urbanized data to test different heat mitigation strategies. The strategies (vegetation, albedo, shade structures) were tested both individually and in combination to see if there was a synergistic effect to determine the most efficient application of resources. The results found that there was in fact a combinatorial benefit that exceeds the sum of the individual performances. The goal is to create a globally adaptive methodology that will aid in the development of site-specific solutions that modify spatial and material compositions to mitigate local environmental stressors – and to inform resilient approaches to achieve performance goals and potentially quantify resource implications that can influence policy and planning.

Bo Yang, Yi Luo, and Shujuan Li, 53, *Social Benefits Assessment: Comparing Project Goals with Outcomes*

Landscape performance assessment posits a frontier in research and practice, with the goal of quantitatively demonstrating the benefits of built landscape projects. The premises are to improve research validity and to boost confidence in assessing performance of future, similar projects. However, to what extent the benefits are quantified compared with stated design goals is largely unknown. Social benefits, in particular, is a less evaluated category. Using published Landscape Architecture Foundation (LAF) landscape performance case studies, this paper compares the quantified social benefits with stated design goals, reviews the benefits across the LAF case portfolio (e.g., per benefit category and project type) and methods and data options available to perform the analysis. Results show that the social benefit category is gaining ground steadily especially after 2012, and this category occupies a share of almost 35% among the three benefit categories (environmental, social, and economic). In addition, the average number of benefits documented per case study (minimum 5 to date), and the average number of social benefits documented per case study (minimum 1.3 to date) have been increasing over the past years in the LAF case portfolio. This presentation also analyzes the reported social benefits across the 16 project types and the 8 major data source categories, as well as highlighting creative ways of obtaining social benefits data (e.g., social media). The presentation closes with suggestions on improving landscape performance research, particularly social benefits, in the enterprise of achieving evidence-based designs that are anchored in quantitative performance measures.

Taner R. Ozdil and Gul Atanur, 69, *Assessing Social Performance in Revitalized Urban District: Perceptions on Bursa Hans District*

In recent decades there have been significant developments in landscape architecture scholarship and profession, to understand the impacts of completed projects through performance studies. Specifically, a number of case studies initiated by Landscape Architecture Foundation (LAF, 2018), perhaps as a result of the growing awareness of sustainable and green design practices since the turn of the century, have not only expanded the landscape evaluation literature started in 1990s (Bookout et.al., 1994; Marcus & Francis 1998; Francis, 1999; Ozdil, 2008) but also advanced the discussion regarding the value of design for the built environment. Whilst most literature to date has tackled the performance question one case/project (i.e. park or plaza) at a time (LAF, 2018; TCLF, 2017), there appears to be a void in understading complex, district scale, urban design interventions, often composed of multiple projects over time. This research is to assess social performance of the City of Bursa's Hans District (urban core) which served as the capital of the Ottoman Empire in 14th century, and added to Unesco's World Heritage Sites in 2014. By building on authors' earlier study (Atanur et.al., 2017), this presentation specifically focuses on social performance assesment (i.e. health, quality of life, safety, educational activites) of various end

users, including, but not limited to residents, employers, property owners, visitors, decision makers etc. (CABE, 2001; Ozdil, 2018). This research primarily benefits from quantitative methods, and adopts a three step procedure for the assesment (Deming & Swaffield, 2011; Ozdil, 2016). First, the study conducts a literature review to understand performance and evaluation studies in landscape architecture and urban design. Second, authors distill a subset of variables and methods from the literature to develop research instruments applicable to district scale. Third, it reports on the findings of comprehensive survey data in regard to the social implications of design interventions undertaken for the district. The research reveals various benefits concerning the social performance of Bursa Hans District by presenting assessments on varying parameters such as health, safety, education, quality of life, and aesthetic preferences. It is discussed that urban design presents attributes that impact social preferences and needs for society in the context of Bursa Hans District. The lessons learned from this case not only present variables and methods that could be adopted for such research, but also understand urban landscape and urban design performance at a district scale, informing the future of such complex revitalization districts in such cities.

Lisa DuRussel, 86, *The New Nature: Digital media in landscape performance*

This presentation will discuss strategies and methodologies for assessing social benefit in a built environment using data than can be gleaned through user-generated, participatory, location-based properties of digital media and social networks. The research and associated findings follow two New York City region waterfront parks: Hunter's Point South Waterfront Park in Queens, New York, and West Point Foundry Preserve in Cold Spring, New York, both of which were evaluated as part of the Landscape Architecture Foundation's (LAF) 2018 Case Study Investigation (CSI) program. During the Case Study Investigation process, the research team identified a need to explore alternate methods for monitoring social benefit, especially for public projects where no existing mechanism exists to track the number of visitors or what they are doing while there. Inspired by the "there's an app for that" mentality, the team turned to the digital realm to explore and create their own set of crowdsourced data and sentiment mapping, helping to qualitatively understand how a visitor engages with, moves through, and potentially values designed public spaces in a way beyond simple site observation. In our tech-savvy world, where social media is popular enough that many first-time and repeat users post about their visits, RSVP to an event via the web, or post digital photographs, potential exists to study hashtags and geotagging as a means to inspire and develop a series of datasets to inform research. During this session, the research team will present their data collection approach, discuss the limitations of using crowdsourced data and provide a discussion on the possibilities associated with participatory sensing in the urban environment. Research challenges associated with this type of data collection will also be discussed.

Jessica Canfield and Scott Randall, 290, *Material Selection in Landscape Architecture Practice* *

The popularization of landscape performance over the past decade has created notable shifts in professional practice and design education (Jost 2012; LAF 2016). Performance metrics have undoubtedly affected how landscapes are detailed and built as well. With the advent of new materials, sustainable products, and innovative technologies, designers are faced with a myriad of choices to help engender performance. Yet material selection, as Calkins notes, "remains a challenging, confusing, and sometimes even contentious issue" (2009, 2). Though, an understanding of material properties and processes is essential for fostering design innovation, especially as we continue to engage in research-driven design processes (Margolis and Robinson 2007, 8). Therefore, this research seeks to better understand professional landscape architecture firms' process for material selection; if and how demands for performance have changed this process; and, what the influence has been on built works. As a first step into this broader inquiry, an online survey, with structured and open-ended questions was used. The survey was emailed to 50+ practitioners, which were identified through snowball sampling. Respondents (37 total) represent a range of practice types and geographic locations. Preliminary findings from the returned surveys will be discussed, revealing various challenges designers are facing in terms of material selection. This knowledge is intended to begin

a critical dialogue on how contemporary landscape works are built and how we can better equip students and design professionals to address landscape performance in design application.

Yi Luo and Bo Yang, 56, *Doing Real and Permanent Good: Examining landscape performance benefits from an ecological wisdom perspective*

Ecological wisdom - "a philosophy of ecological harmony or equilibrium" (Naess, 1973, p.99) - is regaining broader recognition, and being proposed for use in socio-ecosystem planning and management for achieving urban resilience and sustainability (Liao & Chan, 2016; Xiang, 2014). According to Xiang (2014), a project possessing ecological wisdom should do real and permanent good, as exemplified by the Dujiangyan irrigation system in China, which project has been protecting millions of residents from deluge and drought and offering abundant living and flourishing opportunities ever since 256 BC. The beauty of Dujiangyan and other ecological wisdom practices lies in their "endurance overtime, efficacy in practice, and ability to predict project performance" (Yang &Li 2016, p.22). However, there might be inherent or unavoidable conflicts among the different aspects of project performance, as demonstrated in a previous study by Luo and Li (2014). These conflicts can cause compromises and weaken the real and permanent good to be fully provided. Through the perspective of ecological wisdom, this study examines 142 published Landscape Architecture Foundation (LAF)'s landscape performance case studies, arguably the largest case portfolio that systematically quantifies and documents exemplary ecological practices in North America and other parts of the world. Using the framework proposed by Luo and Li (2014), this study (1) examines the LAF cases in order to identify potential converging and conflicting relationships among their environmental, economic, and social benefits, and (2) explore the possibilities and pathways toward minimizing conflicting interests among these benefits. The 142 cases are analyzed according to their project type, size, location, and land use before construction to explore the respective influences on project benefits and their relationships. Preliminary assessment shows that the relationship between economic and social benefits are not always converging; and generally, projects built on brownfield and greyfield tend to generate more compatible relationships and less conflicting relationships. This study expects to offer a better understanding of the performance of ecological practices, and to raise attention to pursuing real and permanent good guided by ecological wisdom.

Tiezheng Zhao, Yang Zhao, Ming-han Li, 95, *Landscape Performance for Coordinated Development of Rural Communities & Small Towns Based on "Ecological Priority and All-Area Integrated Development" Guideline: A case study in East Zhejiang, China*

1. Purpose: Through comparative study for the traditional government-led evaluation system of China on planning and construction development, an applied research summary is concluded for future evaluation system implementation. 2. Background□Throughout last decade China government led "the construction of Beautiful Village" and "Construction of characteristic small towns" in rural area in meeting challenges of eco-environment destruction, population outflow and aging, declining of traditional industries, and rising demand for regional tourism services. Strategic guidance had been consistently revised and improved as time advanced. The most vigorously propagated ones for today are "rural revitalization" and "urban-rural coordinated development". "Ecological Priority and All-Area Integrated Development" is one of the key guidelines for area comprehensive revitalization development promoted by Zhejiang Municipal Government since 2018. According to the author the concept is also of great directing significance for the coordinated development of rural area with beautiful landscape features and ecological background of the Siming Mountains in eastern Zhejiang Province as case study basis. 3. Method: By introducing the landscape performance assessment research method, of which focusing on the pursuing of comprehensive performance evaluation for sustainable development featuring quantitative assessment concerning, analysis is set forth based on case study of practical planning & designs, and development constructions of the region. The study also combines Qualitative Research method (NVIVO software assisted) to

conduct the after-assessment for planning and construction of ecological, social and economic performance of the coordinated development in regional rural villages & small towns. 4. Findings: With the research summary the author proposes that the core guiding ideology of "Coordinated Development of Rural Villages & Small Towns" must be firmly adherent to for current and future statutory planning and development evaluation as guiding line, to avoid repeated construction and inefficiency, and to implement the economical and intensive development pattern building for All-Area Integrated Development. It is crucial to effectively balance the ecology, industry and life factor for the coordinated region through phasing plan, to construct the sustainable and livable ecological rural villages (small towns as a whole) community model with resilience and great attraction, so as to effectively support the all-area "urban and rural coordinated development" strategy implementation and the system building of "Territory Development Plan". 5. Importance: The study achievement will benefit the development consulting for the government policy-making and guidance binding. It will also enrich the practice research for landscape performance assessment in rural landscape architecture field of China.

Jason Sowell and Matthew O'Toole, 173*, Test Site: Integrating fuel mitigation and ecosystem services in the McDonald Observatory Wildfire Protection and Landscape Framework Plans*

In April 2011, burnouts were conducted on hillsides adjacent to The University of Texas at Austin's McDonald Observatory to safeguard the site's critical astronomical equipment and residential community from the Rock House Fire, which ultimately consumed 315,000 acres in the Davis Mountain region. Although the firing technique ensured the preservation of a leading international astronomical research facility, the event revealed weaknesses in the facility's fire protection infrastructure and approach. It also emphasized the role of satellite facilities for expanding the scope of conventional institutional land management practices to embrace diverse techniques that support public education, ecosystem services, and recreation. In response, a Community Wildfire Protection Plan (CWPP) and Landscape Framework Plan (LFP) were developed to integrate a fuel mitigation regime with advanced ecosystem services research and seed bank propagation for regionally threatened pine and hardwood species. The implementation of the CWPP and LFP, however, face three critical challenges: the facility's existing landscape management techniques, onsite technical expertise, and conflicts between the operation of a world-class astronomical facility and instrument sensitivity to particulate matter generated by mitigation technologies. Drawing upon the case study of the McDonald Observatory, this paper examines two key questions: (1) how does the concept of integrated ecosystem services impact institutional land management, and (2) how might integrated ecosystem services lead to any meaningful uptake by the Observatory's existing site programs and management practices? We conceptualize these questions through literature from Science and Technology Studies and Ecosystem Services, and our methods include geospatial analysis of regional fire events relative to site specific ecologies and material conditions; key informant interviews with prescribed fire and forestry scientists, facility staff, and university management personnel; and field studies. Our primary argument is that reconceptualization of the facility's singular astronomical focus will ensure its long-term protection and improve ecosystem resiliency. We conclude with a series of novel techniques for moving forward, including higher level partnerships with neighboring land owners, adaptation of knowledge and technologies utilized on other university lands that employ tailored mitigation regimes, and the implementation of a university system ecological team that would provide expertise and equipment to manage not only the Observatory, but other satellite facilities.

Brad Davis and Matthew Quirey, 204, *Rethinking Georgia Roadsides: A pilot study of perennial wheat*

The planting and management of high-speed interstate and highway roadsides presents a number of challenges to landscape architects and DOT professionals tasked with managing the conflicting goals and values of the public and various constituents. A short list of frequently opposing goals include: establishment of fast erosion control and land stabilization and use of native versus exotic plant material, definition and provision of a publicly desirable landscape aesthetic, management of a safe zone and clear right-of-way, provision (or prevention) of view corridors

for businesses and billboard owners, and preservation of tree cover and other important functioning ecosystems. Landscape architecture can offer design solutions that combine and accomplish many of the goals above. This paper presents the first-year results of a pilot study of perennial wheat (Kernza) at Interstate 85, exit 6, near LaGrange, Georgia and the Kia Motors Manufacturing plant. This study is a joint project with funding and support provided by The Ray Anderson Foundation, The Georgia Department of Transportation, The Land Institute, and the College of Environment and Design at the University of Georgia. As the Land Institute nears the point of release of perennial wheat (Kernza) seed for planting in C3 zones around the globe, questions remain as to the adaptability of perennial wheat to warmer climates. Could the extensive root system and perennial character of Kernza provide a low maintenance and soil stabilizing roadside plant, even into USDA zones 8 and 9? First-year results of this 20' x 20' test plot, located in USDA zone 8b, appear positive with nearly 95% seed germination, successful vernalization and seed production during the first growing season. Interesting questions for further research remain as year two and later data is collected. Will perennial wheat become aggressive and invasive? What is the value to local ecosystems? Will DOT's become amenable to wheat and other crop harvest on public roadsides? Will the public become more accepting of tall grass and forb laden roadsides and their according ecosystem services and abandon the current desire for a turf-like roadside aesthetic?

Adele Pierre, Nadia Amoroso, and Sean Kelly, 13, *Geodesign Application: Using a rule-based design approach for wiser urban design outcomes*

North American cities are experiencing a significant increase in flood events with resulting damage to infrastructure; two recent examples being Houston in August 2017 and Toronto in August 2018. As municipalities look for means of preventing and mitigating damage, new tools are needed to model solutions. This paper explores the use of rule-based design, in the context of the geodesign process, to create a stormwater management system at site scale. This process integrates input from stakeholders, collaboration between design disciplines, and the use of geospatial data to analyze systems and model design alternatives. Geodesign tools were used in this study to model the potential impact bioswales could have on a post-industrial street in Hamilton Ontario. Situated on Lake Ontario, the City of Hamilton has a legacy of heavy industry; consequently, Hamilton Harbour now contains the most highly polluted site in the Canadian Great Lakes. Aging infrastructure is not able to manage urban stormwater runoff, causing overland floods and further degradation of water quality. Though flooding is increasing, there are currently no public policies for implementing green infrastructure in city rights-of-way. The results of this study present a compelling argument for creating change in the decision-making process at the City of Hamilton with regard to stormwater management. The methodology for the study began with interviews of stakeholders and key informants. Data collection included rates of stormwater runoff volumes, levels of pollutants and green infrastructure performance metrics on sites of a similar size. Publicly available GIS data was used to model the streetscape in Esri's CityEngine. Rule-based parametric modelling was then used to create alternative scenarios by changing variables in the design of bioswales, tree infiltration pits and curb bumpouts. Once the model was complete, a digital story map was created and posted online to share the results to the general public. Landscape architects face significant challenges in the design of public space as each project must consider impacts on the urban fabric in a time of significant climate change. Parametric modelling provides an effective tool for assessing impacts of design decisions quickly and effectively, of conveying the results to all stakeholders and enabling informed decisions.

Dominic Fischer, Carlos Montoya, and Yang Song, 358, *Utilizing Two-Dimensional Path Of Travel Prediction Software To Optimize Desirable And Efficient Infill Of Declining Shopping Mall Sites.*

Historical marketplaces were adapted into the ubiquitous suburban shopping malls fading across the American landscape. These prototypical building forms have been analyzed in a multitude of case studies and traditional design research resulting in new models and uses for retrofitting and repairing suburban excesses. However, recent

innovations in the retail sector have usurped many of the traditional benefits of urban infill, and a new responsive archetype is needed. Because shopping malls have generalizable locations and footprints and a nearly identical hierarchy of ingress and egress locations they are ideal for this type of digital network analysis. This research applies two-dimensional path of travel prediction software to existing mall sites as a mechanism to extract the most connective routes and suitable residual spaces for future uses. The data extracted can then be analyzed to dictate the most appropriate forms and locations for open spaces, paths and nodes, storm water infrastructure and maximize pedestrian movement and future retail opportunities. This work seeks to create a methodology which can be replicated for infill projects of prototypical suburban shopping mall sites in the future. We propose a dynamic pedestrian routing model for maximizing efficiencies and uses when applied to prototypical shopping malls. The results suggest a new responsive model that can reduce walking distances between necessary uses, harness path prediction software, and guide urban designers seeking to optimize the performance of landscape and building systems on similar suburban sites.

Ben Shirtcliff and Yuanyuan Su, 198, *Harnessing Big Data for Post-Occupancy Evaluation of Public Space*

Online video from social media contains digital traces of the use of public space, including innocent bystanders in the background, providing design researchers with a lens into public life (Shirtcliff, 2016). Building upon the post-occupancy evaluation (POE) metric developed by Jan Gehl (2011), our research inquired into the extent that design supports activation of four public spaces—Smothers Park, Pompano Beach, Xuhui Riverside, and YanDi Square—in two different countries, the United States and China. Specifically, we were interested in observing the extent to which these public spaces generated spontaneous or creative interpretations that further contribute to the success of public space. In other words, we were evaluating how design shapes space for anticipated social outcomes (yoga in the yoga area) and how individuals or groups shaped space for potentially unanticipated outcomes (dancing in the street). We collected 70 videos for each location from online social media, extracted 670 unique scenes of human activity, and then mapped and coded over four hours human behavior in public space. Initial findings support and provide insight into the use of Gehl's scale for public space research. The presentation makes an important contribution to the measurement of built environments to support human interactions. Most of the social POE literature is dedicated to the performance of design to afford user experience through short observational sessions. We confirm exploratory work by others that data extracted from social media provides a novel and effective means to understand the social and cultural impact of design (Dalton, Kuliga, & Hölscher, 2013).

Elizabeth Macdonald, 160, *Water's Edge Promenades: Physical, social and ecological design characteristics*

Urban waterfronts present unique opportunities for linear public open space oriented toward pedestrian movement. Waterfront promenades can provide paths of considerable length where people can move at their own pace, free of the need to interact with vehicle traffic. These paths are social spaces, where people go to see and be seen by others and part of the public life of the city. Because they are usually very visible and have many eyes on them, they typically provide safety for women walkers who might feel unsafe on less frequented and visible paths, such as walking trails in parks. Urban waterfronts also present unique opportunities for bicycle paths attractive to people of all ages and abilities because they can be completely separated from vehicle traffic, and these bicycle paths also become places to promenade and partake of public life. Urban waterfronts also present other opportunities. They can be restorative public spaces, if they are designed with greenery and to have a calm ambience. They provide opportunities for implementing design approaches that appropriately address the potential for an ecologically rich water to land interface. And so, the design qualities of urban waterfront promenades are extremely important for social, ecological, and public health reasons. Some cities have long had treasured waterfront promenades that serve as focal areas for public life, many other cities have recently built them, and still many others are considering them.

The growth of urban waterfront promenades has coincided with deindustrialization. Recently, many cities have replaced working waterfronts with new residential neighborhoods or commercial precincts, and many of these transformations have included waterfront walks of some kind. Some of these projects have incorporated ecological approaches in their design and others have not. Some promenades are set within commercialized environments and others are set within park environments, leading to their having many different characters. At the same time that many waterfront promenades are being built, their future prospects are threatened by impending global warming induced sea-level rise and elevated storm surge risks, raising a host of challenges. This paper examines the physical form, social qualities and ecological dimensions of various urban waterfront promenades worldwide, using a comparative case study methodology and empirical observations. It concludes that the best waterfront promenades contribute to ecological wellbeing as well as a restorative pedestrian experience, that key design characteristics contribute to this, and that unfortunately sea level rise issues are often not well addressed.

Ryan Sandwick and Jayoung Koo, 265, *Reimagining Manchester, Kentucky: An urban design foundation for rural downtown revitalization*

Urban design is an important approach in downtown revitalization efforts; yet rural communities are often underserved with such assistance. By working with these communities through an academic setting a multitude of challenges can be addressed based on a community's specific circumstances and values. Rural communities which have experienced decades of downtown disinvestment can overlook their existing assets. Downtown revitalization efforts need to tie in with a community's urge to be resilient and open to re-organizing themselves based on heritage, assets and resources suitable to their reviving cultural context (Horrigan, 2014). The goal of this study was to identify the existing assets of the City of Manchester's built environment, with an emphasis on the public realm, in order to explore what can be celebrated and redeveloped as a foundation for future revitalization. This engagement was primarily undertaken each week at a pop-up design studio in a downtown storefront, where the study team visibly embedding themselves in the culture of the community. Engagement was further employed through the 'Chalk and Talk' program and a visual preference survey to identify their aesthetic values taken at the community's Main Street Market. The study team's preliminary findings highlighted Manchester's unique history and strong built environment as opportunities to build upon. An obstacle we identified during the study was a weakness in leadership within various levels of the local government, which influenced the lack of downtown revitalization and vision for how the community can best serve the next generation. The study team also observed the unwillingness of some property owners to appropriately maintain or enhance their buildings, thus diminishing the downtown's character and adding stress upon the city's struggling entrepreneurs who activate the buildings. These obstacles have been observed within many of the adjacent communities as well, inspiring the creation of a menu of revitalization projects that can be undertaken within a variety of scales, budgets and communities. This strategy seeks to spread the ownership of downtown revitalization and highlight small investment opportunities to amplify a downtown's character, economic resiliency, and sense of place for its residents.

Saehoon Kim amd Seonghun Min, 75, *Regenerating a low-rise residential district in Seoul, South Korea: Participatory design and planning for communities*

There is a wide range of concerns about the role of the academic society working with communities for regenerating a shrinking city. Perhaps no one would deny the importance of people-centered, pluralistic collaboration efforts. Nevertheless, many cities are witnessing a wide gap among the perspectives of different stakeholders, causing many forms of conflicts during the participatory planning processes. This is partly because old, low-rise residential areas in global cities are already embedded with multiple sources of social conflicts. These include: conflicts of vehicle parking in areas lacking parking spaces, a nuisance of unattended garbage, social isolation of aged people, and sharply divided communities regarding the decision for redevelopment. The study is an attempt to describe the

process of participatory planning for a dilapidated, low-rise residential district called Nangok-dong in Seoul, South Korea. The site, with a total area of 270,000 m2, was selected as the Seoul's key urban regeneration area in February 2017. The metropolitan and district governments sponsored the formation of a local regeneration center with 9 staffs and initiated a plan for regenerating the district. As a master planner in the center, activating the community through participatory planning was a primary mission for the author. In September of 2017, plan-making processes for urban regeneration was officially initiated. Many public opinions and community voices were collected through workshops and interviews. Among them, supporting housing repair and redesigning alleys for public amenities were suggested. There was also a suggestion about boosting community-based businesses for income generation. The residents had an opportunity to learn from both successes and failures over the years by carrying out small-scale, publicly-funded projects with community activists and the public officers. A sizable number of pilot projects were undertaken, such as Energy Efficiency Improvement Project supported by Seoul's government, Global Social Contribution Project from Seoul National University, and privately-funded social investment projects. Through the processes, a self-organized, community-based social venture was created with a mission of providing affordable housing repair services and thermal efficiency improvement. A group of graduate students from Seoul National University participated in the processes, which is now working on the establishment of a local school for making a livable residential environment.

Wenhai Zhang and Liang Li, 189, *Research on the Historical Place of Dashilar Street in Beijing from the View of Green Micro-Update*

Taking Beijing Municipal Government's research on the change of the old city's guideline system and the micro-renewal project of Dashilar block as the breakthrough point, this paper describes the change of Dashilar's renewal plan in the process of promoting, and then discusses the reasons behind its appearance. Because of the lack of Co-construction and consultation mechanism in community network, the excessive pursuit of space and format transcendence, and the lack of attention on the needs of community residents the micro-renewal project of Dashilar neglects the social process of the implicit existence of community and invisibly increases the "interface" of creating contradictions in the process of community construction. This paper reviews the concept and background of micro-renewal from a historical perspective. Taking the practice of micro-renewal in No. 12 Chaer Hutong as an example, the way, technology and method of "green micro--regeneration" are discussed. Finally, it summarizes the characteristics and ideological significance of "green micro--regeneration" under the background of old city reconstruction. It is believed that the concept of "green micro-renewal" will be a useful supplement to the action of the renewal project of Dashilar and play an active role.

Thomas Schurch, Taner Ozdil, Allyson Mendenhall, John Gibbs, and Michelle Eichinger, 211, *Urban Design in Landscape Architecture: Taking the pulse in education and practice*

J.B. Jackson stated that the concept of landscape encompasses "everything," and therefore it includes urban form and urban design resulting in form. Historically, landscape architecture has contributed significantly in this regard, evidenced by its development in response to the Industrial Revolution. The work of the Olmsteds, Elliot, Kessler, Nolen, Manning, Wright, Peets, and other luminary landscape architects in the 19th and early 20th centuries is testimony to this. More recently, the profession's evolution stemming from the 1960s Environmental Movement, with influence by the likes of Ian McHarg, John Lyle, and Anne Whiston Spirn towards practice concerned with long term environmental and public health continue to be important to urban design considerations today. In a rapidly changing and urbanizing world today, attention to urban form is more significant than ever in both the professional and academic communities. With landscape architecture "staking out" urban design practice along with the professions of architecture and urban planning, e.g., through the latter's developments of New Urbanism and Smart Growth, what are concerns for landscape architecture's participation in urban design in the 21st century? The

preceding question is the focus of a panel discussion by five members of the professional and academic communities with established backgrounds in urban design. In addressing this question, defining urban design as an area of practice and scholarship, identifying landscape architecture's unique areas of contribution to urban design, and underscoring this contribution to advancing environmental, public, and economic wellbeing are considered. The discussion will address urban design education in landscape architecture - including curriculum content - how urban design education in landscape architecture "measures up" to emerging masters of urban design (MUD) degrees, what professionals' expectations are regarding graduates of landscape architecture programs, how the profession might "grow" its participation in realizing urban form, and why this can and should occur as an avant garde pursuit for landscape architects. In addition to a robust "round table" colloquy by panel members regarding a topic significant to landscape architecture education and practice, questions, answers, and discussion with the session audience are anticipated. Therefore, a recording of the various discourse is proposed, with subsequent development of a narrative transcript for submission to Landscape Journal or Landscape Architecture as an addition to the literature.

Joern Langhorst, 187, *Enacting the Right to Place: Contested terrains, multiple publics, and landscape democracy*

Responding to raised concern that the various processes of neoliberal restructuring are threatening democracy, this paper critically interrogates the agency and instrumentality of space in encouraging/enabling or discouraging/suppressing democratic processes, actions, and behaviors. In order to understand and frame the complex and entangled ideas and practices of landscape democracy it investigates classical and contemporary theoretical perspectives on the relationship of the spatial-material and socio-cultural, foregrounding urban public spaces and issues of social and environmental justice, as framed by Lefebvre's (1968) "right to the city". This review of relevant theories and discourses from various fields and disciplines, in conjunction with observations, critiques and analyses of three examples of designed urban space, serves as a basis for a proposed framework to understand, critique and enact the democratic potential of and for urban public space and landscape democracy. First, four lenses (public/public sphere, right to place, utopian/dystopian/heterotopian, situationism/hyperreality) are established to organize key contemporary and historical-theoretical discourses on urban space, forming the basis for understanding and evaluating actions of intentional spatial change, their ability to enable or suppress democratic, inclusive and discursive actions and practices that are socially and environmentally just. Second, three criteria - expose, propose, politicize (Marcuse 2009) - guide an investigation in how to interpret, imagine and enact the dialectic between the actual and the possible (or, between urban life as it is experienced and as it could be) – a dialectic that is a key element of most, if not all, critical theories of urban space and its operations. Third, assemblage provides a method/methodology that can meaningfully relate the four lenses and three criteria to each other, but also significantly expands the discourses on urban space and urbanity. These finding are applied to three examples of public urban space (High Line, Memorial for the Murdered Jews in Europe and the "Platform" in New Orleans) illustrating how practices of exposing, proposing and politicizing are situated differently and generate vastly different outcomes in establishing "landscape democracy". A new alternative approach to the understanding and design of spaces based on "assemblage" as a theoretical and conceptual framework is developed, holding potential to realize the "right to the city", to counteract the post-political erosion of the urban public sphere associated with austerity and neoliberal governmentality and to facilitate Mitchell's (2003) postulate "to be effective, politics must be made visible in public space."

Cory Parker, 242, *Homeless Negotiations of Public Exclusions in the California Urban Landscape*

Cities exclude homeless people from urban public space, such as parks, squares and streets. This exclusion happens through design (Bergamaschi, Castrignanò, & Rubertis, 2014; Davis, 1990), policy and policing (Amster, 2003) and

aesthetics (Gerrard & Farrugia, 2014). Cities' increasingly fragmented spaces of commerce and housing are designed to exclude non-residents and those who do not shop. Yet the partitioned city also includes the actions of marginalized people, the way they occupy and shape the urban landscape, often at odds with the top-down planning visions. How do homeless people enter into the ongoing urban dialogue? What landscapes do they occupy? How do they negotiate and ultimately transform these urban spaces? To understand this, we engage with homeless people at "the street level of dynamic social relations" (MacLeod & Ward, 2002). I observed homeless people's behavior in public spaces in two California cities, Sacramento and Santa Cruz, to create behavior maps (Gehl, 2011), locating activities in the urban landscape. I then did qualitative interviews with homeless people outside (n=14) who discussed where they went each day and why. Follow up interviews with social service agents, transit providers, police and former homeless people provided systemic context. I combined behavior maps and interview transcript excerpts in a qualitative GIS (see Knigge & Cope, 2009) to generate patterns of movement and rest within the two cities at multiple scales, as well as offer preliminary explanations for a homeless response to exclusion. I found homeless people may move throughout a neighborhood but socialize and rest in three primary places: 1) large-scale nature parks and open space, 2) sidewalks around social service agencies, and 3) transportation rights-of-way formed through the need to buffer speed. These urban landscapes provide the necessary shelter and social relations, as well as potential for modification, homeless people seek. They adaptively and creatively re-appropriate mobile spaces in the landscape as living areas in which there is a constant tension between speed and stasis, visibility and inconspicuousness, and transgression and belonging. By visibly inhabiting the 'desolate' landscapes of the city, they also challenge formal, aesthetic conceptions of a progressive city. Findings suggest single-purpose open space and transportation corridors could be re-designed to accommodate multi-purpose urban living.

Carey Clouse and Zach Lamb, 259, *Revisiting the Batture: Risk aware urbanism in New Orleans*

When Hurricane Katrina made landfall in New Orleans on the 29th of August, 2005, the city entered into a crisis of unprecedented severity. The city's engineered levee system failed, allowing water to inundate low-lying neighborhoods; more than 400,000 people were displaced and over 100,000 houses were damaged by the flooding in Orleans Parish alone (Geaghan 2011, 2; New Orleans Community Data Center 2006, 23). In the days and weeks that followed, it became clear that over-confidence in engineered infrastructure---namely the city's protective levee and pump system---had facilitated several decades of largely uninformed urban development (Campanella 2015; Souther 2008). Likewise, the Katrina flood also highlighted pockets of resilience: against the backdrop of a flooded city, those areas that escaped substantial damage stood on stark display. This paper addresses the design and planning implications of risk awareness through the lens of one highly resilient neighborhood: the Batture community in New Orleans. Historically a community of some 400 residences on the "wrong side" of the Mississippi River levee, today a much smaller enclave has exhibited a series of urban characteristics and attitudes that reflect the neighborhood's remarkable staying power (WPA 2009). In developing incremental flood management strategies over more than a century, and in operating outside of the municipal levee embankments, these design ideas have been tested under a variety of environmental stressors. The purpose of this presentation and paper is to highlight design characteristics that have helped the Batture to thrive, and to extrapolate these attributes into a series of strategies that could be used proactively in other contexts. The paper shares historical and spatial information about the riverside community, incorporates information from onsite interviews with residents, and engages an interdisciplinary literature review. Findings are presented as a series of design recommendations for other risk-aware environments, with some discussion about associated transference. The informal settlement of the Batture demonstrates an alternative emergent urbanism--- one in which residents intentionally question accepted strategies for urban development and environmental risk mitigation. As such, the antifragile thinking expressed by this case study may have important lessons to offer the design and planning disciplines.

Scott Carman, 244, *Flipping the Script: Academic and civic dividends of an 'inverted' urban design process*

In many landscape architecture programs, the existing paradigm of urban design education often follows a design process similar to one generally used for landscape design and site planning. This process typically starts with research and analysis and ends with a design proposal informed by that analysis. Following this model, urban design studios routinely begin at the large scale, with mapping and analysis of urban form, systems and flows, progressively working down to more detailed levels of understanding. From the region, to the city, to the district, to the block, to the street, often concluding with site-specific placemaking exercises that employ the lessons learned from the larger-scale analyses. While there are rational and well-established justifications for such a process, an alternative model would be to begin the process with site design and use that experience to inform the larger-scale analysis, which may be the principal product of the study. This 'inverted' model of 'data-gathering through design,' leading to meaningful urban-scale analyses, can offer significant benefits in terms of both pedagogy and service to the community. During the spring semesters of 2015 and 2016, I co-taught graduate-level landscape architecture studios at University of Colorado Denver that explored urban design and placemaking through the lens of urban agriculture. This presentation and paper will reflect on the somewhat unorthodox methodology used in these studios, which began at the small scale with site-specific designs and concluded at an urban scale with evidence-based analysis and recommendations. In partnership with the City and County of Denver (2015), the neighboring City of Lakewood (2016), and numerous local organizations promoting urban food production, students engaged in service-learning projects that reversed the typical urban design process. These studios were divided into three modules: 1) site-specific designs in close cooperation with organizations that engage in the development of urban agriculture projects; 2) reflection on the design process and enumeration of the site characteristics that contributed to, or negatively impacted, the success of the projects from module 1; and 3) urban-scale analyses identifying sites that exhibited the most advantageous characteristics for deployment of similar projects throughout the metropolitan area. Starting with a problem statement that is most familiar to landscape architecture students (the design of a site) and working through scalar shifts towards a better-informed urban analysis provides actionable products not just for community stakeholders, but also for the municipality seeking to encourage urban agriculture (or any other amenity) within its borders. Pedagogically, this approach provides a promising alternative to the typical process and may lead landscape architecture students to a more robust understanding of urban design principals through a progression from the tangible to the abstract.

Shannon Bassett, 383, *Designing the Village Tapestry Weaving Landscape and Ecological Urbanism, Informed by Engaged Scholarship*

How might landscape and ecology become the agency, connective tissue, as well as operational strategy for redevelopment? How might engaged scholarship inform this process? "Tapestry is the visual metaphor for the Village of the Arts Plan (VOTA) to Act Project. The strength and beauty of tapestry fabric is derived from interlaced threads, the warp and the weft; the successful sustainability of this project is dependent on an intricate combination of actions over time by a diverse group of stakeholders and partners". This paper will discuss the process and findings for the masterplan design of a 42-acre site for the VOTA community. The neighborhood was part of a CRA within the inner-city of Bradenton, Florida. The area became part of an effort in 2000 aimed at artists across the country to come and homestead there. The area had become fragmented by urban blight and suburban flight, leaving behind a "terrain vague" of vacant lots, blighted urban stock, and foreclosures. The urban design proposal includes the use of landscape and ecological infrastructure which both mitigates the urban flooding experienced by the community, as well as to providing a scaffolding which layers different programs throughout the various spaces of the Village. Vacated alleyways become unvacated and an off-road connective path connecting accessory dwelling units operating as secondary gallery spaces to proposed event and pop-up spaces and principal circulation patterns. A participatory design and planning charrette process was held. This served as a multi-layered framework for the

envisioning of urban landscape strategies operating from the bottom-up. It included working with the community, constituents and stakeholders and conducting community-based asset mapping. "Building a community from the inside-out… considering local assets as the primary building blocks of sustainable community development…" Landscape and ecology here act as a placemaker, simultaneously working across physical space, at once overlaying a connective social tissue. It reclaims the right to the city, working within Lefebvre's idea of the social production of space. The final phase consisted of responding to the issues raised by the community through a pin-up of the design proposal, in addition to suggesting opportunities and precedents. Conclusion In conclusion, landscape and ecology can become formal operational strategies within the design process and informed through engaged scholarship. This paper presents through the discussion of the Village Tapestry project, the tools for intervention that endorses civic participation in the shaping of space with the ability to be transformative and political.

POSTER ABSTRACTS

Chingwen Cheng, 74, *Social-Ecological Experimental Design and Landscape Performance of Desert Green Infrastructure*

Green infrastructure for stormwater control provides multiple ecosystem services and benefits that have been studied extensively in areas with high frequency of storm events in the US such as cities of Seattle, Portland, and Baltimore; yet only one LAF case study in Tucson, Arizona. City of Mesa, Arizona, in 2014 published a toolkit for low impact development promoting green infrastructure stormwater design. A number of public projects have since implemented rainwater harvesting basins or raingardens. In the meantime, the local non-profit organization, Watershed Management Group, has engaged with communities to implement dozens of raingardens on private properties in Phoenix metro area. However, no monitoring and evaluation of landscape performance on those specific stormwater control measures has conducted in Phoenix area. The Hydro-GI Lab, established at The Design School in ASU, takes on integrated social-ecological systems approach engaging stakeholders in the experimental design processes for the understanding of social-ecological drivers and social-ecological outcomes in desert green infrastructure design. The experimental design project has been installed in September, 2018, in partnership with Flood Control District of Maricopa County for the co-production of construction details, and monitoring protocols. On-going monitoring efforts for soil infiltration capacity are undertaken by Hydro-GI Lab. In another post-construction evaluation on ASU Tempe Campus Orange Mall with a series of biodetention stormwater control design, the Hydro-GI Lab is assisting in monitoring both social and ecological landscape performance, which will help the project to be Sustainable SITEs Initiative certified. Site observations of mental restoration and social interaction activities were analyzed. In addition, on-going water quality testing and water quantity assessment on water budget are evaluated throughout the raining seasons. The preliminary results show promising trends of increased social and ecological benefits of green infrastructure design for enhanced social capital and increased infiltration and water quality improvement, particularly with amended soil and plantings. Those projects together explore how engaging stakeholders in design experiments for understanding hydrological performance achieves sustainable water design of desert green infrastructure in Phoenix and Tempe.

Hannah LoPresto, Catherine De Almeida, 78, *The Social Baseline*

Participating in the Landscape Architecture Foundation's Case Study Investigation, the University of Nebraska-Lincoln research team had the opportunity to collaborate and partner with landscape architecture firms in the US. Working with two world-renowned offices, post-occupancy analysis was conducted of two projects that reclaimed underutilized sites with high performing landscapes in the Great Plains—Tom Hanafan River's Edge Park in Council Bluffs, IA and P Street Corridor in Lincoln, NE. Both are public projects in urban settings with primary goals of transforming formerly unpleasant, underused spaces into highly accessible public destinations that implement stormwater management strategies. The research team documented, measured, and evaluated social, environmental, and economic benefits at each site to capture the transformative aspects of landscape architecture. Due to the reclamation aspects of these projects, the research team became interested in how user perceptions of the sites had changed in light of these recently constructed projects. While collecting social benefit data on-site, unanticipated opportunities and constraints arose during the user surveying process. This paper highlights the methodologies used to document social benefits, and explores the unexpected outcomes between each site's survey results when documenting user perception, safety, ease of access, and increase of activity. With minimal social baseline data present for either site, a methodology was developed for collecting the team's own baseline line data for comparative pre-project and post-project studies by tapping into the historical knowledge of local visitors. Survey questions directed to users with pre-existing site knowledge (aka "baseliners") was of utmost importance to

capture comparative perceptions of before and after conditions. Although the surveys distributed at each site followed almost identical formats, differences in the surveying environments soon became apparent. Factors such as foot traffic density and frequency of local visitors caused the research team to adjust survey expectations in terms of completion quantity. Upon analysis of the survey results, patterns were discovered corresponding to these differences in the surveying environment—making it clear that these differences can have unanticipated impacts on both the surveying process and results.

David Barbarash, 134, *Automated Post-Occupancy Assessment Tools and Techniques*

Post occupancy evaluation is time consuming and captures an incomplete picture of site use over time. Few firms invest in assessment of their built works and we too often miss valuable lessons that could be learned from seeing how designs are used, maintained, and impacted by (or placing impacts on) local context. If the end goal of post occupancy evaluation is to generate lessons learned from built works, what can existing software-based methodologies provide and where does the technology seem to be headed in the near future? Existing products are capable of tracking human movement through spaces through networked camera feeds, but they lack the granularity of human behavior capable through in-person assessment. They are unable to capture perceived mood, interaction, and socialization of site occupants, though some aspects can be inferred from tracking and timestamp data (how long people stay in congruent groups, paired motion through space, etc.) In-person evaluation does not offer a complete analysis of a site across all hours of the day and is missing granular environmental and historical data to determine influences on human behavior. This presentation will discuss what current software is capable of and demonstrate research into developing a more robust tracking tool for use-analysis of public space.

Jinki Kim, 185, *Green Infrastructure (GI) Benefits at House and Neighborhood Scale*

Recently, the green infrastructure (GI) concept has been adopted by many cities for stormwater management even though doubt still remains as to whether it can be fully embedded into planning and design. As many researchers have stated, GI planning has been discussed as offering a number of broad benefits in ecological, economic, and social spheres. The aim of this study is to examine the benefits of GI which can be used at various ranges of scale to support the principles of low impact development (LID). Case studies of two different scales, site scale and neighborhood scale, have shown ecological, social, and economic benefits of GI. The locations are in the Chicago suburbs for site scale and in downtown of Champaign, IL for neighborhood scale The projects include GI elements and LID strategies such as green roof, rain barrels, porous pavement, rain garden, gravel grass, vegetated swales, and retention basins. For the stormwater management benefit, TR-55 in DuPage and Champaign County, IL was employed. SWMM, the US EPA's Stormwater Management Model was used for calculating water elevation in both existing and future conditions and annual carbon sequestration was calculated using National Highway System sequestration rates. The result indicates that GI elements are effective in detaining stormwater and reducing the amount of runoff. Native prairie grasses, sedges, and plantings also improved habitat value and led to a noticeable increase in birds, bees, and butterflies. The GI project provided outdoor activities, promoted social interaction, and showed a positive effect on economic spheres as well. Quantification of these benefits is important for landscape architects, planners, and policy makers because it can provide better strategies for GI planning.

Bo Zhang, Yang Song, 374, *New Lessons Learnt on Water Landscape Design by Using Crowdsourcing Data: A study on Fort Worth water gardens*

By systematically mining, analyzing, and interpreting imagery and textual data from Instagram, this research studies how Fort Worth Water Garden is used and viewed to expand the current understanding of water landscapes. The 4.3 acre Fort Worth Water Gardens, designed by Philip Johnson and John Burgee, is an iconic project in the history of landscape architecture. This project features various forms of designed water features and enclosed

spaces. The Water Gardens have been well-visited in the city of Fort Worth, where, injuries and deaths also occurred. Hence, this research uses Fort Worth Water Gardens as a vehicle to test the theories of water design and safe perception related to water. The design drawings, designer's reflection papers, as well as critic essays were collected, which suggest the design intentions and "well-recognized" attributes. Then the researchers collected 6383 posts on Fort Worth Water Gardens from 4677 Instagram users during the time span from Jan 1st 2017 to Dec 31st 2017. These data include photos, captions, hashtags, locations, and time. They were categorized based on patterns of water feature typology, visitor behaviors and facial expressions. Correlation analysis were conducted to reveal the impacts of various water features on human perceptions, activities, and preferences. The locations where people took photographs were also mapped to reveal the congregation areas and viewing angles. The results provided findings on (1) the forms of water features, (2) the spatial compositions, (3) the human reaction patterns to water feature typology, and (4) safety design guidelines for practitioners. The significance of this study is three folds. First, it extends the current understandings of water landscapes. Second, it aids researchers to examine the usage and experiences of built environment in a more systematic and richer manner. Third, this study provides a practical methodology for landscape architects, clients, and managers to conduct post occupancy evaluation and site programming using crowdsourcing data.

Eloisa De Leon, Cory Gallo, 483, *Evaluation of Watering Systems in Community Gardens*

Community gardens are places where people gather to share in the experience of gardening. However, many working families can struggle to find time on a daily basis to care for their plots. This research explores the impact of the design of gardening watering systems on cost, time, and overall plant health. The study analyzed the inputs and outputs of hand watering, automated irrigation and wicking watering systems. Nine raised planters with three replicates of each treatment were used for the experiment over a single growing season controlling for crop species. The results indicate that wicking watering systems, while having the most expensive up front cost, provided flexibility in time investment for watering, eliminates complexity of operation found in automated systems, and produced statistically higher quality produce. The research indicates that groups and municipalities investing in community gardens should consider investing in these systems to increase crop production and make gardens more accessible to users with limited time during the week to invest in watering.

7. LANDSCAPE PLANNING AND ECOLOGY

PAPER ABSTRACTS

Galen Newman, Marccus Hendricks, Jennifer Horney, and Siyu Yu, 6, *The Costs and Benefits of Green Infrastructure in Underserved, Flood Prone Neighborhoods*

Globally, cities face challenges of becoming more resilient in light of impacts from climate change, environmental degradation, deteriorating infrastructure, and increased frequency/intensity of natural hazards (Reja, et al. 2017). Addressing these challenges requires interdisciplinary collaboration; one such approach focuses on collaborations between universities and communities (Ehlenz 2017). Many underserved urban communities face issues of flood resiliency in that they tend to experience larger amounts of damage during flood events than other communities (Highfield et al. 2013). Most planning for built environments is done solely within expertise-driven groups, without community involvement; a more engaged approach can improve understanding and procure more efficient solutions (Hendricks et al. 2018). For these reasons, the use of service-learning has increased (Helms et al. 2015). Most design/planning-based service-learning projects conclude at the conceptual phase, failing to measure the probable effects of the product(s) generated. However, when evaluating green infrastructure (GI) solutions, it is important to be able to predict performance relative to project goals (Struck et al. 2011). Relatively little information has been collected and analyzed about the benefits that these practices can offer (Clements et al. 2013). The use of GI solutions can provide social and aesthetic enhancements (Struck et al. 2011), but there is also a need to better understand the hindrances of actualizing their intended purposes, particularly at the neighborhood scale. While professionals in the design fields generally recognize multiple rationales associated with the need for GI (Matthews et al 2015), the literature offers few estimates of the impacts of GI approaches, specifically related to costs and other economic aspects (Ellwood 2012). To address this gap, the Landscape Architecture Foundation (LAF) has developed a series of Landscape Performance tools that provide the ability to measure the effectiveness with which existing or designed/planned solutions fulfill their intended purpose (Yang et al. 2016). GI is often recommended as a sustainable, low-impact solution to urban flooding. Service-learning projects provide an opportunity for making community design schemes more inclusive through university-community partnerships. However, implementation remains challenging due to the high costs of proposed systems. Thus, service-learning projects can sometimes produce unaffordable designs. Using landscape performance modeling, we calculate projected costs for a set of green infrastructure proposals developed during a service-learning project in an underserved neighborhood in Houston, Texas using Landscape Performance tools to project GI benefits in a marginalized community in Houston, Texas. While the solutions proposed can benefit the neighborhood in the long term, short-term cost burdens include installation and maintenance expenses, which can create additional burdens for already marginalized communities.

Farzaneh Khayat and Margaret Bryant, 199, *Landscape for Equal Play in Nature: Equitable connections to children's play spaces in Syracuse, New York*

Opportunities for children and youth to connect directly with nature in outdoor environments has declined in recent decades. Disconnection from nature causes different physical and mental health issues for children (Mustapa et al., 2015). Playing outdoors is an essential component of a child's life. Outdoor play spaces are the main source of physical activity, which is associated with decreased obesity and improved temperament in children (Herrington & Brussoni, 2015). Early childhood is an important developmental period involving cognitive learning, intellectual growth, and the establishment of social connections and learned behaviors. Design of high-quality play spaces based on children's needs and integration of natural elements is critically important for children's health and

wellbeing. This study addresses environmental justice in vulnerable neighborhoods in the city of Syracuse, New York by focusing on equitable access to high quality, nature-integrated play spaces. Syracuse is a medium-sized city with a high rate of concentrated poverty, especially among Blacks and Hispanics. More than 50% of children under 18 live in poverty, and the average rate of economically disadvantaged students in Syracuse elementary schools is 79%. More than half of the households with a child aged 0-5 were below the poverty level based on American Community Survey 5-Year estimates, 2009 to 2013. A collaboration between a local nonprofit, Atlantic States Legal Foundation, a national play nonprofit, KaBoom!, and students and faculty in the Department of Landscape Architecture at SUNY ESF led to this research study. Using geospatial analysis, a detailed assessment of equitable access to play areas was conducted for three neighborhoods in Syracuse and compared to Syracuse as a whole. Options for decentralized play environments were explored, and approaches for the integration of green elements (e.g., urban forest and green stormwater management) were developed. The study results identify best practices for integration of decentralized play spaces with access to nature in the context of neighborhoods with high levels of concentrated poverty.

Morgan Davis-Kollman and Yang Song, 261, *Oil Spill Armature: Creating resilient tribal community through hydraulic modeling and conservation planning*

Over half of the 135,000 miles of oil and gasoline pipelines in the U.S. were installed before 1969, with implementation of pipes occurring before maturation of steel or coating technology. Leaks and spills are becoming increasingly common within the realm of man-made environmental hazards. North Dakota is the second largest in oil production in the United States; reducing oil imports has allowed the state to become a dominant force among environmental destruction with the extracting of oil leading the state to 85 paramount oil spills within the last 20 years. Tribal lands within North Dakota are faced with the diminishing of resources and the shrinkage of indispensable ecosystems. Once prosperous and wholesome are now fragmented amid sectors of hazard, creating a state of crisis within reservation environments. In 2006, a broken pipeline burst more than a million gallons of brine wastewater into Charbonneau Creek, a tributary of the Yellowstone River in Northwestern North Dakota, altering ecosystem services and the residents who relied on the land and surrounding water bodies. The massive die-off of fish, plants and the tainting of productive soil and drinkable water sources directly impacted Native Americans who are most reliant on environmental healthy and stability. Oil spills are extremely unpredictable, with little available information of when, where and how they occur. Beyond the unforeseeable, there are few remediation or planning strategies to be executed when spills transpire. While most literature focuses on the reporting protocol and response actions, this study will propose an analytical strategy to mitigate the environmental threat of oil spills to water resources through environmental planning. Geospatial and hydraulic modeling tools will be introduced using National Hydrography Dataset for watershed-based drainage delineations, basin characteristic visualization, and streamflow estimation. A variety of case studies will be examined and analyzed to inform environmental intervention. The result will present a landscape conservation and resiliency plan to include hazard identification, vulnerability analysis and ecological planning for an endangered watershed area on Fort Berthold Reservation. The goal is to produce new perspectives on possibilities of creating a more resilient and sustainable tribal community.

Jane Futrell Winslow, 334, *Realizing Cultural Ecosystem Services Through Green Infrastructure*

Green infrastructure is celebrated for its role in providing ecosystem services. To date, however, studies have largely focused on single components of green infrastructure. This study explores the aggregation of green infrastructure to provide both regulating (stormwater management) and cultural (recreation and open space) ecosystem services to benefit human health and well being. Four built projects are evaluated through the green infrastructure planning principles of multi-functionality and connectivity with a goal of relating plans to outcomes. Using qualitative methods, data for analysis included review of project plans and field observation of how built projects met stated goals. On site audits were conducted to assess the presence of green infrastructure with

opportunities for physical activity. Findings suggest that projects demonstrate connectivity through the master planning of stormwater facilities and shared use of recreation facilities and open space, yet green infrastructure solutions appear to be fairly conventional in approach and implementation. Further research is needed to relate the aggregating of infrastructure to promote health and well being, particularly with regard to cultural ecosystem services and its importance in urban ecological infrastructure.

Alison Tompkins and Gary Austin, 24, *Designing a Sustainable Constructed Wetland to Treat Wastewater for the City of Juliaetta, Idaho*

Small communities have a small tax base, limited funding, limited staffing, and must still meet all federal and state requirements for the treatment of wastewater. Many small communities in the United States are now facing the challenging problem of how to replace aging rural infrastructure like wastewater treatment systems with limited resources. This is compounded by increasingly stringent water quality standards for treated effluent. Countless cities small and large obtain their drinking water from the same rivers that receive treated wastewater effluent. When cities fail to meet water quality standards for treated wastewater, it directly impacts the need and cost for other communities to obtain a source of clean drinking water. Literature reveals that constructed wetlands have been used all over the world to treat wastewater, even in cold climates. This study researches the benefits and cost of a constructed wastewater treatment wetland compared to a traditional mechanical system. Case studies demonstrate that constructed wetlands provide a cost-effective solution for wastewater treatment that can be applied to small communities in cold climates. Constructed wetlands can remove nutrients and solids from wastewater and provide sustainable benefits that traditional engineered systems cannot, such as wildlife habitat, energy savings, irrigation water, and recreation area. This project presents effective design and construction methods for a constructed wetland to treat wastewater from the City of Juliaetta (population 582) located in northern Idaho. The French reed bed is a two-stage vertical subsurface flow wetland which receives raw wastewater. Primary treatment occurs in the first wetland stage and secondary treatment follows with opportunities to incorporate tertiary treatment prior to effluent discharge. The proposed constructed wetland is designed to meet federal and state discharge permit requirements and water quality standards. It can be maintained by two staff employed by the city, is affordable to construct and maintain, and be sustained by the community for the lifetime of the system. The proposed constructed wastewater treatment wetland provides secondary benefits including wildlife habitat, irrigation water, and recreation area. Cost, effectiveness, and benefits of a constructed wastewater treatment wetland are compared to traditional systems to demonstrate the value and feasibility of constructed wastewater treatment wetlands. Constructed wetlands, as a built and natural environment, provide the perfect opportunity to apply stewardship, planning, and design to treat wastewater.

Steven Greco, 152, *Landscape Conservation Planning and Design: An engaged scholarship program*

Purpose: To achieve sustainable wildlife conservation across regional landscapes there is a great need for incorporating comprehensive systematic conservation planning at the local level in city and county general plans. In the USA land use is controlled at the local level and conservation lands need to be identified at the local level by addressing all natural communities and native species. Locally-based conservation planning is needed to complement federal Habitat Conservation Plans (HCPs) and state-level plans that focus conservation efforts only on a small set of special-status species. Regional advanced mitigation planning also benefits from this approach. Background: General plans for most municipalities typically lack modern systematic conservation strategies in the mandated "elements" for conservation or open space. These conservation strategies should be scientifically based using ecological principles. HCPs, as prescribed in the federal Endangered Species Act, typically employ these strategies, however, they focus on conserving threatened and endangered species and do not address any other species. Typically, HCPs require many years (>10) to complete and cost millions of dollars. The state of

California's Natural Community Conservation Planning (NCCP) Program partially addresses the need for more comprehensive conservation and is oftentimes integrated into an HCP planning process. However, HCPs and NCCPs are both optional planning processes and most municipalities will not engage in those processes due to time and expense. Methods: A case study in Yolo County, California is used to explore these conservation issues. A novel planning process is described to create a voluntary, non-regulatory "local conservation plan" (LCP) to complement a federal HCP and a state NCCP. The LCP subsequently was integrated into a new conservation planning tool in California called a Regional Conservation Investment Strategy (RCIS) that facilitates advanced mitigation. Findings: The Yolo County General Plan was updated in 2009 and contains a combined conservation and open space element that is non-comprehensive. It contains a single species list with 38 special status species. A HCP and NCCP planning process was conducted from 2002-2018. The HCP/NCCP covers 12 special status species and 15 natural communities. From 2015-2018 a LCP/RCIS was developed as a conservation framework for the species not covered in the HCP/NCCP. The LCP/RCIS contains three focal species lists with 40 species for the RCIS and 71 species for the LCP. Importance: This approach promotes comprehensive conservation and focuses beyond special status species. This is critically important to prevent future endangered species and sustain existing wildlife populations.

A. Haven Kiers and Shannon Still, 456, *Living Landscape Adaptation Plan: Campus planning in the face of climate change*

A partnership between UC Davis Campus Planning and the Arboretum and Public Garden is focusing on the impact of climate change on the university landscape and the pressing need to investigate how to best and most rapidly adapt to a changing climate on a campus/regional basis. The Living Landscape Adaptation Plan (LLAP) incorporates collective faculty expertise in climate modeling, plant science, entomology, agriculture, water/soil systems, and design to create a plan of action that will successfully transition the landscapes of UC Davis over the next 70 years. Importantly, the team has tied design and implementation of the LLAP to hands-on student internships with a focus on interpreting applied academic research and integrating it into the campus landscape through the design, construction, and maintenance of climate appropriate gardens and wildlife habitats. Here we outline the core components of the LLAP and describe the methodology for creating a climate-adaptable campus. The plan's framework draws from a mixture of site-specific climate modeling, aggressive tree planting and management, landscape ecology, community design best practices, and experiential student involvement. Although many of the sustainability techniques are currently employed in long-range environmental planning efforts, rarely are they so intricately intertwined with community and student engagement. The study explores the unique challenges of incorporating a transdisciplinary, student-faculty partnership approach to campus planning, the benefits of experiential student leadership internships, and the implications for campus environmental sustainability. This type of roadmap for climate-adaptive campus design has practical applications for educators striving to incorporate engaged learning opportunities into their classrooms, as well as for campus planners and landscape architects seeking to merge student learning and academic research with long range planning efforts.

Julia Badenhope, 467, *"Place-ing" GeoDesign*

GeoDesign frameworks, developed by Steinitz and others, provide a logic model for large-scale planning and decision making situated in biophysical dimensions of landscape and strategic focus on identifying feasible pathways to landscape change through formal government action. Working through three iterations of framing questions, the landscape planner codifies landscape processes and associated landscape structures in suitability maps that guide the formation and evaluation of scenarios for change. Policy and decision making authority are introduced early in framing the issue, and at the conclusion, to analyze feasibility of scenarios. As a landscape planning practice, GeoDesign emphasizes strategic decision making privileging externally validated research over nuanced primary investigation of human agency in shaping landscapes. (Moa). Yet landscape architectural and

other scholars have demonstrated that decisions about landscape change are influenced by place attachment and place identity (Clarke, Manzo), practices that link humans to place (Ingold, Stilgoe), and the ability to project or imagine unprecedented places (Knigge, Badenhope). While significantly influencing land use and resistance to change, phenomenological and cultural agency elude description and rarely represented within conventional GeoDesign practice. Place dimensions of large scale landscape change, as a product of cultural activity as well as biophysical factors, can be supported in GeoDesign through participatory action research targeting place, community, and landscape values and practices. Initiated early in the GeoDesign process- when the "problems" are described, represented, and mapped- place dimensions can inflect the evaluation of biophysical suitability through a cultural lens. Later in the GeoDesign process-when assessing impacts of proposed scenarios- integrating place criteria and cultural practices can be introduced as an indicator of cultural fit. Finally, when assessing decision making actions, the everyday decisions made by residents can be considered alongside other decision making factors- such as cost, policy, and actions by local government authorities. Two disaster recovery case studies utilizing engaged place research to ground GeoDesign illustrate the promise and challenge of integrating cultures and practices of Place in planning. In one case, focus groups, paired with narrative mapping, revealed significant places and the cultural practices that created them which informed all scenarios for landscape change. In the other, interviews, surveys, and collage studies revealed not only places and preferences but also dreams and desires that could be embodied in future plans. These evidence based engaged planning studies show promise to infuse GeoDesign with place knowledge and supporting practices for more situated scenarios for landscape change.

Jon Calabria, Sarah Ross, and Caitlin Teuton, 255, *Back From The Dead: Implementation and Monitoring Maritime Longleaf Pine*

Reestablishing Maritime Longleaf Pine plant communities after forestry operations is an important component to attaining Longleaf Pine restoration goals in coastal areas in the Southeastern United States. Longleaf Pine (Pinus palustris) was reduced to only two percent of its range and several initiatives are underway to replant pines in Georgia, US to provide habitat for other species such as Gopher Tortoise (Gopherus polyphemus). This study informs stewardship of coastal lands that are subject to increased climatic variability and disturbances, such as two hurricanes that impacted coastal Georgia at the beginning of the experiment. This study reports on student collected monitoring data of six plots within a seven hectare conversion to determine Longleaf Pine and reports on the establishment of the forb and grass layer. This study controlled for environmental covariates, such as soil characteristics and environmental gradients to help bracket pine survival tolerances, which is an important factor when designing sustainable landscapes near an encroaching coastline and increases salinity. The Design of Experiment (DOE) is a randomized split plot experimental design that includes hard to change factors such as site preparation with two levels; one where half the sites were randomly cleared of forestry residual (chipped branches, etc.) and the other remaining sites were not cleared of residual. A second factor included successional response with one level with natural occurring succession and the other level includes the same as the first with the addition of outplanted forbs and grasses collected from nearby sites and grown at the Mimsie Lanier Center for Native Plant Studies at the State Botanical Gardens of Georgia. Although the second factor was replanted because of impacts from the two hurricanes, results of this study found that pine survivorship was impacted by site preparation techniques and lime buffering capacity, which was a valuable predictor of pine survivability. These findings will inform landowner recommendations for site preparation to aid in restoring Longleaf Pine plant community. Future classes will continue to monitor the pine, forb and grasses to better understand long term restoration success, particularly as it relates to a prescribed burn recommendations and fire behavior predictions that must occur to support Longleaf Pine reforestation success in urbanizing coastal areas.

Yoonku Kwon, Soyoung Han, and Mintai Kim, 444, *The Benefits of Increasing Blue-Green Infrastructural Ecosystem Services*

Urban decision makers are faced with many complex issues related to balancing urban development and environmental impacts today. Expectations for increased demand for new infrastructure construction are the natural phenomenon (Wouters et al., 2016). The infrastructure that relies on the mono-function with high complexity system results in a chain of failures in interconnected systems, which lead a significant loss for properties of the physical, social and economic (Little, 2003). This is the reason why we who are engaged in the discipline of the landscape architecture pay attention to the new approaches of Green Infrastructure. Among the various concepts of Green Infrastructure, this study has focused on the values in including the role of urban hydrology within urban water management. Many of the symptoms of climate change are related to water. Recent changes in rainfall patterns and the increase in impervious water due to urbanization have resulted in increased urban floods, decreased groundwater, increased heat island phenomena, and worsened water pollution. In response to these, the terms of "sustainable urban drainage", "low impact development", "water sensitive urban design", "Water Sensitive Cities", and "Modified rainwater management" have been appeared. Taken together these terms, Wouters et al. (2016) uses the term Blue-Green Infrastructure (BGI) instead of Green Infrastructure. BGI not only includes rainfall runoff and pollutant abatement technology elements that are applicable to urban areas in a narrow sense, but also encompasses major ecological infrastructure in urban areas, meaning open space conservation and interconnection in the broad sense. In addition, it can provide sustainable multi-dimensionally sustainable various social, economic and environmental benefits of urban areas as well as water cycle recovery in urban areas. The purpose of this study is to explore the various potentials and possibilities of the "Blue" area in the BGI, particularly the ecological services aspect associated with water by examining the case of Bishan-Ang Mo Kio park and Kallang River project in Singapore. Briefly to sum up, there are four fundamental ecological processes occurring in these cases, including the water cycle, nutrient cycle, energy cycle and community dynamics. In this study, we would like to articulate the functions and roles of ecosystem services of urban hydrology within urban water management in BGI. There are many questions to be answered about the ecosystem services integration of BGI into cities. The answer to the most important questions from the designer's point of view is that, beyond the quantitative expansion of the BGI for the restoration of the city's water cycle, there is a need for a systematic approach to provide citizens with an ecological environment and aesthetic satisfaction at the same time.

Andrea Galinski, 398, *The Role of Landscape Visualization in Large-Scale Ecological Restoration Planning: A review of Louisiana's Coastal Master Plan*

Landscape visualization often plays a critical, yet under-appreciated role in the development of large-scale ecological restoration plans. This can specifically be seen in recent iterations of Louisiana's Comprehensive Master Plan for a Sustainable Coast developed by the Coastal Protection and Restoration Authority (CPRA, 2012, 2017). The Coastal Master Plan is one of the nation's most ambitious, forward-looking plans to create a 50-year / $50 billion strategy to protect and restore the Louisiana coast in the context of rapid environmental change. While such environmental planning initiatives are founded on the state-of-the-art science and engineering, the influence of landscape-based visualizations on public communication is important to not overlook in achieving the ultimate goals of plan approval, implementation, and public acceptance of oftentimes controversial environmental management decisions. The importance of landscape visualization in participatory community planning processes has been long documented. For instance, "[visualization] is the only common language to which all participants—technical and non-technical—can relate," (Al-Kodmany 1999, 45). However, landscape visualization also places a critical role in traditionally science-based planning processes such as ecological restoration or climate change planning. As noted by Sheppard et al. (2008), landscape visualization has distinct benefits including: offering an engaging and impactful medium; synthesizing technical data and information with illustrative/experientially rich presentation; illustrating multiple future scenarios; and clarifying/simplifying complex datasets and modeling outputs. Furthermore, developing rigorous frameworks for analyzing landscape visualization is ongoing. For example, and particularly relevant to the context of ecological restoration, Raaphorst et al. review projects

developed for the Rebuild by Design competition in New York after Hurricane Sandy (2012) and assess visual elements to evaluate design representations in terms of validity, readability, and interactivity (2018). This proposal reviews Louisiana's Coastal Master Plan (2012, 2017) in order to describe the role that landscape visualization played in the plan development process and communication of the plan to the public. To formulate this assessment, the proposal reviews the Coastal Master Plan's primary publications, and a range of complementary visualization projects that such as the "Shifting Foundations" exhibition at the CPRA/LSU Center for River Studies and a series of digital Story Maps. The Coastal Master Plan incorporates complex natural and human systems, competing stakeholder interests, demands for transparency, and a great deal of uncertainty about future environmental conditions. Landscape architects play a critical role in enhancing plan legibility, visualizing ecological systems, connecting people to the landscape, articulating uncertainties, and envisioning future scenario conditions.

Travis Flohr, 23, *Wildfire Risk Reduction: Evaluating local government's implementation of wildfire risk reduction best practices in the American West*

This paper assesses the effectiveness of community wildfire protection planning (CWPP) as well as the implementation of wildfire risk reduction best practices in American West. Two plan evaluation indices – "CWPP Process and Plan Instrument" and "CWPP Implementation: Local Governance Instrument," – were created to score the presence or absence of best practices within CWPP documents and local governance (e.g., comprehensive plans, zoning, building codes, landscape codes, development review processes). The purpose of indices, in general, is to allow comparisons across time and space (Ebert & Welsch, 2004). The proposed process index and implementation index are critical to wildfire mitigation in the CWPP process because they aid in decision-making surrounding the prioritization of planning processes and implementation strategies. This is significant in the daily practices of wildfire mitigation and the CWPP process for both A) the decision-makers and B) the community members. An effective process index is important for decision-makers in order to 1) compare a community's process with others to validate localized best practices of community engagement, 2) prioritize the utilization of staff time and resources, and 3) facilitate community participation without overburdening community members. There are two main benefits of a process index for community members: 1) the promotion of more meaningful engagement in the planning process by focusing community participation where members can actively contribute, reducing fatigue and frustration, and 2) legitimization of the CWPP planning process by providing sustained appraisals on planning products, procedures and results. This study selects a representative sample of economic status and of WUI coverage by using a two-tiered cluster sampling methodology. This methodology involves 1) a stratified sample of counties based on median household income levels and percent of WUI, and 2) a simple random sample of county CWPPs to select 40 CWPPs from three income-derived county strata for a total project N of 120. Two document coders reviewed relevant documents with 20% overlap to align the coders' understanding of the instrument (Cohen's Kappa >0.80). The average CWPP process and implementation index scores were 0.345 and 0.42, respectively. In grading terms, these are F grades. These results demonstrate a lack of 1) descriptive and measurable goals and objectives, 2) clearly defined WUI, and 3) a lack of best practices in the landscape design and management codes and development review processes. Significant improvements in following best practices need to be made in order to reduce wildfire risk in the WUI drastically.

Yiwen Han, 10, *Role of Landscape Pattern of Current Forests in affecting the Habitat Quality of Historical Remnants in a Highly Urbanized Area: Seoul (1972-2015)*

Urbanization fragments natural habitats, often resulting in small and isolated remnants that can lead to the degeneration of ecosystem services (ESs) and a loss of biodiversity (Chiang et al., 2014; Martínez-Harms & Balvanera, 2012; Terrado et al., 2016). However, our understanding of landscape pattern on ESs provision in the urban area remains limited. Distinguishing historical remnants from recently established habitats, and quantifying changes in ecosystem services supplied by historical remnants is rarely performed (Dallimer et al., 2015). This

study measures the changes in the extent of forested ecosystems and the role of the historical forest remnants (HFRs) play in generating ESs in a human-dominated modernized landscape of Seoul, Republic of Korea, using a spatial configuration of habitats to measure an index of biodiversity as an ecosystem service. We used land cover maps from two times periods to identify sampling 37 isolated patches at current parks with HFRs, and quantified landscape patterns and modeled Habitat Quality (HQ) and Habitat Units (HUs) a proxy for biodiversity using the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) model. Then, we examined landscape metrics combined with HUs using Pearson correlations and forward stepwise multiple regressions to explore the key indicators affecting the biodiversity in HFRs. The specific objectives of this study were 1) to process joint analyses of landscape metrics and HQ of forest habitats during the urbanization process in Seoul between 1972 and 2015, 2) to identify HFRs and their role in supporting urban biodiversity, 3) to explore the role of the landscape metrics of current habitats in affecting the biodiversity of HFRs, and 4) to discuss implications for planning and design strategy in urban forest conservation. We found a 35.31% decline in the total HUs because of the significant decline in the total forest area. However, HUs of HFRs increased 0.5%. The shapes of current forests may positively affect the biodiversity of HFRs while the area of newly formed habitats may negatively affect. Thus, we emphasize the importance of the careful design of newly formed habitats during urban planning initiatives for conserving historical patches. We contend that in constructing urban green infrastructure, fragmented forest remnants should be increasingly viewed as essential components and historical evidence, and as such, should be integrated into landscape conservation schemes.

Behnoud Aghapour, 215, *Assessment of Expanding Light Rail Transit (LRT) Versus Highway: Influence on land use change and habitat fragmentation*

The purpose of this research is to assess and investigate the impact of expanding the Light Rail Transit (LRT) systems versus conventional highway systems for land use change, land formation, and habitat fragmentation in the Dallas Fort Worth (DFW) metropolitan area as a highly developing urban area. The DFW metropolitan area is one of the fastest growing urban areas in the United States (U.S. Census Bureau, 2016). Successfully accommodating this population growth requires north Texans to collectively address important issues including: environmental degradation, landscape formation and fragmentation, suburban sprawl, lack of public transportation, transportation expansion, and energy consumption. Habitat fragmentation caused by transportation infrastructure has gained attention and importance during the last couple of decades. With their larger size and higher traffic volumes, highways represent a serious threat to wildlife, affecting a wider range of wildlife species and presenting an almost impassable barrier for many species (Jackson, 2000). The impact of roads on wildlife can be pervasive as roads can cause numerous fatalities as a result of collisions with the vehicles that travel on them (Malo et al., 2004; Saeki and Macdonald, 2004; Ramp et al., 2005). While LTRs are not free from negative impacts on habitat, however it is more environmentally friendly compare to highway system in many ways such as: Reduce greenhouse gas emissions, facilitate compact development, conserving land, and saving energy (Federal Transit Administration, 2016). This research compared impacts of Dallas Fort Worth Turnpike and Trinity Railway Express (TRE) between downtown Dallas to downtown Fort Worth. Analyzed variables are land use change, tree canopy cover change, and habitat fragmentation and habitat mortality. Both DFW Turnpike and TRE passing through 2 exceptional Cross Timbers and Blackland Prairies ecological regions. Currently there are more than 80 endangered and threatened species in the area of study (Texas Park and Wildlife Department, 2018). Spatial analysis and historic mapping over the chosen timeframes of 1995, 2000, 2005, 2010, and 2015 were used to quantify the degree of land use changes within the one-mile buffer of DFW Turnpike and TRE. Habitat fragmentation and land transformation were analyzed by comparing patch numbers and mean patch size area. Based on Analysis negative impacts of DFW Turnpike and TRE over the past 25 years are undeniable. Direct and indirect effects of each on analyzed variables are different. Although, direct negative effects of DFW Turnpike during construction, short-term, and long-term is noticeably higher than TRE.

Patrick Miller and Jisoo Sim, 416, *Scenic Viewsheds: Making the turn*

This presentation describes the development of a procedure for nominating and assessing viewsheds for inclusion in a state scenic viewshed register. The purpose of the scenic viewshed register is to call attention to scenic landscapes and to encourage their preservation. The project developed two procedures: a nomination procedure and a scenic assessment procedure. Each procedure required a protocol or set of requirements established by research. The nomination procedure requires photographic documentation and descriptive information for the nominated viewshed. Nominations were to be made by citizens and local government officials, who did not have expertise in visual management. The second procedure was the scenic assessment procedure. Individuals, who have some knowledge of visual concepts, would apply this procedure to determine if a nominated viewshed merits placement on the scenic viewshed register. The assessment procedure drew upon best practices from the literature. However, most of the visual management concepts and methods in use today were developed in the past for different purposes. Many were developed 30 or 40 years ago to manage the visual impacts of resource harvesting on public lands (U.S. Forest Service and BLM land). Since that time, the role of visual management on public land has turned away from resource harvesting toward stewardship. The researchers for this project also had also to make the "turn," drawing upon and modifying literature to make it appropriate for viewsheds of today. A keywords a search of the literature garnered 853 citations from the years 1969 to 2018. The keywords used in the Search were: scenic value, scenic beauty, visual assessment, landscape preference, visual quality, scenic quality, visual resource management, landscape quality, and landscape assessment. A second literature database with 1,854 publications from 1936 to 2014 was also used. It was from the "Scenic Solutions Website" and developed by Dr. Andrew Lothian. Following a set of guidelines, the researchers identified a set of theories, concepts, and methods from the literature that were modified to use in the viewshed nomination and assessment procedures. The researchers then turned these procedures into forms or protocol sheets that can be used to either nominate or assesses the scenic quality of a viewshed. Both of these procedures will be demonstrated during this presentation. The presentation will conclude with a discussion of viewshed management and its future directions.

Penelope Cottrell-Crawford, Kelly Cederberg, Philip Stoker, and Penelope Cottrell-Crawford, 321, *Impacts of Golf Course Land Use Change on Residential Property Values*

Hundreds of golf course facilities are closing nationally in the U.S. each year (National Golf Foundation, 2017). When a golf course facility closes, homeowners become uncertain of how the land use change might affect their property values. Public parks and open space often provide a logical alternative land use. The purpose of this study is to measure the impact of land use change from golf courses to public parks on surrounding residential property values. In this study, we compare housing values abutting and near operating golf course facilities with housing values near parks that were formerly golf courses. This data was collected and assessed for golf courses in Utah County, UT, Tarrant County, TX and King County, WA. For the parks, tax assessor data were examined for three years prior to the golf courses closing and then again after the courses became public parks. This data was compared to open and operating golf course facilities in the same counties for the same years. Preliminary results reveal that properties abutting a public park pay similar premiums to those that abut a golf course. However, when comparing houses not abutting the park or golf course but within ¼ mile, property values were higher for homes near the repurposed public parks than those that were near golf courses. Homeowners and stakeholders concerned about property values in golf course communities faced with golf course closures should feel confident that supporting a change to a public park or open space would not decrease the value of their property.

Runzi Wang and Ming-Han Li, 247, *Exploring Stream Water Quality Management with Hydrologically Sensitive Area (HSA) Approach: A case study in San Jacinto River Basin, Texas*

Land use factors such as agricultural activities and urbanization which lead to stream water quality degradation have been studied extensively. However, few studies have investigated the relationship between landscape factors and stream water quality with a spatially and hydrologically explicit approach. In this study, we will introduce the concept of hydrologically sensitive area (HSA) which is a small portion in a watershed contributing more to runoff generation. It is probable that areas with higher hydrological sensitivity are critical source areas of pollutions. The objective of this study is to explore the relationship among stream water quality, land use and hydrological sensitivity, and provide water quality management suggestions from the aspect of HSA accordingly. The study site is San Jacinto river basin located around the Houston metropolitan area. As the Houston metroplex expands to the north, wastewater treatment plants and urban runoff increase the organic, nutrient and fecal coliform bacteria loadings around the area. To analyze this issue from the HSA aspect, this study will be implemented in the following three steps: 1) Producing HSA maps within San Jacinto river basin and dividing the basin into several hydrological sensitivity groups. 2) Modelling the relationship among land use, hydrologically sensitive groups and stream water quality using redundancy analysis (RDA). 3) Investigating how hydrological sensitivity interacts with the relationship between land use and water quality by giving HSA weights to land use explanatory variables. We will also compare HSA weights to some common weighting schemes including Euclidian distance weights, flow length weights and flow accumulation weights. The result of the first step will generate HSA maps in San Jacinto river basin where water quality management should give more attention. It appears that HSA is more likely to locate in the area where the infiltration capacity is low such as clay soil area or high percentage of impermeable area. The result of RDA is anticipated to show that the relationships between land use and stream water quality vary among areas with different hydrological sensitivities, and targeted management actions should be taken accordingly. In the third step, it is anticipated to find that land use variables with HSA weights can explain the most variations in stream water quality. The HSA approach is effective in modelling and managing stream water quality.

POSTER ABSTRACTS

Xiaohua Guo, Fei Dai, Shibo Bi, 38, *A Simulation Study on the Effect of the Road Greenbelt Planning on PM2.5 Reduction Based on ENVI-met*

Urban road green space is an important part of urban green space system, the road greenbelt undertakes the important function of the ecological environment improving, the road green belt of the cross section layout is the core content of road green space planning and design. By using the urban microclimate simulation software ENVI-met, the typical daily meteorological parameters of Wuhan city were selected, and the numerical simulation of the particulate matter was carried out on several kinds of green forms that were common in urban main roads. The results show that 1) the green type of road cross section has significant influence on the distribution of particulate matter. The road greening results in the increase of particulate concentration of motor vehicles and the decrease of the concentration of non-motorized driveway and pavement. 2) Road greening can significantly reduce the PM2.5 concentration of pavement. In terms of the reduction area of PM2.5, there are four-plate & five greenbelt > two-plate & three greenbelt > one-plate & two greenbelt> three-plate & four greenbelt. From the extent of the reduction of PM2.5, two-plate & three greenbelt > four-plate & five greenbelt > one-plate & two greenbelt> three-plate & four greenbelt. 3) The best effect of the two-plate & three-greenbelt and four-plate & five-greenbelt greening reduction was achieved, with the maximum rate of sidewalk reduction increased by 18%.

Jialing Shui, 110, *Taking a Plan of Heritage Corridor near Ancient Great Wall in Datong City as Example: Construction strategy of scenic forest in heritage corridor*

Due to the particularity of the ancient Great Wall cultural heritage corridor along Datong, its vegetation construction has higher requirements in maintaining ecological stability, creating characteristic landscapes and inheriting historical culture. Therefore, the construction method of scenic forests is introduced. Different with

traditional approach, the investigation is multidisciplinary collaborative that combines geographic information system (GIS), forestry, landscape architecture and historic preservation and studies the landscape forest construction strategy based on the principles of landscape protection, ecological restoration, landscape construction and economic revitalization . First, we evaluate the heritage resources along the ancient Great Wall and delimit the boundaries of heritage corridor. Then, we identify the ecological problems in the study area and used the method of forest land suitability evaluation to select the suitable land, and then classify afforestation classes according to different site types.Finally, we use the method of plant landscape planning and design to carry out tree species selection and community layout planning and corresponding to the planning sub-class.This paper is beneficial for the future construction of heritage corridors which is able to conducted in a systematic, ecological, regional and aesthetic manner. In this work, a heritage corridor construction method is proposed which is more systematic as well as better integrates regional culture and forest aesthetics. The results demonstrate our proposal.

You Jung Kim, Galen Newman, Samuel Brody, 137, *Climate Change Preparedness: Comparing future urban growth and flood risk prediction in Amsterdam and Houston*

Rising sea levels due to climate change will make coastal cities globally more vulnerable to floods. Growing populations and urban expansion can worsen climate change conditions and enlarge hazard impacted areas due to land use conversion and increases in impervious surface amounts. This research examines two waterfront cities confronting sea-level rise and population growth: Amsterdam in the Netherlands and Houston in the U.S. The Netherlands is well-known for their flood protection strategies, though much of its land is below sea level; the Netherlands consistently leads the charge in urban resiliency with plans to upgrade their dikes to combat future sea level rise (Nicholls and Cazenave, 2010). Contrarily, Houston has suffered from flood events periodically, but shows no comprehensive resilience plan to help counteract flooding from future hurricanes and flood hazards. It is the only major city in the US without land use regulation (Qian, 2010, Fisher, 1989). This research examines flood risk for future urban growth in lieu of sea level rise for both cities. It answers the questions; 1) how much urban land will be endangered by future flood risk by the year 2040 when considering sea-level rise?; and 2) how will the flood-vulnerable area differ in each city/location from 2010 to 2040? Land use change, the result of interaction between human activity and natural resources (Agarwal et al., 2002), can now be predicted using advanced spatial and digital models. Using a spatial prediction model, this research (i) forecasts future land use changes in Amsterdam and Houston with a GIS-based land use prediction tool called Land Transformation Model (LTM) (Pijanowski et al., 2002, Newman et al., 2016), (ii) projects the sea level rise 100-year floodplain (Berke et al., 2015) by 2040 for Houston, (iii) projects future flood risk based on the 1/100 per year in Amsterdam (Risicokaart, 2018), and (iv) identifies and compares impacted areas of predicted urban growth within the 2040 floodplain in each location. When comparing the two cities, there are three salient findings. First, Houston has developed much more urban area within flood-prone zones compared to Amsterdam. Second, in the predicted future urban areas under risk, though the city sizes differ, predicted flood-prone future urbanization in Amsterdam is relatively smaller than Houston. Third, the increased floodplain by sea-level rise would impact existing and future urban areas in Houston significantly more than the 1/100 risk area in Amsterdam.

You Jin Kwon, Dongkun Lee, 158, *An Optimal Green space Scenario for Thermal Comfort and Proper Renewal Cost in Urban*

This research aims for investigating the optimal layout of roads, pedestrian paths and green spaces, which constitute outdoor spaces in urban canyon through urban renewal cost and thermal radiation calculating. Therefore, we set up the minimum unit of city planning 100 meters 100 meters as a spatial scope, and built scenarios according to arranging the urban component layout and urban surface type which affect thermal radiation under urban canyon and urban renewal cost.Then, we tried to find the best combination of elements by using NSGA-II for multipurpose optimization with thermal radiation and the renewal cost calculated for each

scenarios. The expected results help to know quantitatively the proper arrangement, direction, and the height of the buildings in designated land and an appropriate volume of green space for the purpose of maximizing the cost-benefit, reducing the thermal radiation in summer and preserving the radiation in winter. The result can be utilized as an optimal standard for the development cost and thermal efficiency in constructing the urban space in the case of high-density urban reconstruction.

Nian Wang, Jianning Zhu, 183, *Rural Landscape Ecological Planning in Urban Suburbs Based on Ecological Network Construction: A case study of the urban-rural intersection in southern Fuyang City, Anhui Province*

In recent years, with the continuous advancement of urban-rural integration, the landscape pattern of urban-rural space has been changed, and the natural ecological process and environment of urban and rural areas have been threatened. As a special type of regional agricultural space and ecological space, rural landscape in urban suburbs is a transitional zone of industry, population and spatial structure from city to countryside, with strong spatial heterogeneity. Many studies have shown that agricultural intensification leads to landscape simplification and loss of biodiversity, which may further lead to the loss of ecosystem functions and reduce the resistance to external disturbances. Traditional rural landscape planning pays attention to the discussion of culture and residential building style, but not enough attention to the comprehensive ecological space of landscape, forests, fields, lakes and grasses in rural areas. How to integrate all kinds of natural resources and put forward reasonable and effective means of spatial planning under the concept of ecological civilization construction is a direction worthy of further study. Taking the southern urban-rural ecotone of Fuyang City in Anhui Province as an example, this paper determines the core habitat patches of site natural spatial components by means of geographic information technology and landscape connectivity, delineates the core areas of habitat conservation, and constructs an ecological corridor network system in combination with forest belts and canals to maintain and maintain the unique regional Village of Huaibei Plain. Texture, increasing biodiversity and promoting sustainable development. On this basis, the main historical villages are connected in series with farmland roads and waterways on the principle of low-impact development. Combining with the existing village facilities, a slow-moving tour system is constructed to promote the construction of rural human settlements and the development of rural agricultural economy, to revitalize the urban pastoral tourism industry in the urban suburbs and to create a solitary residence. The ecological pastoral landscape of color provides new ideas for the ecological planning of the rural landscape in the new era.

Jinki Kim, 188, *Green Infrastructure (GI) Network Plan in Yesan County, South Korea*

Green Infrastructure (GI) can be used as a framework for planning human settlements and guiding development away from natural areas that possess high ecological value and provide important Ecosystem Services for society's development. GI Plan for Yesan County, a small shrinking city but possesses very rich, unexplored natural and cultural resources in South Korea was developed through a multifunctional approach based on the different ecological and socio-cultural characteristics of the region. It allowed connecting the core elements that conform the vernacular landscape and get the most out of the Ecosystem Services provided by resources in the area. The categories considered for ecological variables were the First-Degree Ecological features, Conservation Priority areas, Forestry and Agriculture, and Hydrological Resources. For protection of the native fauna and territorial characteristics, ad-hoc data on roadkill and slope were added respectively. The Socio-cultural category consists of Recreation and Ecotourism, Aesthetic value + Inspiration, and Cultural heritage + spiritual and religious vale. Recreation and Ecotourism was defined based on the indicators of Park Visitation, Cultural Assets, and Touristic Spots mapping. The Aesthetic value + Inspiration category is based on the indicator of the amount of geotagged images. As for the Cultural heritage + spiritual and religious value, Yesan's cultural value assets were the base. The plan was defined mainly in two stages: first, applying weights to the different ecological and socio/cultural

characteristics; secondly, arranging them through a set of spatial analysis with a patch-corridor-matrix model. The final outcome is a lean network of ecological value hubs, connected to a set of socio-cultural value assets through a network of water bodies, intrinsic forestry characteristics and wildlife mobility in the area. This is followed in order to connect, facilitate and improve mobility and energy flow in Yesan. The study provides essential guidelines for County's future development. Considering both Ecological and Socio-cultural assets the plan allowed the identification, valuation and prioritization of the sites that need more attention by the local government for their development.

Dan-dan Zhang, Jing-yun Cui, Pei-yao Hao, Li Dong, Xiong Li, 201, *Study on Plant Community in Granite and Limestone Mountains of Beijing Based on Eco-restoration*

Mining industry used to be a part of the important industry in Beijing area. As a result, a large area of abandoned mining land has been produced, which has a serious impact on the ecological balance around Beijing and the sustainable development of regional economy. Therefore, it is of strategic significance to realize timely restoration of mine wasteland. The research on vegetation ecological restoration of mine wasteland at home and abroad mainly focuses on the restrictive factors of mine ecological vegetation restoration: soil is an important restrictive factor for vegetation biodiversity and ecosystem function restoration. At the same time, it is pointed out that bedrock conditions may be an important factor in the existence of plant landscape differences, and may also make the plant landscape style unified. The purpose of this research is to get the plant landscape and species corresponding to different bedrock conditions by studying the characteristics of plant landscape under different bedrock conditions. It may provide a reference for the establishment of urban ecosystem and the ecological construction of landscape plants under the same rock conditions. Three granite mountains and two limestone mountains are selected as the research objects based on the data of Beijing geological map and remote sensing satellite image. The composition of plant species in granite and limestone mountain areas in Beijing was investigated by the quadrat survey procedure. The results are as follows: The number of plant species in the Granite mountain was 188 belonging to 61 families and 148 genera. The number of plant species in the Limestone mountain was 95 belonging to 38 families and 80 genera. Species diversity indices of tree layer, shrub layer, herb layer and interlayer plants in different community types of two bedrock mountains in Beijing were analyzed and compared. The results show that the species richness index of the herb layer are generally higher than that of the tree layer and shrub layer. The comparation among the Granite Mountains' plant characteristics shows a result that there is no similarity, and that among the Limestone Mountains' shows a high similarity. Based on the investigation of the vegetation of granite and limestone mountains in Beijing, the species composition, plant community characteristics, similarity, pioneer species and succession direction of special habitats were analyzed. Planning proposals of plant species for ecological restoration are put forward for the restoration of granite and limestone mountain areas in Beijing, as well as granite quarries, limestone mines, limestone quarries and other granite and limestone-based rocks.

Jie Hu, 209, *Holistic Design Based on Multidisciplinary Collaboration*

From classical philosophy to 'Wisdom is gained by integration' and 'unity of knowledge and action', efficiently gathering the "wisdom" and scientifically and creatively solving complex problems is China traditional ecological wisdom. Landscape planning and ecology has covered many levels of landscape planning and other relationships, such as regional ecology and national scale eco-security, land resource planning, green infrastructure and low impact development, stormwater management and sponge city, carbon footprint, low-carbon construction and plant carbon sink, brownfield restoration and pollution abatement, eco-wisdom, ecological restoration and biodiversity research, and etc. Beijing Tsinghua Tongheng Urban Planning and Design Institute has formed an interdisciplinary cooperative service mode covering the fields of urban and rural planning, landscape architecture, architectural design, infrastructure and transportation, technology and media, and etc. It combines advanced concepts and scientific and technological support with local characteristics. After a period of accumulation and adjustment,

systematically solving complex practical planning and design problems based on multidisciplinary collaboration and cooperation has become our feature. Some project cases including: 'Comprehensive Planning of 2019 Beijing International Horticultural Exposition': the project team included experts in landscape architecture, planning, horticulture, transportation, tourism planning, historical preservation, operation planning, municipal engineering and lighting design, and hosts of previous expos. The planning aimed to create a resilient green infrastructure system through constructing eco-security pattern, protecting and recovering damaged wetland and river ecosystem, creating a mountain-river-visible landscape corridor, forming a spatial pattern with development surrounding the river, creating horticultural industry community, advocating horticultural life and constructing beautiful village. 'Landscape Conceptual Planning of 2021 Yangzhou International Horticultural Exposition': system integration and transboundary innovation. Except for landscape conceptual planning, the planning included industrial planning, regional tourism, ecosystem pattern reconstruction, regional comprehensive traffic network, public safety and disaster prevention and mitigation, intelligent park, municipal facilities, supporting service facilities, landscape lighting, soundscape planning, and etc. 'Landscape Renovation of Chaka Salt Lake': the 'Mirror of the Sky' in China. It was a typical protection priority project and the multiple professional team stopped the brutal reconstruction at the first time on the site and persuaded the client in three days of rapid conceptual design. 'Landscape Design of Yanxiu Park': engaging a river flood plain. It has demonstrated a practical, economical and environmentally sustainable approach to creating an attractive public park that primarily preserves, restores and enhances original landscape elements of water, roads and vegetation, creating a stable and secure ecological balance and valuable amenity for local residents.

Shagha Shahhosseini, Emanuel Carter, 241, *Biosphere Reserves as an Environmental Learning Opportunity in Landscape Architecture Programs*

In 1971, UNESCO launched the Man and the Biosphere Program (MAB) in order to "…..establish a scientific basis for the improvement of relationships between people and their environments". The MAB program "…..combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits. UNESCO's preferred unit of analysis is the biosphere reserve (686 biosphere reserves in 122 countries, including 20 transboundary sites) which UNESCO refers to as "science for sustainability support sites." These are "….special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity." This poster project is about how the SUNY College of Environmental Science & Forestry is beginning to engage the study of biosphere reserves in eastern North America and what this engagement means for the professional and research programs in the Department of Landscape Architecture and for the analysis, planning, and management in the practice of landscape architecture. MAB program's goals are the basis for UNESCO's Millennium Ecosystem Assessment, the UNESCO Sustainable Development Goals and the UN-Habitat III New Urban Agenda. Between 2000 and 2005, United Nations initiated "The Millennium Ecosystem Assessment" to provide ecosystem change results for human well-being and to discuss the scientific basis for improvement of conservation and sustainable use of those systems and their connection to human well-being. After all, in 2017, world leaders established the New Urban Agenda, that adopts a new global standard for sustainable urban development, and discusses about how to plan, manage and live in cities. The New Urban Agenda is a framework for building urban areas that are considered the bases of prosperity and centers of cultural and social well-being while protecting the environment. The new urban agenda also is a framework for using the Sustainable Development Goals and providing a basis for actions to address climate change and other sustainable solutions for urban challenges such as promoting safe, accessible and green public spaces. Since MAB and New Urban Agenda are aligned in providing sustainable urban developments, the MAB is a valuable representative of learning opportunities in the world of urbanism. The poster will address the coursework, workshop, research and public service planned for this effort. The study areas to be profiled are the Champlain-Adirondack Biosphere Reserve, the Hubbard Brook Biosphere Reserve, Mont Saint-Hilaire Biosphere Reserve, Lac Saint-Pierre Biosphere Reserve, and the Frontenac Arch Biosphere Reserve.

Yang Wang, Xiao Feng, 395, *A Planning Support System (PSS) for Mitigating Urban Stormwater Runoff in the United States (U.S.): Using vacant urban land as a resource*

In recent years, the total area of an impermeable surface and vacant urban lands (VUL) has significantly increased due to rapid urbanization in the United States (U.S.), leading to a growth of potential flooding risks and urban stormwater runoff accumulation. Excessive runoff caused by dramatic increases of impervious areas (e.g., parking lots, vacant parcels, roads) is causing flooding in urban areas and water quality deterioration in receiving water bodies. The main aim of this study is to develop a framework for a comprehensive planning support system (PSS) and a tool to select countermeasures to support planning practitioners, landscape designers, local stakeholders, and decision-makers in collaboratively finding effective, supported, site-specific sets of mitigating urban stormwater runoff measures for a particular vacant urban lands (VUL) project in the United States (U.S.). In this research, I will develop an open-source, web-based Use Data Viewer as a visual interface to explore quantitative planning support system (PSS) use data. I will use the Python Django web framework for a PSS and the D3.js visualization library to create and deploy the tool. I will import state information to select countermeasures to support planners in collaboratively finding effective, supported, site-specific sets of mitigating urban stormwater runoff measures for a particular vacant urban lands (VUL) project. The result includes a filling knowledge base about mitigating urban stormwater.

Tawab Hlimi, 426, *Recovering the Confederation Creek as Social/Ecological Infrastructure*

Background: This research/design project will explore the potential of daylighting a culverted urban stream as green stormwater infrastructure in the context of an urbanizing watershed and a changing climate. The focus of the project is the site of the former Highland Park golf course in NW Calgary, Canada, situated in a coulee landform of 20.83ha, through which the culverted Confederation Creek flows. The site serves a significant watershed function as it is the point of concentration of three channelized tributaries, draining a watershed of 2293ha into Nose Creek. Purpose: In the context of the City of Calgary's regional drainage studies to leverage the Confederation Creek coulee landform as flood detention infrastructure, an opportunity has presented itself to explore the potential of daylighting/recovering the Highland Park site as a public works project that can reconcile the technical utility of stormwater infrastructure with the cultural and ecological dimensions of environmental education, stewardship and recreation. The aim of this project is challenge the prevalent model of stormwater infrastructure design which is typically large, centralized, standardized/universal, and driven primarily by performance metrics (volumes and flow rates), with little consideration to the socio-cultural and ecological dimensions of a particular place/locality. Through the lens of landscape architecture, which engages systemic design thinking to bridge across disciplinary, spatial, and temporal boundaries,the objective of this project is to present an alternative scenario to stormwater infrastructure design that is place-based, regenerative of glacial landforms and ecological networks, multi-functional in addressing both technical and socio-cultural dimensions of design, and adaptive in anticipating climate change. Methods: Mapping is the primary method of inquiry. Mapping can facilitate the spatial and temporal exploration of a place, and reveal design opportunities. Findings: While the study is still in progress, selective mapping of landscape attributes/systems such as hydro-geology, creek morphology, urban morphology, and infrastructure (stormwater and roads), across time and space has revealed the social and educational opportunities of daylighting a creek which flows primarily through the grounds of schools, community centers, and parks. Given the urbanized watershed of the Confederation Creek, this project could shed insight on strategies for the daylighting of other urban waterways as social and ecological infrastructures.

Jonghoon Park, Jun-Hyun Kim, Ming-Han Li, Dong-Kun Lee, 453, *The Role of Green Spaces Configuration to Reduce Air Temperature in Urban Areas*

Previous studies have reported the benefits of green spaces (GSs) to cool down air temperature in urban areas. Among the design features using GSs to reduce urban heat, the area ratios of GSs have been one of the most important indicators to create cooling zones to mitigate urban air temperature. However, the configuration of GSs to optimally connect cooling spots have not been fully evaluated. The purpose of the study was to understand the optimized configuration of the urban GSs to maximize their benefits to mitigate urban air temperature. The study site was located in a residential area in College Station, Texas and consisted of two zones close to each other showing identical microclimate; Zone A was a lawn (3,391m2) with eight GSs (the area ratio: 31.6%); and Zone B was a single-family lot (1,495 m2) with six GSs (the area ratio: 19.4%). The mean Euclidean distance between each GS of Zone A was 32.2 m while that of Zone B was 24.9 m. The transect survey was conducted at 10h, 13h, and 16h in a sunny day and repeated six times from November 2016 to April 2017. Air temperature data were collected by utilizing a device with T-type thermocouple sensor and a digital video camcorder. The cooling degree of each GS was analyzed with the differences between the highest air temperature in two zones and the air temperature of each GS in each zone during each measurement. T-test and paired t-test were performed for statistical analysis. As a result, although Zone A had a higher GS area ratio than Zone B had, the GSs' cooling degrees between Zone A and Zone B did not show a significant relationship. More interestingly, during the summer, GSs of Zone B seven contributed to lowering air temperature more than Zone A. When we compared cooling degrees of paired zones according to all the data collection period, the GSs in Zone A showed higher cooling degrees ranging from 0.1°C to 0.9 °C during winter (November and February). However, the GSs in Zone B contributed to lower air temperature more effectively during the early summertime (March and April) by showing a range of 0.25 °C to 1.06 °C decreases from the daily air temperatures ranged from 24.7 °C to 30.8 °C.

David Myers, 485, *Tools for Tree Canopy in Greyfield Redevelopment*

The loss of tree canopy is on ongoing concern in urbanizing landscapes. Canopy losses are the result of a number of activities, including individual tree mortality, property owner removal, development (greenfield development), and redevelopment (greyfield development). The State of Maryland has been a leader in a number of green infrastructure and forest conservation efforts in the United States. The Forest Conservation Act (FCA), developed in 1991, was the first statewide forest regulation to mitigate forest loss during the development process (Galvin et, al., 2000). The FCA, while assisting in both protection and afforestation of forests in the development process, does not typically address tree loss through single lot redevelopment. A new state effort, coordinated by the Sustainable Forestry Council, defined the no-net-loss of forest policy as the stabilization of the rate of forest loss by 2020 with the goal of maintaining the state's existing 40% forest coverage. More recent jurisdictional initiatives, including a new tree canopy cover law, have provided more fine-scaled approaches to maintaining urban forest and forest canopy, in particular on redevelopment properties. The purpose of this paper is to describe and assess a recently enacted tree canopy law in Montgomery County, Maryland. Montgomery County (MOCO) passed the Tree Canopy Law (TCL) in July, 2013 and the law went into effect in March 2014. Further, processes and outcomes of the new TCL are placed in the context of other activities, both regulatory (e.g., Environmental Site Design - ESD, etc.,), and non- regulatory (tree planting programs, etc.,), that are intended to maintain or increase canopy cover. Conflicts between water-centric ESD regulations that result in pressures to remove tree cover for the installation of BMPs are explored using case studies. Where trees cannot be planted, fees in-lieu are paid for mitigation, providing funds for plantings in other locations that are a priority for the county. The TCL impacts development that disturbs 5000 square feet or greater (the regulatory trigger for a sedimentation plan(DEP, 2015). For a three year period (2014-2016), approximately 40 % of the 1204 approved sediment control permits required mitigation under the TCL. The TCL, in this period has resulted in approximately 700 trees and 1.2 million in mitigation fees (DEP, 2015). The MOCO TCL is the first of its kind in the Maryland and the understanding of it may be helpful for other jurisdictions.

8. PEOPLE-ENVIRONMENT RELATIONSHIPS

PAPER ABSTRACTS

Jules Bruck and Anna Wik, 390, *Coastal Resilience Design Studio: Force Multiplier in Statewide Engagement*

Coastlines have long served as a valuable amenity to trade, commerce, community, and the natural habitats in and around them. Protecting and maximizing the value of coastlines, particularly in urban areas, often focuses on a single or limited range of values, striving to balance and/or minimize negative impacts on competing interests. Climate change and sea level rise (SLR) add to the complexity of protecting vulnerable coastlines. This study examines the challenges and advantages of an integrative approach to coastal resilience. Specifically, how an interdisciplinary coastal resilience design partnership strives to integrate knowledge and methods from landscape architecture with other disciplines to synthesize approaches to teaching, research, and outreach. Communities are facing unprecedented challenges related to all areas of sustainability. Some of those threats include concerns that fall under the "Urban Challenge" such as unemployment, poor housing conditions, and environmentally and socially related health concerns. Other threats fall within "Managing the Commons" such as marine environmental problems related to depletion of natural resources and marine pollution (Unesco, 2010). Regions experience additional threats specific to locale. For example, the northeast coast of the United States is among the most vulnerable areas to the effects of future sea level rise, having already experienced faster and more significant impact than other regions during much of the 20th century (Yin and Goddard, 2013). Global warming is expected to continue to cause SLR in the northeast to occur twice as fast as the average global rate (Yin et al., 2009). In Delaware specifically, flat topography and low mean elevation are factors contributing to predictions of mean sea level increasing by the year 2100 by 1.53 m / 5.02 ft (High scenarios), 0.99 m / 3.25 ft (Intermediate scenario), and 0.52 m / 1.71 ft (Low scenario) (Committee, 2017). These changes have a profound impact on fragile ecosystems such as those found in the Delaware estuary and have the potential to impact millions of people living in proximity to the three largest regional cities including Philadelphia, Camden, NJ and Wilmington, DE. Complex challenges such as how communities design and build resilience responses to natural and human-made threats require interdisciplinary solutions. Interdisciplinarity "analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole" (Choi & Pak, A.W., 2006). Carole Long, quoted in Repko, Szostak, Buchberger states, "The real-world research problems that scientists address rarely arise within orderly disciplinary categories, and neither do their solutions" (Repko, Szostak, R., & Buchberger, M.P., 2017). Further, landscape architect students must be prepared to integrate knowledge and methods from their discipline to synthesize approaches going beyond merely cooperating with experts across fields. To explore landscape architecture's interdisciplinary capacity in teaching, research, and outreach within the framework of coastal resilience, a group of stakeholders formed a new partnership called the Coastal Resilience Design Studio (CRDS). Initiated by UD Landscape Architecture and funded by National and Delaware Sea Grant, the CRDS priorities are to 1. explore the value and process of interdisciplinary teams and critiques as part of an undergraduate design studio, 2. to work across academic disciplines to develop robust research partnerships that integrate processes to solve coastal challenges, and 3. to explore participatory methods to engage in generative research within communities. This new teaching/research/outreach collaboration has garnered robust local and regional support. Participation includes over fifteen UD faculty members representing six different academic departments, three existing UD Institutes, Delaware Sea Grant, and Cooperative Extension. Additional participants include agency members from Department of Natural Resources and Environmental, Delaware National Estuarine Research Reserve, and Resilient and Sustainable Communities League along with community members, city council members, town planners, and local

professionals. The project connects to the UD Landscape Architecture program's strategic priority - Leading the profession. It has garnered significant attention and approximately $300,000 in funding within the first six months of its creation. This session will explore challenges and advantages while describing how the CRDS projects aim to synthesize approaches through three specific projects in each of the CRDS focus areas - teaching, research, and outreach.

Omar Faruque, 15, *The Influence of the Riverine Ecology and its Landscape Surroundings on the Work of Rabindranath Tagore*

In 1913 the Nobel Prize for Literature went to Rabindranath Tagore, a Bengali from India. He became the first non-European to receive this honor. Understandably, this news created a sensation in India. In Europe too, this became an extraordinary news since he was hardly known there as a literary figure at that time. This paper investigates the true nature of his work, their uniqueness and the driving force behind them. It traces the influences of his upbringing, exposure to classical and romantic poets, travels, cultural experiences, and more importantly, the environmental surroundings. The study finds that, among of all the factors, the riverine ecology of Bangladesh and West Bengal of India was the most influential on Tagore's work, especially during the most critical and productive years of his life. This was the time when he took over his family's 'zamindari' and lived very close to the great river Padma of Bangladesh. Through examples, this paper articulates four major aspects of his work: 1) In his poems including their musical versions as well as in their literary constructs, the imagery of the rivers, their tributaries, and the adjoining agrarian fields and pastoral preserves play important roles. 2) The settings as well as the plots of his short stories and novels took full advantage of the riverine landscapes, their structure, flow and geographic configurations. 3) In Tagore's abundant use of metaphors, he extensively draws from the imagery of the water cycle: the clouds, rains, streams, rivers and their landscape elements, boats, sails, ferry stations, and docks. 4) In Tagore's philosophical and mystical writings, the river is used as a symbol in a variety of iterations. From this investigative study, the author came away with a concluding view that landscapes, especially the ones that have a distinct character as do the riverine surroundings can be very powerful and are memorialized in form of literary work.

Jeffrey Hou, 250, *Understanding Park Uses in an Inner-City Ethnic Neighborhood: Post-occupancy evaluation of two Chinatown parks in Seattle*

Donnie Chin International Children's Park and Hing Hay Park are two neighborhood parks located in Seattle's Chinatown-International District. After years of neglect and disrepair, both parks went through recent renovation and expansion based on extensive community outreach and participation. Completed respectively in 2012 and 2017, the outcomes of both projects have generally been well received by the community based on anecdotal information and sources including articles in local newspaper and reviews on Google Map. With an interest in understanding better how the two parks have performed and to inform future open space development in the District, the Seattle Chinatown International District Preservation and Development Authority applied for and received a neighborhood matching fund grant to carry out a Post-Occupancy Evaluation (POE) study. Defined as a systematic evaluation of a designed and occupied setting from the perspective of users, POE is often recognized for its importance in environmental design (Marcus and Francis, 1998). In particular, well-constructed POEs can supply data on user satisfaction and demonstrate societal values of landscape architecture (Kapper and Chenoweth, 2000), and ongoing POEs are essential to monitor a project's success over time (Francis, 1998). However, in practice, studies are rarely conducted due to budget and time pressure in professional offices (Marcus and Francis, 1998). Such is the case in Seattle. Using mixed methods of site observations, behavioral mapping, interviews, surveys, and engagement at public events, the study was carried out by a community organization staff and two student interns in late summer and autumn of 2018 to collect data in different seasonal conditions. Site observations were timed for mornings, mid-days, and late afternoons and on weekdays and weekends to gauge how the parks are used at different times. Semi-

structured interviews were further conducted with key informants with more extensive knowledge of the parks. A survey questionnaire for each park targets not only how the park is used but also how key issues faced in the design process have been addressed through the design, such as public safety and multigenerational uses. An advisory committee, consisting of local residents, landscape architecture professionals, and city staff, provided inputs and suggestions on the study. This presentation will summarize the key findings from the study, and reflect on the design and implementation of the study with a goal of identifying lessons for future implementation with similar projects.

Kenneth Hurst, 474, *Location-specific Amenity-based Physical Activity in Public Parks and Playgrounds*

Public parks are critical settings for getting children and families outdoors, active, and interacting with each other (1). This research evaluates relationships between park use and amenities in park and playground environments, and their contribution to physical activity (PA). Systematic observations were conducted during 210 observation periods, recording non-intrusively observable demographic and PA characteristics of the park users and placing their locations on plans of the park and playground sites in three comparative public parks situated in the same/similar neighborhood. With guidance from SOPARC (2) the three parks were divided into 4 Park Zones and 4 Playground Zones, then further sub-divided into 10 amenity-based affordance areas where use in terms of age, gender and PA levels were recorded and evaluated. Observation data were evaluated to identify patterns of use in parks and playgrounds relative to different amenities or affordances available to support PA (3). The data were also analyzed in terms of total use and metabolic equivalent (MET) scores of the recorded PA categories in the parks and their playgrounds, with respect to associated affordances (4, 5, 6). The Park Zones contributed 54% of the overall use, and active sports areas accounted for about 28% of park use with 60% of users being physically active. Trails attracted about 10% of use but 97% of the users were active. In the Playground Zones, the combined active playground areas provided 29% of park use. The majority (67-92%) of the playground users were physically active. The MET values paralleled use levels and were magnified in the high PA areas where the active playground areas recorded 30% more METs per observation than did the active sports areas. Sports areas make their expected contribution to use and PA in parks with a corresponding contribution from trails. Participation in children's play environments was considerably larger than expected, with PA and METs surpassing that of sports areas, with substantial participation by adult caregivers. Sports areas were used most heavily later in the day and playgrounds were used most heavily during the mid-day hours. The practice of evidence-based design uses the evidence of research to supplement practice in applying design decisions (7). With the location-specific observation tool, use and PA associated with specific amenities can be evaluated spatially and temporally to guide decision making in policy and construction toward amenities that have the greatest impact, making the most effective public open spaces supporting fiscally responsible and effective practice.

Keunhyun Park, 33, *Park and Neighborhood attributes Associated with Park Use: An observational study using unmanned aerial vehicles (UAVs)*

As the world becomes more urbanized, neighborhood parks are becoming an increasingly important venue that people engage in physical and social activities. Using park-use data collected by unmanned aerial vehicles, this study aims to account for park use in light of park attributes and neighborhood conditions. The role of built environments near a park is particular attention, which is under-studied in the literature. A regression model shows that neighborhood park utilization is positively associated with park attributes (i.e., larger area, a playground, a creek/pond, quality maintenance, and organized activities) and neighborhood attributes (i.e., lower minority/low-income population, higher density, more commercial and public uses, and a well-connected street network). The statistical significance of the factors varies by user types. This study provides insights into the role of neighborhood compactness and mixed land use, which calls for interdisciplinary collaboration among urban planners/designers, landscape architects, and park programmers.

Hala Nassar and Robert Hewitt, 460*, Assessment of Public Space Visitor Attitudes on the Presence of Unmanned Aerial Vehicles (UAVs)*

While there is considerable research on unmanned aerial vehicle (UAV) applications and navigation (Koh 2012, Nemeth 2010, Tripicchio 2015) and an emerging body of work in landscape architecture, largely related to landscape assessment potential and park user behavior (Kullmann 2017, Park 2016), there is little research addressing user perception of UAV presence in public space, or criteria for design of public space for UAV averse users. The paper presents initial findings from research funded by a multiyear National Science Foundation (NSF) grant to develop landscape architecture design responses related to the use of UAVs in and around public outdoor spaces, through examination of: 1) user behavior and user perception of UAVs in public space in Sarah Duke Botanical Garden in Durham, North Carolina; and 2) potential aerial visual access to a representative range of forested and open landscapes frequented by visitors in the garden Findings are derived from: a) garden visitor survey analysis; and 2) visual analysis of the garden's landscape. Surveys of 144 self-selected garden visitors were administered over two consecutive days. Garden visitors were also observed throughout the garden those same consecutive days. Potential aerial visual access was determined through analysis of representative forested and open areas. Because the garden's tree cover is relatively uniform in terms of tree size and canopy coverage, the garden was consistently divided into gridded 100' squares. The squares were categorized according to 5 40+ tree densities with visual access consistent with tree density. Landscape assessment of the garden's aerial visual access indicates a range of large, medium and small clearings and paths completely open to visual access, as well as forested landscapes, which offer a range of visual access from completely inaccessible to entirely accessible, connecting and surrounding the garden and its features. Survey findings suggest a corresponding range of garden visitor concerns about UAV use in public space, from fear and avoidance to acceptance Preliminary research conclusions suggests that large public open space venues may adequately serve a range of visitors with favorable and unfavorable opinions about the presence of UAVs. Under these circumstances, design guidelines could provide continuous landscape features with restricted aerial visual access surrounding and connecting public areas with aerial visual access.

Sylvia Janicki and Ken Yocom, 59, *Displaced by Illness: Exploring narratives of chronic illness for a more inclusive built environment*

The physical environment plays a critical role in human health. Research shows that certain qualities of a place can enhance our physical and emotional well-being. For populations living with chronic conditions without effective medical treatment or cure, the built environment presents an even greater potential as a source of healing. However, current built environment research in the context of public health largely targets illness prevention and promotes physical activity. Furthermore, existing design guidelines for accessibility primarily focus on accommodating mobility disorders, overlooking the experience of people who live with complex and under-recognized forms of disabilities and chronic illnesses. This study examines how individuals living with chronic illnesses experience and navigate everyday built environments and offers spatial design and planning recommendations that could serve to support these populations. Lyme disease was selected as a case study for this project due to its growing prevalence in the United States and the high level of impact it has on the daily function and quality of life of patients. Using a generative qualitative approach, narrative research was conducted through semi-structured interviews with eight individuals living with Lyme disease to understand their lived experiences relating to the built environment. Prior to conducting interviews, an interview protocol and informed consent form were submitted to the Institutional Review Board at the University of Washington. Upon approval, participants were recruited through postings on an online support group page, at a local clinic in Seattle, WA, and through snowball sampling. Interviews revealed that living with Lyme disease results in the experience of physical and social isolation that stem in part from diminished access to everyday places and the loss of shared activities with others due to

increased physical limitations and reduced perception of safety away from home. Furthermore, Lyme disease patients experience distinct challenges related to transit and safe housing. The study shows that the needs of people who live with chronic illnesses are not well represented in our built environment, demonstrating the largely unexplored potential of urban design and planning in providing agency to and improving the lives of this large yet hidden population. Interview findings were synthesized with three existing therapeutic design theories (Stress Reduction Theory, Attention Restoration Theory, and Universal Design Principles) to produce a set of design guidelines that serves to inform the design of supportive third places that could contribute to the well-being of those living with chronic illness.

Anna Maria Vissilia, Theodora Porfyraki, and George Papadopoulous, 392, *Assessing the Value of Outdoor Space in Nursing Homes: A case study for Athens Geriatric Home (Greece)*

This study investigates how the outdoor environment at Athens Geriatric Home is experienced by its residents and staff. Results are used to gain knowledge with implication for landscape design. The aim is to raise awareness and understanding of the variety of roles that the outdoor environment plays and how this affects experience and use of elderly people living in care facilities in Greece since there is an increasing global interest in improving outdoor environments as an important health resource for seniors. Access to green outdoors is widely documented in an increasing number of studies to have multiple physical and psychological benefits on humans. However, the evaluation of outdoor space usage as an important component to improve health and quality of life at senior care settings is still given less attention and there is limited research on environmental preferences and expectations of outdoor environments at nursing homes. In Greece, long-term geriatric care services for the large aging population have decreased dramatically in recent years and outdoor space has rarely been considered a valuable tool to meet well-being demands for elderly people. Issues of lack of outdoor space, underuse, and maintenance are often reported in the majority of case studies found in Greece. Very few of Greek elderly people are privileged to access and enjoy an outdoor environment, even if it is not successfully designed. In this context, the authors conducted a research on the Athens Geriatric Home situated in the urban core of Athens, the oldest one in Greece that dates back to 1873, in order to collect information on size, placement and quality of green spaces, using the Seniors' Outdoor Survey, a valid and reliable cross-cultural instrument developed through a series of research projects to evaluate the ability of green spaces based on how well they fit the needs and preferences of long-term care seniors. The study is based on literature review and data assessment, collected from responses of both residents and staff. The Athens Geriatric Home provides an important pilot research study, a first attempt to explore older people's attitudes toward, and use of, gardens and grounds as well as understand the significance of the green environment toward their well-being in Greece.

Eric Bardenhagen and Robert Brown, 500, *Microclimatic Design of Outdoor Places for Seniors*

Aging adults are increasingly making their homes in long-term care facilities. There are physical, mental, and social benefits to seniors who remain active, and long-term care facilities have responded by providing outdoor areas for physical activities. However, these spaces are often underutilized, a problem that can be linked to the subtle design and arrangement of the amenities and features within the space. One key area that may contribute to this underutilization is in how microclimatic-responsive design solutions are not well understood or addressed in these spaces. Seniors are particularly sensitive to environmental changes and their tolerance to thermal extremes is lower than that of younger adults. For example, outdoor courtyards in the full sun may be a barrier to use by seniors since their ability to regulate body temperature is slowed. To assist designers and care facility managers two audit tools have recently been developed. First, the Seniors' Outdoor Survey (SOS Tool) offers the ability to evaluate usable outdoor spaces for their potential to support the activities, needs, and preferences of aging residents. Secondly, the Shade Audit Tool identifies how the landscape affects the amount and type of solar radiation that a person would receive. Direct solar radiation can cause an elderly person to become overheated long before their body tells them

they are in danger, while ultraviolet B radiation can cause sunburn even when a person is sitting in the shade. Toward the goal of promoting positive change in the lives of older adults, this paper will present a review of how changes in microclimate affects seniors, a methodology used to collect vital microclimate data in long-term-care facilities and resulting design strategies based on these tools to assist designers and care providers. Understanding key outdoor space design parameters and the importance of microclimatic-responsive design strategies will allow care providers and design practitioners to connect older adults to outdoor environments that considers their health and well-being.

Pongsakorn Suppakitpaisarn, Brian Deal, Chun Yen Chang, and William Sullivan, 462, *Green Stormwater Infrastructure in Urban Landscapes: Perceptions, preference, and vegetation density*

Urban landscapes created challenges for designers and planners. In a city, we need space to accommodate people, infrastructure, and ecosystems. In the past decade, green stormwater infrastructure (GSI) has been implemented across US and Europe. GSI offers many ecological benefits. However, we know little about how people perceive and accept GSI as a part of their cities. GSI, such as bioretention or constructed wetland, can look widely different from the conventional Western landscapes because it contains tall grasses and dense plantings. This issue presented us with a gap in our knowledge. GSI is being implemented without a complete understanding of whether the communities in which they are installed can or will help maintain the infrastructure. If the GSI are not valued, they will be dismissed and replaced with pipes, pumps, and concrete so that the space can be occupied by other projects deemed more valuable such as housing. The purpose of this study is to understand how people perceive GSI landscapes. We sent out four sets of questionnaires via online crowdsourcing system. Each questionnaire contained 54 images with different levels of tree and bioretention density. Each image was accompanied by a question about naturalness, safety, messiness, or preference depending on the questionnaire. We then tested whether naturalness, safety, and messiness correlated with preference, and whether the tree and bioretention density influence these landscape characteristics (n=427) using ANOVA and correlation tests. We found the statistical correlations between preference and perceived naturalness and safety, but not perceived messiness. The images with higher tree density levels were perceived as natural and safe, and they were more preferred than the images with lower tree density levels. The images with the highest bioretention density scored significantly higher on naturalness, safety, messiness, and preference. This means that the designs of GSI which people feel natural and safe are more preferred. Designers and planners can achieve perceived naturalness and safety that by increasing trees and bioretention. Even though higher density level of bioretention make people perceive the landscape as messier, it did not affect the preference of the landscapes in this study. This study helps identify the characteristics that make people prefer GSI landscapes and can be used to inform planners and designers in implementing GSI in the future. Future studies should investigate the applications for different cultures and climates, the possible factors such as cues of care, and the seasonal effects on these urban landscapes.

Joanne Westphal, 404, *Diffusion Theory: The use of theory to predict public acceptance and adoption of green roofs*

From 2008-2013, the Green Roof Team at Michigan State University (MSU) conducted field research on many of the eco-service benefits of green roofs systems. After most of the field studies were conducted, the author began examining public and professional perceptions affecting the likelihood of green roof adoption in the Midwest. Two major survey efforts followed. The first involved a survey of professionals who commonly work in the built environment. Over 150 landscape architects, architects, planners, and building construction professionals in Michigan were asked to rank their perceived barriers to green roof adoption in the Midwest. Results from this first study indicated that the single most important barrier to green roof adoption was a "lack of information on the systems". The second study involved an invitation to participate in a statewide survey conducted by the MSU Institute for Public Policy and Social Research. This survey, which was coupled with five other "environmental

issues" facing the state, resulted in nearly one thousand residents across Michigan reporting their general acceptance of green technology in the state, and more specifically, their knowledge of, and perceived barriers to, green roof adoption for different building genres. In this study, the data confirmed what professionals in the first study thought—i.e., less than 10% of the study population stated that they knew "a lot" about green roof systems, while the remaining residents said they had "never heard" of (45%), or "knew only a little" about green roofs (45%). Despite this lack of knowledge about green roof systems, the statewide population was favorably disposed to considering the systems on different building types. This paper will discuss the major findings uncovered in these two studies, and it will use Diffusion Theory to explain how the perceived barriers relating to green roof systems may be overcome in both public and professional circles of influence. This paper is one of the few studies to date that actually addresses issues of green roof adoption due to perceived barriers to widespread acceptance among consumers and professional client groups.

Maria Counts, 414, *Beyond Beauty: Interpreting Lawrence Halprin's Greenville Main Street through the sounds of social exchange*

Critical to understanding the cultural significance of landscapes is developing an awareness of and appreciation for how they function as social generators. This paper revisits one of Landscape Architecture's most beloved Main Street projects, to explore how sound plays a role in revealing the interrelationship between a site's physical design and its success as an urban landscape by investigating its sonic implications in its evolution. The site explored is Greenville, South Carolina's Downtown Main Street designed by Lawrence Halprin Associates in the 1970s. An analysis of the soundscapes that occur at a series of study areas along the Main Street help to enable researchers and practitioners to appreciate more than the aesthetics and spatial relationships of the legacy Halprin left behind, but the pedestrian experience it provides as understood through sound. A new type of evidence emerges in support of landscape's ability to impact individual site legibility and the importance of the profession in playing a role in the daily lives of citizens and social discourse in the public realm. Overall, the paper finds that sound mappings and cross-comparisons with landscape architectural plans and archival photographs, when paired with sound recordings, can capture how people engage with one another based on physical space. In conclusion, differences in the human engagement and social interactivity and exchange can be attributed to specific site design elements, configurations and point towards an aspect of the profession that may in turn lead to new types of narratives and points of preservation.

Jessica Fernandez, 21, *Touching Base with American College Towns: A qualitative look at the built environment from campus and community perspectives*

Higher education institutions are currently experiencing a time of both physical and populace growth. Contemporary trends include large-scale campus expansions and revitalizing master plans, and colleges and universities are also playing an increasingly larger role in the development of their surrounding communities (Coulson, Roberts, and Taylor, 2015). However, these advancements are often accompanied by issues such as traffic and parking changes, unsightly views, and changes in the socio-economic structure of the campus surrounds. As college towns across America continue to transform and evolve, it is important to understand the perceived impacts of changes in the built environment and the environmental needs of the holistic college town community. As a lens for this study, stakeholder theory purports the necessity to include individuals and groups not directly related to an organization in decisions which affect those people (Zakhem, Palmer, and Stoll, 2008). In college towns, this theory supports that both campus and community representatives should be involved in the decision-making process of physical projects that affect both entities. A three-year research exploration of American southeastern college towns provides a platform to investigate the high and low points of the design and planning process from the perspective of both sides, as well as identified current design and planning needs at the intersection of campuses and college towns. The result of this study is a series of recommendations for improvement of both the social and physical

environments in the holistic higher education community. Methods include surveys and interviews of designers, planners, and other decision makers from three large public higher education institutions and their neighboring municipalities. Findings might inform future campus and community design and planning efforts, addressing processes which have proven successful or not successful and acknowledging current built environment needs from the lens of research participants. Outcomes include the potential for a physical community transformation that accommodates an inclusive campus-community experience, as well as social shift towards a more collaborative design process.

Yuanqiu Feng and Yun Hye Hwang, 432, *Mangroves for Whom?: A comparison of urban greening initiatives in an informal settlement*

Urban greening projects often garner enormous popularity in cities across the globe, but increasingly questions are asked about their environmental justice dimensions. In cities of the developed world, numerous scholars have pointed out gentrification as a potentially problematic outcome of popular greening projects (Wolch et al., 2014, Immergluck and Balan, 2017, Lim et al., 2013, Checker, 2011). However, studies that examine social equity issues in urban greening efforts in developing world cities are comparatively scarce. In congested and resource-scarce urban environments where a significant population does not have security of tenure nor safe environmental conditions, carving out space and resources for new greening projects should raise important questions of whom these projects will benefit. We discuss the development and outcomes of urban greening initiatives in Baseco, a large informal settlement in Manila. Baseco is a 56 ha. landfill off the estuary of the Pasig River in Manila Bay, densely occupied by approx. 100,000 informal settlers who have chosen to live in the harsh environment to be close to economic opportunities in the nearby piers and city center. From small community gardens to large-scale mangrove restoration, various organizations (government, NGOs, political figures, local leaders) have initiated urban greening projects at a range of scales to improve the livability of the landfill site and restore lost habitat. Based on fieldwork done in Baseco between 2011 and 2018, six urban greening projects led by different parties are presented and compared – three community gardening efforts and three mangrove restoration efforts. We collected data about the timelines and project motivations through government publications and interviews with key informants. UAV photography, on-site mapping, as well as site photography were used to corroborate and document changes in these projects over time in order to assess how they have been used, modified and/or maintained. Due to its particular context, the greening projects in Baseco have not led to environmental gentrification. Instead, when poorly designed and planned with minimal reference to community needs, they represent a waste of scarce resources at best, or the threat of displacement and loss of existing livelihoods at worst. Externally-conceived projects often produce design visions that are jarringly incongruous with the realities of living in an informal settlement, embodying the aesthetics and aspirations of an external organization. Availability of resources and political will allows these projects to be rapidly implemented, but their long-term sustainability is subject to political developments and changes in leadership without local community buy-in. In contrast, projects led by local community organizations can be slow to establish in its initial phases when large upfront costs are involved due to the lack of resources. However, we found that for both small-scale community greening efforts and more ambitious mangrove restoration plans, they had thus far achieved more long-term success due to dedicated maintenance by a few key community members who reside on-site and tend to them daily. This emphasizes the importance of producing designs that are locally relevant in order to ensure long-term sustainability of the landscape.

Mariami Maghlakelidze, Shan Jiang, Yang Song, and Dongying Li, 116, *Nature at Playground and the Impacts on Children's Play Behaviors: A comparative case study*

Play in nature and parks provides children with the opportunities for cognitive, emotional and social development (Mainella, Agate, & Clark, 2011). However, children in modern American society experience a lack of play in natural settings, which leads to not only play-deprivation but also "nature deficit disorder" -- a concept describing the diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses as results of alienation from nature (Edginton, DeGraaf, Dieser, & Edginton, 1995; Louv, 2008). A nature-based playground could promote children's physical activities and significantly prolong outdoor playtime (Barton, Sandercock, Pretty, & Wood, 2014; Coe, Flynn, Wolff, Scott, & Durham, 2014). Nature-based play may significantly contribute to one's cognitive and intellectual development as well as socioemotional outcomes in early childhood (Mainella, Agate, & Clark, 2011). Therefore, strengthening children's connection with nature at outdoor playgrounds has become an emerging topic in recent years. This study aimed to examine the impacts of natural elements, play devices, and landscape-design features of outdoor playgrounds on children's play behaviors. Two outdoor playgrounds in Washington, D.C. were selected for this case study; one has a high green coverage ratio with direct visual and physical access to natural elements, while the other has a low green coverage ratio with limited visual and physical access to street trees from the playground. Following the play observation scale (Rubin, 1989), children's cognitive and social play behaviors were observed and mapped through the Geographic Information System (GIS) Cloud program on the two sites. Other variables included the site's hourly sun exposure and shade analysis derived from the LiDAR data and EnergyPlus weather data, one's visual and physical access to nature, and the green coverage ratio of the site. Preliminary findings indicated that play behaviors varied among different age and gender groups of children. Certain play behaviors correlated with the visual and physical access to natural elements. The green coverage ratio of a playground and play devices significantly predict preschoolers' types of social play behaviors. This study also tested the effectiveness of a research protocol of combining site observations with LiDAR and GIS spatial data analysis. The findings highlighted the important roles the design characteristics of the playground in shaping children's play behaviors and called attention to the thermal comfort of children during play.

David Watts, 267, *White Brain Matter and Play*

A current direction in research is exploration of the physiological basis for high order cognitive functioning and behavior, which has led to increased scrutiny of white brain matter. White brain matter is tied to the development of executive function in the brain which encompasses self-regulatory skills, focus and attention, and flexible thinking (5). It has been shown that executive function skills are important for school readiness and for long term career success (6). The brain contains grey matter, and white matter with the latter accounting for approximately 50% of the human brain (1). Its name comes from the electrical insulation (myelin) that acts as a high speed transmission for electrical impulses in the brain affecting executive function. Brains continue to undergo myelination, the production of the myelin sheath, through at least the first thirty years of life. New studies have indicated that this process actually continues throughout our entire lifespan (3). A key component of this process is white matter plasticity, the ability to modify the organization of myelin structure and function in response to experience (4). Children are not born with executive function skills, but with the ability for their development (5). Studies have shown that a child's environment can have a significant impact on the process of myelination. The environment can facilitate, and enhance myelination as it can also inhibit and stint process development. A recent study has identified a corollary between children in low socio-economic status and levels of white brain matter (2). Studies have indicated that within outdoor environments two significant types of experiences can have a positive effect on the development of white brain matter in children and adults. These are concentrated physical exercise (aerobic activities) and the learning of a complex new skill such as learning a new language or a musical instrument (3, 1). This literature review discusses the connections that exist between the physical environment of children, primarily the playground, and the physiological changes occurring within the child. Historically, playground research has discerned benefits from behavioral observation, but with the white matter research, behavior can be attributed to a physiological phenomenon responsive to the environment. The review will identify research questions including what design interventions can affect myelination? Which ones can facilitate the learning of a complex new skill?

What role do musical instruments have on the playground? Future research should afford landscape architects with design direction to effectively inform the utilization of limited resources in the creation of playgrounds.

Xiangrong Jiang Jiang, Chun-Yen Chang, and William Sullivan, 476, *Effects of Green Infrastructure on Directed Attention Recovery*

Directed attention is what we rely on to get every achievement in life, but it is easy to fatigue. Exposure to nature enhances the resources necessary to replenish our directed attention. The benefits of GI to ecosystem have already been recognized, while there are also potential benefits to human health (Tzoulas, Korpela et al. 2007). Previous studies have shown that some types of GI (e.g., trees, roof gardens) can promote attention restoration from mental fatigue (Van den Berg, Hartig et al. 2007, Jiang, Chang et al. 2014). However, we know essentially nothing about the extent to which other types of GI (e.g., bioswales) promote recovery from mental fatigue. The gap in our knowledge prevents us providing the desired solutions in design and city administration to promote public health. As GI has become a prevalent natural resource for urban residents, it is important to understand which type of GI is most effective in promoting attention restoration. To fill the gap of our knowledge, we have conducted an experiment to examine the impact of exposure to GI on attentional functioning by Sustained Attention Response Task (SART). The data presented here is a part of the study called Landscape on the Brain. We recruited 62 participants and randomly assigned them to watch one of three five-minute videos as a natural treatment. The video treatments showed a) urban settings with no GI, b) the same setting with trees, c) the same settings with trees and bioswales. After the pre-processing, 43 out of the 62 samples are qualified for further analysis—14 in NoGI group, 15 in Trees group and 14 in Trees&Bioswale group. Then we did a between-group comparison to explore the SART results before and after the video. The results show that participants who watched the video with trees have a significant improvement in their directed attention while participants who watched trees&bioswales keep their attentional capacity. However, participants who watched video with no GI have a significant decrease in their directed attention. The findings support that exposure to trees are beneficial to mental health. Urban settings with no vegetation can easily contribute to mental fatigue. Adding newer types of GI like bioswales may neutralize the positive effects from trees. Further research is needed to test out the performance of bioswale in promoting attention restoration.

Bin Jiang, Jielin Chen, Jibo He, Hua-qing Wang, and Christ Webster, 370, *A Trade-off Effect: Comparing impacts of a variety of freeway landscapes on drivers' driving performance and self-reported mental status*

Driving on the freeway is a daily but unhealthy activity for tens of millions of people worldwide. Although plenty of studies examined on safety issues of the freeway system, what they rarely investigated is impacts of freeway landscapes on driver's mental states. This experimental study used driving simulation system and visual-analog scale questionnaire as main instruments. We compared 32 subjects' driving performance and self-reported mental status during their driving on an identical freeway with six different types of landscapes which include barren, turf, shrub regular, shrub random, tree regular, and tree random. The results show the shrub random yields the best objectively measured performance and the tree regular yields the best self-reported psycho-physiological status. The findings suggest a trade-off effect: Impacts of landscapes on performance and mental status are optimal when a landscape is not at two extreme conditions: low information load/monotonous (barren) and high information load/diverse (tree random) landscape.

Elizabeth Boults, Marc Treib, Clare Cooper-Marcus, Achva Stein, and Deborah Giraud, 119*, The Meaning of Gardens, Revisited*

Thirty years ago, professors emeriti Mark Francis and Randolph T. Hester, Jr. organized a two-day symposium at the University of California, Davis, to "define and debate what role gardens play in people's lives and in society." Drawn from diverse fields of expertise, participants examined how meaning is constructed and perceived in gardens and garden-making. The resultant collection of essays, The Meaning of Gardens, edited by Francis and Hester and published by MIT Press in 1990, provided a broad perspective on the human/environment relationship and was widely used as a text in introductory courses in landscape architecture and environmental design. Contributors elaborated on the context and motivation of people who shape and experience gardens as manifestations of "idea, place and action," representing the influence and development of place-based theories in landscape architecture at that time. The content was further organized by the editors according to "six oppositions that the garden transforms into muses," namely concepts of faith, power, ordering, cultural expression, personal expression, and healing. At a time when gardens received little attention in academic journals and professional publications on landscape architecture (as indicated by a subject matter inventory of Landscape Journal and Landscape Architecture magazine from the 1980s), Francis and Hester positioned the garden as a powerful metaphor for inspiring positive social and environmental change; they argued that gardens—tended with "sunshine, skill, love, struggle and good dirt"—inherently represent hope, a belief in a better future. In addition to its renewed focus on gardens, one may contend that The Meaning of Gardens was significant in provoking renewed interest in landscape architecture theory and in providing a framework for a wealth of discourse, particularly discourse concerning the role of landscape meaning and representation, generated in the subsequent decade. To acknowledge and assess the impact of The Meaning of Gardens, this panel brings together four contributors to the original symposium at UC Davis and the subsequent publication to reconsider the position of gardens in our individual and collective lives. Panelists, representing both academic and professional perspectives, will reflect on their initial assumptions, and comment on what factors and forces may have emerged in the last three decades to influence how gardens are understood as idea, place, and action today.

Bruce G. Sharky, 29, *Hiding in Plain Sight: The importance of shadow (awareness) in landscape architecture design*

This paper is reporting a current research in progress. This research is an exploration in the choice and placement of plants in the landscape considering shadows cast to create an intentional result and experience To summarize this paper has a threefold purpose: first, provide an overview of the perception and impact of shadows in the landscape, second, introduce how to bring affecting shadows as an intentional rather than accidental design enterprise, and third some thoughts for the designer to incorporate shadows in landscape design. In other words: considering the choice and placement of plants and other constructed elements in the landscape to create an intentional designed result heightened with the experience shadows. For a long time I have had an interest in the play of sunlight and shadow on planer surfaces more recently evolving an idea that the study and consideration of shadows—in particular shadows cast by plants—is worthy of serious study. I argue that shadows should be one of the considerations in addition to the standard plant selection criteria of form, color, texture, and seasonal variations that a landscape architect considers. Figure 1: Shadows in the Landscape . The images in Figure 1 demonstrate how shadows can affect--in tandem with sunlight—visual and emotional responses and imbue experiential qualities of space. In the following I explore the following themes that I have researched, thought about, and observed.: 1. Introduce the idea of appreciating shadows and that they are and should be considered important attributes of our visual environment as we appreciate the architecture and landscape architecture of the design environment. . 2. Introduce the idea of the importance of the shadow creation of plants meriting study when learning about plants and the aesthetic potential in selecting plants of shadow qualities as we do currently with the color, form, structure of plants. 3. Introduce the potential of how shadows affect emotional and feeling in landscape spaces. I have approached the topic as one of art rather than of mathematics and science. In my effort to better understand the

design potential of shadows I have found that they imbue powerful layers of affecting content in the visual realm of landscape design. Shadows augment color and form to constructed objects and landscape materials. They aid in judging distance, time, and shape.

Melissa Currie, 341, *The Formation of Social Capital in Newly Constructed Neighborhoods*

What factors encourage or discourage the formation of social capital and community resilience in neighborhoods geared toward affordable/workforce housing and vulnerable populations? Newly built starter-home neighborhoods-first introduced in the mass--produced Levittowns and commonly called "cookie-cutter"-pre-sent a unique opportunity to answer this question. Lessons learned from divergent neighborhood outcomes help us better understand how to build more resilient neighborhoods and avoid constructing neighborhoods "built to fail." Including survey data in research introduces people's experiences and viewpoints, and helps us learn things that can only come from the perspectives of those living in the neighborhoods-for example, why someone chooses to move to a particular neighborhood, what things are liked/disliked about the neighborhood, feelings of safety, and the social dimensions of a neighborhood. These factors are indicators of social capital and in this study, door-to-door surveys of starter-home residents were used to try and understand its formation in newly built neighborhoods and how social capital is associated with resilience. Results show the building in of resources, including providing open spaces, street trees, quality construction practices, and locating neighborhoods near amenities and away from harm-ful land uses, facilitates the formation of social capital and resi-lience in newly constructed neighborhoods.

Joshua Goeden and Don Burger, 34, *The Role of Landscape Architecture in Cognitive Mapping*

The Image of the City (Lynch, 1960) provides a theory of how people perceive the built environment. This was one of the first major studies that dealt with the topic of cognitive mapping, or the mental images that people create while observing their surroundings. According to Lynch, there are five major feature classes that help to construct these mental maps: paths, edges, districts, nodes, and landmarks. Another spatial study states that the large-scale environment is too extensive to be perceived in its entirety (Weisman, 1981). Rather, the relationships between smaller elements are stored in the mind. In cities, parks and public spaces form a portion of these elements. However, the role these features have on cognitive mapping is largely undetermined. The goal of my study is to attempt to define this role. Over the past seven years, landscape architecture students at South Dakota State University have worked on a cognitive mapping exercise focused on how SDSU students generally perceive their campus. Mostly, campus greenspaces and other landscape features were absent from participants' cognitive maps (Burger, 2018). These spaces were left as unlabeled voids between the footprints of the buildings, parking lots, and roads of the campus. This led to a scalar question- does this absence persist at the city scale? This study examines whether parks and other public spaces are absent from the resident's cognitive maps in Brookings, South Dakota. Participants were recruited during community events and asked to draw a map of the City of Brookings from memory. They were then asked to orally describe their daily commute. Finally, they were asked a series of demographic questions, including where they lived within the community. A content analysis (ongoing) reveals how prevalent landscape features are to each participant and where these features fit within cognitive mapping theory. My hope is that the results of this study will help open up discussion on what the role of parks and public spaces should be with regard to wayfinding, and to open up further research on the relationship between cognitive mapping, park usage, and park design.

Gabriel diaz Montemayor, *232, The Reach of a Public Mile: A case study in Latin American landscape architecture practice*

The purpose of this study is to analyze the design implementation of a recent case study in Latin American public space. The Vistas Cerro Grande Linear Park is one mile long and 140' wide. It sits in a very low-income

neighborhood of Chihuahua, Mexico. Its main programmatic capacity is a polyvalent strip where a weekend market provides general supplies to an otherwise food and commerce 'desert'. This project is framed in the larger urban and social context of the XXI century in Latin America, where exemplary practices focused on 'social urbanism' originating in Colombia or Brazil, are often thought to be a widespread mode of operation. Unfortunately, most public projects in Latin America's second largest economy, Mexico, are not guided by principles of social and environmental justice. This study intends to demonstrate the viability of projects intersecting a top-down decision with a bottom-up configuration. The analysis highlights how a participatory process deployed to determine a public space program was effective in delivering a polyvalent infrastructure capable of maintaining existing practices on site but also deliver additional functions. This study suggests how this process of implementation could become standard practice, particularly in locations with high responsibility to increase the quality of human life while mitigating socio-economic poverty and environmental issues. The analysis studies the whole process of design implementation. It compares original design intentions with the actual built version. From the original contractual terms, through all design phases, to post-construction site visits. It looks at the tools and methods employed in the participatory process, conceptual design and schematic design, construction documents and budgeting. A series of qualitative post-occupancy visits, based on observations done at pedestrian and aerial levels, contribute to a positive preliminary evaluation of the project's social performance. Unfortunately, the project delivers limited environmental benefits, particularly when compared to the original design intentions. The study confirms how in similar contexts of urgency, social priorities continue to prevail over ecological concerns for both politicians and communities. This project is presented as a significant reference for the growing number of Latin American Landscape Architecture and Urban Design practices interested on improving social conditions. Evidence of this, is its selection as an honor award in the parks and recreation category of the 2018 Third Latin American Landscape Architecture Biennale, where, according to the jury's comments, the social focus of the project was what made the difference in the most competitive category: built parks and recreation projects.

Chanam Lee, Sungmin Lee, Robert Brown, Forster Ndubisi, William Sullivan, Jun Hyun Kim, Naomi Sachs, 151, *Landscape Architecture for Health: Weaving health into landscape architecture research*

Background: The built, natural and social environment that landscape architects design and study influence public health directly by exposing people to healthy/unhealthy features (e.g. urban nature, microclimate, pollutants) and indirectly through behaviors/lifestyles (e.g. physical activity, crime). The first panel on "Landscape Architecture (LA) for Health" was presented at the 2017 CELA conference, which involved facilitated discussions around the three domains of protecting, developing, and restoring health. The first panel focused on putting forward LA for Health as a timely and interdisciplinary area of scholarship and education in LA. Introduction: The 2017 CELA attendees were invited to complete a short survey (n=43) designed to gauge their level of interest in LA for Health. Among the three broad areas of LA for Health applications, the majority (86.1%) expressed their interest in research, followed by practice (53.5%) and education/teaching (41.9%). For the specific research topics, the top five were active living and walkability (58.1%), quality of life (55.8%), therapeutic landscape (51.2%), microclimatic design (39.5%), and healthy aging (39.5%). Purpose: Responding to the results from the above survey and the panel-audience discussions during the 2017 CELA conference, the 2018 panel takes the next step by focusing on the "disciplinary" and "research" discussions on the LA for Health initiative. Panelists: This panel brings experts in LA for Health research, who will address a wide range of topics including (a) active living and walkability–Chanam Lee; (b) therapeutic landscape–Naomi Sachs; (c) quality of life–Jun Hyun Kim; (d) microclimatic design–Robert Brown; (e) healthy aging–Sungmin Lee; (f) healthy communities and landscape ecology–Forster Ndubisi; and (g) urban nature and restorative landscape–William Sullivan. Structure: The first half of this panel session will feature presentations by the panelists showcasing their recent/current research, including their assessment of current knowledge status, critical research gaps, and key frontier issues. For the second half, the moderators (Chanam Lee and Sungmin Lee) will facilitate the panel-audience discussions on strategies to promote

LA for Health research within CELA and beyond, which may include establishing a CELA track, interest group, and research consortium; publishing journal special issues and books; and offering funding and grantsmanship training. Learning Outcomes: Attendees to this panel discussion will be able to gain and share insights related to LA for Health research. They will also be able to understand diverse research topics in LA for Health, and be engaged in discussing and joining relevant initiatives/efforts aimed at promoting LA for Health research.

Dongying Li and William Sullivan, 168, *Nature and Learning: Density of tree canopy cover in school surroundings and high school academic performance*

High school achievement has important personal and social implications. However, in recent years, unsatisfactory academic performance in high school and increasing drop-out rates have raised concerns in the United States. An often-neglected factor that might have considerable influence on performance is the physical environment. Nearby nature offers salutary effects to children and adolescents, e.g., reduce stress, relieve mental fatigue, develop resiliency, and build protective social relationships. However, few studies have examined the relationship between the canopy cover beyond the school campus and students' performance. In this study, we examined the association between the density of tree canopy cover in school surroundings and school-level academic performance of public high schools in Illinois, US (N=624). Performance data were extracted from the Illinois Report Card provided by the Illinois State Board of Education, which included information on ACT scores, college readiness, freshman-on-track, and four-year graduation rates. The percentage canopy cover in school surroundings was derived from the 2011 National Land Cover Database canopy product. The appropriate ordinary least squares (OLS) or simultaneous autoregressive (SAR) models were fitted to test the associations between canopy cover and the students' performance. Results of the study confirmed the positive relationship between nature in school surroundings and school-level performance. Percentage tree canopy within a 1-mile radius of high schools was positively associated with ACT scores, college readiness, and marginally positively associated with freshman-on-track, even after controlling for factors known to influence academic performance. However, the four-year graduation rate was not correlated significantly with tree cover. Testing the effects of the different buffer distances, ACT was significantly related to tree cover at all distance, but the relationships between tree cover and college readiness and freshman on-track were only significant at the 1-mile buffer distance. The results of this study, along with similar findings from recent studies, create a small body of evidence showing that exposure to tree canopy may benefit adolescents' academic performance, suggesting the importance of forestry management in school surroundings in supporting learning.

Wenwen Cheng and Robert Brown, 176, *Designing UV Healthy and Thermally Comfortable Schoolyard Environments in Low Latitude Urban Areas (College Station, TX)*

School children are often required to spend a considerable amount of their day outside (Antoniadis et al. 2016). There are many benefits to outdoor activities but, without careful design, schoolyards can have negative effects on children's health. For example, school grounds that are too shady might be depriving children of the opportunity to produce sufficient Vitamin D which can lead to rickets and cardiovascular problems, while schoolyards that have insufficient shade have been identified as urban hotspots that might be putting children at the risk of heat-related illnesses (Vanos et al. 2017). Determining the appropriate amount of shade in a schoolyard is complicated by three factors. First, it is ultraviolet radiation (UVR) that is used by the body to create Vitamin D and is also responsible for causing sunburn. However, unlike visible light, UVR is scattered by the atmosphere and comes equally from all parts of the sky. This means that providing overhead shade structures is only part of the solution. Secondly, children's bodies respond differently to heat than adults, yet all human energy budget models are designed specifically for adult bodies. And thirdly, guidelines cannot be universally applied as the health risks are latitude- and climate-dependent. For example, northern locations and cloudier climates are at more risk of providing insufficient solar access, while southern locations and sunnier climates are at increased risk of allowing too much.

Our study has begun investigating the first two questions in the context of the thirds – the southern location of College Station, Texas. UVR sensors have been calibrated and the experimental configuration has been designed. This matrix of 6 UVR sensor collects data in the four cardinal directions plus upward and downward. Tests on a range of landscapes will identify the physical characteristics of a site that affect UVR. Physiological characteristics of children have been acquired from the literature and used to modify the COMFA (Kenny et al 2009) human energy budget model (Kenny et al 2009) for young bodies. This COMFA-kids model has been tested against data from the literature, and will be tested in a range of outdoor conditions. The results of this study will provide a deeper insight into the effects of school ground design on levels of ultraviolet radiation and the thermal energy budget of children and will lead to latitude- and climate-specific design guidelines for providing healthy outdoor school environments.

Michael McCullough, Michael Martin, and Mollika Sajady, 180, *Building the Outside-in Classroom*

This paper describes a primary school-level curriculum proposal that engages students in a project-based learning module. The module includes environmental education as well as design, installation and maintenance for a "green wall" system constructed within the students' classroom, an effort that includes the active participation of the students. The proposal is grounded in pedagogical research that indicates educational benefits from learning environments that incorporate components of the outdoors, as well as research that supports active-learning/project-based curricular strategies. Our premise: contemporary (and relatively inexpensive) modular green wall technologies create opportunities for the transformation of classrooms as learning environments, while affording instructors and students the opportunity to be directly and continuously involved in that transformation. Studies in applied pedagogical design have shown that, at all educational levels, direct exposure to the natural environment can enhance learning by improving student attention and behaviors (Kaplan, 1995; Taylor et al., 2002; Li and Sullivan, 2016; McCormick, 2017). Implementing green walls—a "vertical garden", or "living wall" interior wall that typically includes greenery, a growing medium (soil or substrate) and a water delivery system—provides environmental health benefits, but also potentially provides a practical application within classrooms for minimizing directed attention fatigue in students by connecting them to "outdoor nature" within the indoor environment. Hands-on "project-based" learning is another pedagogical strategy that has proved to be effective across the spectrum of educational levels and across subject areas (Lieberman and Hoody, 1998; Chawla et al., 2014). Design and construction of a simple modular green wall system has the potential to inspire critical thinking through a combination of project-based learning strategies and environmental education. The authors have outlined a curriculum involving the implementation of an indoor living wall system within a classroom-learning environment, incorporating project-based learning modules that interact with the wall. In conjunction with the passive health benefits of a green wall, project-based curriculum models can connect students interactively with indoor nature and have the potential to inspire real-world thinking related to science, technology, engineering, art, and mathematics fields within the indoor learning environment. Through a combination of these passive and interactive modes, students are connected to nature in the indoor environment, regardless of weather conditions outdoors. Future research direction could include post-construction studies of the effectiveness of project-based curricula related to living walls, and the long-term impacts of implementing green walls in classrooms on school achievement and student behaviors.

Nathania Martinez Gonzalez and Alpa Nawre, 111, *Lessons for Designing Outdoor Classrooms for Middle-school Students*

Many children spend a third of their day in school, yet, with the exception of few, public school grounds in the United States do not encourage children to interact with their local natural environment. Richard Louv, author of Last Child in the Woods, concluded that our "mental, physical, and spiritual health" depend on reducing what he termed a "nature-deficit disorder" that alludes to the increasing divide in the relationships between nature and childhood (Louv 2008, 3). This study describes outdoor classroom space elements that are optimal for lessons and

will inspire middle school teachers—with fifth to eight grade students—to teach lessons outside and develop opportunities for increased environment-based education. The results from the surveys and interviews undertaken as part of this research help landscape architects to understand the physical conditions under which teachers teaching any academic subject will take a lesson outdoors. Methods used for this study include a review of existing literature; interviews with middle-school teachers concerning their ideal outdoor learning gardens and current use of the campus grounds for lessons; an online survey asking of alumni to describe experiences with outdoor learning during their schooling; and a participatory-workshop with current students that focuses on their experiences and perceptions of their campus grounds. The investigation site is on the grounds of P.K. Yonge Developmental Research School. PKYDRS is a public institution affiliated with the College of Education at the University of Florida, with a mission to design, test, and disseminate innovations in K-12 education, while serving a diverse community of students from kindergarten through 12th grade—an age range of 4-18 years old (P.K. Yonge, n.d.). The analysis of information compiled through this research provides an understanding for the kinds of elements teachers, specifically middle-school teachers, require in outdoor teaching spaces. These elements range from ambience, work and demonstration surfaces, seating arrangements, storage, to technology. Preferences for these elements begin to inform on how formal, informal, or flexible these spaces are. The results from this study are limited by its sample size, constrained to its geographic location, and influenced by its school's technology-based pedagogical focus. However, this study calls broader attention to the lack of federal or local mandate to address secondary school campus grounds design. And most importantly, it provides a better foundation for landscape architects to be leaders on this issue and enhance landscape performance of school grounds to bridge the gap between children and nature.

Sara Hadavi, Paul Gobster, Alessandro Rigolon, and William P. Stewart, 413, *Greening Vacant Lots, Visual Quality and the Issue of Crime in Urban Residential Areas: A longitudinal study*

Urban vacancy has been a pressing issue for many cities in the US. High amounts of vacancy can facilitate criminal activities and reduce resident safety and other aspects of neighborhood quality of life. A growing body of literature focuses on various ways to alleviate these issues (1,2). Different strategies have been implemented to address crime in high-vacancy urban neighborhoods, including the sale of city-owned vacant lots to property owners living on the block. This study evaluates whether one such initiative, the Large Lot Program in Chicago, has contributed to reduced crime. After more than two years of running the program, we are exploring the potential outcomes of the program. We hypothesized that with social use and visual signs of improvement made by new owners, city blocks with lots sold through the program will see declining crime rates compared to blocks without such lots. The study sites include Englewood and East Garfield Park neighborhoods. Using a sample of 2063 residential blocks, 234 of which had at least one Large Lot, we examined crime density for two years before the Large Lot purchase and two years afterwards. We used spatial lag models in which one of the independent variables of interest was an index of visual lot condition and care indicators identified in the cues for care literature (3). The models controlled for demographic characteristics, amount of vacant lots, and adjacency to several land uses potentially associated with crime (4,5). Crime data was acquired from Chicago Data Portal, demographic data and vacant buildings from American Community Survey, and vacant open spaces from City of Chicago landuse map. The values were calculated at block level. The data was spatialized in ArcMap and GeoDa. Our initial findings contribute to existing research on urban greening and crime in several important ways; they support earlier studies showing that vacant lot greening is associated with reduced crime density, but unlike many studies they show that this relationship holds when using a finer-grained, block level unit of analysis. Further analyses are expected to demonstrate that the quality of greening can play a significant role in reducing crime density. These findings have useful implications in planning and design of safer residential neighborhoods through community engagement and resident-led beautification.

Robert Ryan, Paige Warren, and Brenda Bushouse, 62, *Re-connecting Local Residents to Urban Forests: Implications for place attachment, ecology, and stewardship*

Urban forests face many challenges, especially in economically struggling cities where declining municipal budgets can lead to minimal maintenance of public parks and conservation areas. The result is forested areas and park trails becoming overgrown, especially with invasive non-native species. To fight these unintentional landscape changes, park managers are increasingly turning to local non-profit groups to partner in stewardship activities. However, little is known about the public's willingness to engage in these activities and their motivations particularly as their nearby parks and forests continue to be neglected. Local residents' attachment to place is one potential motivation to become active in stewardship programs(Ryan, 2005), but little is known about how place attachment may change in the face of landscape change caused by declining maintenance. Place attachment has been found to motivate local residents to take action to address urban neighborhood issues, but less is known how this manifests itself in urban forests (Manzo and Devine-Wright 2014). Moreover, the landscape changes to urban forests caused by declining maintenance may also have implications for the biodiversity of these remnant ecosystems that may be apparent to local residents. There is a need to understand the attachment local residents may have for these nearby urban forests and their willingness to become engaged in stewardship activities. In order to explore these relationships, this study examined urban forests in parks and conservation areas within a mid-sized, New England city, Springfield, Massachusetts. The study used interviews and focus groups with forest users, neighborhood leaders, and public officials to understand current use patterns, place attachment, as well as willingness to engage in pro-social behavior and stewardship activities. Ecological studies of bird diversity (species richness) and non-native invasive plant abundance were conducted to understand the forests' ecological health. Taken together, the study examined how landscape change in these urban forests affected public access, use, and place attachment, as well as impacted the ecosystems within them. This pilot study discovered that urban forests are often hidden, and relatively unknown to local residents, especially if not associated with a more active recreation park. Local residents had stronger place attachment in forests with more use and access, and greater willingness to engage in stewardship activities. Biodiversity, as measured by bird species richness, was higher than expected, especially in areas with higher access. This research suggests that forest managers should increase opportunities for public access to build a stronger connection between local residents and their nearby forests. Developing stewardship programs where local residents engage in removing invasive species and clearing overgrown areas could help create a positive feedback loop for both local residents and the forest ecosystems.

Xiyue Wang, Shiyang Zhang, and Xiangrong Wang, 387, *Interstitial Urban Space: Strategic framework of urban wildscape in the context of living environment*

In cities undergoing excessive rapid urbanization process and horizontal spread, the increasing amount of the urban built area has led to the continuous encroachment to the natural land and expansion to the urban fringe, resulting in the ecological degradation of the living environment, as well the loss of urban characteristics and the decline of urban space quality. In this context, this paper proposes to restore the damaged natural environment and topography in the city from the perspective of landscape architecture: utilizing the neglected urban wilderness as the basic carrier to revive natural force of urban landscape spaces, repair the landscape topography and therefore to enhance the city characteristics and vitality. A growing amount of vacant lands exist like the "interstitial" space of urban area, they are formed for complex reasons. Some of them were the left behind in the rapid urban expansion left deserted for long time, some were abandoned in the gap of land renewal and grew wild. Such interstitial sites often have complex background, luxuriant naturally restored vegetation and ambiguous function. The paper suggests that if combined with long-term planning, reasonable design and management, they are capable to be utilized to stimulate the urban vitality, strengthen the ecological service, enhance the city quality and character. This study first explores the historical connotation of wildscape in the context of living environment, and discriminate its conceptual relationship with natural landscape and waste landscape in the discipline, further the

contemporary cognitive pattern and development of wildscape in urban green space is discussed. On this basis, urban wildscape sites are categorized representatively into: the protective utilization of the primary wilderness landscape, the restoration of the secondary wilderness landscape and the creation of the wildscape. Accordingly, based on current urban wildscape practices home and abroad, a strategic guideline framework is put forward respectively for the three categories, along with its pros and cons and the applicable site situation, namely, tabula rasa approach, heritage approach, conservation zoning approach, dynamic control approach, public participation approach, landscape narrative approach, function transition approach. The dynamic natural process onsite of wildscape as its core value and resource in the urban context, which can be integrated into a coherent green infrastructure, be reused as public green space for daily recreation or as a site base for city events. The strategic framework for urban wildscape proposes that these interstitial spaces have the potential to provide efficient and economical solution for the planning, design and management of urban green space, and is possibly to become the trigger point of restoring the urban nature-initiative environment and enhance the space quality and to strengthen the ability of the city adapting to the natural spontaneous succession process, thus as a medium to couple human activities with the force of nature initiative in the urban development. The study may provide a reference for the survival, sustainable development and construction of the wildscape in the future urban space, and a viable method to cope with the degraded urban spaces.

Fatemeh Saeidi-Rizi, Wen Ling Chung, Chun-Yen Chang, and William Sullivan, 384, *The Impacts of Exposure to Urban Nature on Healthcare Workers*

With growing urban populations and increased scrutiny over budgets and time, healthcare workers are under increasing pressure to deliver high-quality care. This is while their job is critical, requiring alertness and efficiency. How might healthcare workers respond to these demands while they must spend the majority of their time inside the hospital and clinics? Previous research indicates there is a positive association between exposure to green outdoor space and recovery from mental fatigue and decrease of stress and anxiety. Therefore, in the current study, we investigate how taking an occasional break in a green setting allows them to restore and recharge their attention and reduce the anxiety and stress that they are encountering. To explore this hypothesis, we conducted an experiment, through which healthcare workers were randomly assigned to walk three times a week in an urban green space or urban space that lacked vegetation. We collected data using a controlled randomized experimental design with 50 participants. Eligible participants were chosen among the intern doctors and nurses working at National Taiwan University Hospital (NTUH). The nature group walked in DAAN Forest park in Taipei, and the urban group walked in an urban area which had no vegetation. Each participant in each group walked three times for 40 minutes in one of the assigned environments during one week. During the walk, participants wore a GPS sensor which recorded the path they walked and showed heart rate variability (HRV). After each walk participants were required to answer three online questionnaires (State-Trait Anxiety Inventory, Attentional Functioning Index and Affect Grid). Preliminary analysis reveals a significant difference in attention and anxiety levels between the two groups (urban walk and nature walk), suggesting that even a short contact with nature in an urban setting can promote recovery from mental fatigue and reduce anxiety level and stress. This outcome has significant application for healthcare practitioners who work under stressful conditions, whose mistakes can have life-altering consequences.

Mei Yang and Zhaoyang Feng, 68, *Comparative Study on Spatial Forms of Ancient Waterside Towns Based on Google Earth Pro: Taking the example of Qingmuchuan, Fenghuang and Houliu in Southern Shaanxi, China*

The purpose of this study is to address the problem of ancient towns dying out in developing countries, particularly China. Intensifying conflicts between human settlements and the natural environment are described, and guidelines

are proposed for the development of waterside ancient towns in China's southern Shaanxi Province in the interest of conserving cultural and natural heritage. The towns of Qingmuchuan, Fenghuang and Houliu were selected as representative examples due to their strong reputation among tourists.They have the characteristics of traditional southern Shaanxi towns, but each has a completely different layout, space and structure. The comparative findings of this research provide a point of reference for establishing guidelines to preserve the integrity of ancient towns worldwide. In this paper, we compare the geographical conditions with the layout and texture of the streets by Google Earth Pro. And we analyze the details of spaces along the river zones, architectural styles and building decorations in order to research the relationship between the natural environment and the human settlement conditions. We note the unfortunate common trend of commercial development steadily taking over the natural environment, particularly the rivers and unique elements of the old towns. Finally, we summarize the similarities and differences of the spatial forms among these towns and put forward proposals for the further development of ancient towns. This research is important for all regions who stand to lose their national treasures. Consequently, measures should be to taken to curtail hyper development before we lose our historic scenery.

Sijie Wang and Xiong Li, 127, *Low Impact Development of Green Space in Shallow Mountain Area--Based on Water Balance*

The development of hillside area in urban regions is a global issue. Hillside area mainly includes mountains below 300 meters altitude or those with local elevation ranges in 300 meters. As a transitional zone connected urban and nature, hillside area is significant in the preservation and construction of ecological environment. Therefore, the study chooses a particular site near the central city, which is planned to build as a country park considered both nature preservation and urban recreation, according to the superior planning of local government. The site is located at the eastside area of West Mount in Shijiazhuang, Heibei Province, which is a typical region in the North China Plain with the shortage of water resource and uneven distribution of annual precipitation. Therefore, the core conception of this study is attempting to maintain the water source demands of this country park only by recycling stormwater from the hillside and save the deficient city domestic water which is massive used in maintaining city parks. Considering the low-impact development planning ideas and the characteristic landscape features of the hillside areas in the larger North China Plain, the study proposes an overall planning concept of ecological priority, natural balance and landscape integration. A strategy is proposed through the calculation of precipitation runoff and the estimation of water demand for common garden plants, based on the existing natural conditions in this region and the analysis from data of current topography, geomorphology, relevant superior planning and field research. The research achieves the objective of the ecological and water-saving green space planning in hillside areas by the result of using the method of quantitative balance to calculate the stormwater recycling in the area, irrigation water demand of vegetations and then divide the proportion of irrigation and non-irrigation vegetations in vegetation planning. Through scientific and rational quantitative research, the study introduces a theoretical support for low-impact, low-interference and low-maintenance planning practices in typical hillside areas in the North China Plain and analogous regions around the world.

Sungmin Lee, Chanam Lee, Wei Li, Minjie Xu, Xuemei Zhu, Sameul Twone, and Marcia Ory, 153, *Neighborhood Factors, Walking Behavior, and Transit Use Associated with Perceived Crime among a Primarily Hispanic and Low-Income Population*

Background: Fear of crime can adversely affect one's decision to engage in outdoor activities, reduce one's quality of life, and negatively affect one's mental health. Both individual characteristics (e.g. age, race, and gender) and neighborhood factors (e.g. physical/social disorder, natural surveillance, social cohesion, and collective efficacy) have been shown to be associated with perceived crime. Use of public transit has been linked to increase daily physical activity through walking/biking to transit stops and may provide a safe way to commute to places. Despite increasing evidence supporting the importance of transit use associated with physical activity and other health

benefits, the associations between transit use and crime safety have not been sufficiently investigated. Purpose: This study examines how neighborhood characteristics, walking behavior, and transit use are correlated with perceived crime among primarily Hispanic and Low-income residents living in the city of El Paso, Texas. Methods: A total of 320 participants living along a major transit corridor in El Paso, Texas, were recruited in 2016. Online and paper surveys were used to measure participants' demographics, socioeconomic status, travel behaviors, and safety-related neighborhood perceptions. Logistic regression was used to examine whether residents' perception of having high vs. low crime rates in the neighborhood was linked with neighborhood characteristics, walking behavior (minutes per a week), and transit use (days per week of transit use). Preliminary Results: Among the study participants, 61.6% were female and 18.8% were Non-Hispanic. Overall, 23.4% reported that their neighborhoods had high crime rate. After adjusting for demographic and socio-economic confounding variables, neighborhood conditions and transit use were significantly associated with perceived neighborhood crime. Social cohesion (i.e. could get help from neighbors if needed, OR=0.47, 95% CI=0.24-0.94; and perceived people could be trusted in their neighborhoods, OR=0.42, 95% CI=0.22-0.82) was significantly associated with decreased concerns on safety from crime. Also, residents who used transit more than 1 day per a week (OR=2.34, 95% CI=1.14-4.80) and felt that their neighborhoods had many strangers (OR=6.61, 95% CI=3.28-13.31) were more likely to perceive high crime rates in their neighborhoods. Conclusions: Those who frequently use transit and live in highly transit accessible areas, such as downtown, tend to be exposed to more strangers, and have increased concerns of crime. While transit is an important mobility option, especially those lacking access to private automobiles, and has the potential to promote physical activity, these findings highlight the importance of community-level social cohesion that is attractive for both residents and transit users.

Lingyun Liu, Hongqian Wang, Bo Yang, and Qingqing Wei, 172, *Children's Daily Activities, Spatiotemporal Characteristics, and Daily Life-Sphere Structure: A case study of Wuhan, China*

Among the 200 million children in China, children living in cities account for a large proportion. However, no cities in China have acquired the child-friendly city certifications from the United Nations, which have been obtained by more than 400 cities around the world. The lacking consideration for children of urban construction does not match China's rapid economic growth in recent decades. Questions have been raised, such as: How our cities care more about children's daily need when building? Do their daily activities have some characteristics? How they have changed as compared to past generations? Can the common characteristics be described by the model? A three-year study on children aged 0-12 and their parents was completed in Wuhan to better understand the spatiotemporal characteristics of children's daily life in big cities in China. A total of 346 interviews and 132 questionnaire surveys were conducted. Results show that, regarding the spatial features, children's overall daily activity's ranges have become broader while the spatial distributions of children's daily activities are uneven. Children's activity destinations vary, with great diversity in choices, while the choices are mainly indoors instead of outdoors. In terms of temporal characteristics, the travel frequency of children's daily activities has decreased, and the travel duration time presents noteworthy differences among weekends and weekdays. Five major factors that explain the characteristics of children's daily life include: change of family structure, increasing popularity of private cars□ development of Internet, the growing number of organized social activities and the closed residential districts in big cities. Combining the fruitful daily life-sphere theory with the findings above, we built the daily life-sphere model of children to describe their daily activity characteristics. Results expect to improve the overall understanding of children's daily life, and to provide guidelines that help urban designers and managers build child-friendly cities.

Chingwen Cheng, Deni Ruggeri, and Tonje Cecilie Stordalen, 71, *Ecological Design as a Catalyst for Social Change: An assessment framework and case studies in USA and Europe*

Green infrastructure applying ecological design principles refers to an interconnected system of human-made (e.g., community gardens, public parks, bioswales, green roofs, green streets, urban forestry) and natural landscapes (e.g., forest, wetlands, deserts) that provide multiple ecosystem functions as one of the fundamental infrastructure systems—transportation, energy, waste management, etc.—to sustain a community. It has contributed to emerging social impacts in local communities such as serving as a critical climate change adaptation strategy and a tool to achieve climate justice (Cheng, 2016) as well as to enhance health, wellbeing and livability (Ruggeri, Harvey, & Bosselmann, forthcoming). In addition, having regular access to natural environment can influence people's values and behaviors and strengthen environmental stewardship through increased motivation in sustainable behavior and actions (Corral-Verdugo et al., 2016). Furthermore, through participatory process of designing for green infrastructure, people can engage in the practice of democracy and ensure that visions reflect the needs and ambitions of all community members (Hester, 2006; Egoz, Jorgensen & Ruggeri, 2018). Eventually, people's shared interactions and stewardship of green infrastructure help to strengthen social capital and enrich civic life (Hou & Rios, 2003; Ruggeri, 2017). What kind of transformation does green infrastructure instigate in communities and individuals? How can we measure social change as a function of green infrastructure design? This paper proposes a framework to evaluate the presence and the participatory process of green infrastructure design in relations to social and behavior changes at neighborhood scale. Through surveys, interviews, and results from participatory workshops, this paper investigates the transformative social change derived from designing for green infrastructure, including the participatory processes, in various types of projects (e.g., community gardens, green streets, urban parks, greenways) in the United States and Europe. The case studies discuss commonalities and differences in challenges and opportunities those transformative social changes have evolved and provide a more comprehensive framework for evaluating social and cultural performance of green infrastructure. The findings reveal social impacts through ecological design for emerging civic urbanism.

Stephen Mainzer, Kendall Mainzer, and Alexandria Chomyn, 85, *Assessing the State of Landscape, Community, and Behavior Inquiry in Landscape Architecture Practice*

Nikolas Smilovsky, 251*, Predicting the Geography of Behavior*

> *Defining the geography of people's behavior has been of great interest for many decades. With the proliferation of Geographic Information Systems (GIS), researchers from varying disciplines have begun to study the human spatial-behavioral phenomena with new innovative tools and modern methodologies. Researchers have been particularly interested in understanding why people behave the way they do and where they go in urban environments, in relation to other influencing factors such as socioeconomic status, culture, and the environment. This study focused on determining the extent to which variables associated with social capital building and civic engagement could predict people's personal activity spaces. By understanding people's behavior, future stakeholders have a greater ability to make informative decisions that will positively influece these individuals. The specific variables gender, ethnicity, educational achievement, income level, voter registration status, and neighborhood perceptions of safety/trust were leveraged to forecast activity space. The study used an archival data set, focusing on a sample of adults living in communities in Chicago, Miami, and Phoenix for analysis. The results from the study are threefold: 1) the variables of ethnicity and environmental perception of safety/trust (quantified spatially) can significantly predict an individual's activity space, 2) on average non-Hispanics have larger activity spaces than Hispanics, and 3) people that perceive their neighborhoods as safe and trustworthy have larger associated activity spaces than people who poorly perceive their neighborhood's safety and trustworthiness. This research was conducted as part of a Doctoral dissertation.*

David Spooner, 61, *Measuring Walkability Through Movement: A flip-book approach*

Measuring properties of walkability within the built environment has been the source of numerous research studies over the past two decades. The primary focus of existing research attempts to tie walkability to human health,

community design, and ecological function through a series of quantitative measures. For example, measuring walkability traditionally follows the three D's model which includes Density, Diversity and Design. Later studies added two additional D's (and a P for Parking) to include Destination accessibility and Distance to transit. Recently, another methodology was created to measure the "micro features" of the built environment in an attempt to understand walkability at a street-level scale. Five criteria including: (1) imageability; (2) enclosure; (3) human scale; (4) transparency; and (5) complexity were identified as statistically significant factors for determining street-level walkability and operational definitions were developed for standardized testing. Arguably, one of the missing variables of these research models is movement. Existing models rely on GIS based analysis, Google Earth images and other distance-based measures such as Walk Score and the Scottish Walkability Assessment Tool (SWAT) to determine a streets walkability. Where on-foot surveys are conducted, such as the Irvine Minnesota Inventory (IMI), researchers walk streets to document the presence and quantity of items related to accessibility, pleasure, and perceived safety from traffic and crime. The purpose of this study is to argue for and illustrate the importance of a complementary approach for understanding walkability that involves movement as a variable. The process involves capturing motion through sequential street level imagery, similar to a flip-book, to replicate the look and feel of walking within the built environment. A pilot study involving 24 participants and imagery from several streets in the United States and Italy were tested. Participants "walked" each street and were asked to identify sequences of movement within the street corridor that they preferred. Participants regularly identified preferred sequences of movement, but often were unable to articulate why they chose certain parts of a street over others. In several instances the same preferred sequences on the same streets were identified by different participants. When the most popular sequences were compared to existing urban design theory, principles of urban form and walkability research, noteworthy correlations are made. The study concludes with a self-critique of the of process and methodology and offers suggestions for tying movement to existing walkability research.

Yang Song, Evan Lecy, Dominic Fischer, and Runzi Wang, 225, *Machine Learning From Las Vegas: Analyzing big datasets of online reviews for improved placemaking guidelines.*

Las Vegas has been a national index for shifts in design thinking from postmodern architecture to casino related design. Public review platforms such as Tripadvisor, Expedia, we8there, Foursquare, Google Places, etc. have collected an increasing amount of feedback in the form of unstructured user reviews. These reviews are self-posted, volunteer created text about user experiences with products and services which differs from surveys asking targeted questions. Studies show the Hospitality industries adoption of user reviews has successfully improved hotel management operations(Xie et al,2016). Regional planning teams have also begun to adopt these practices. Machine learning technologies such as decision trees and natural language processing (NLP) were implemented in these studies to extract meaningful information from the user reviews (Büschken, J., & Allenby, G. M., 2016). Public spaces share the same review platforms as hotels/restaurants/museums. However, no consistent methodologies to implement review data for public spaces design have been applied. This paper aims to fill this intellectual gap and explore the utility of online reviews on public space research and design. A dataset of reviews charting the past 10 years has been created. This data set contains approximately 20,500 genuine online reviews, over 1.6 million words from patrons of the strip of Las Vegas in Nevada. Next, a natural language processing (NLP) technique called Latent Dirichlet allocation will be applied to make sense of the topics that are expressed in the words used to describe visitor experiences. Poisson regression will be applied to explore the association between topics in the comments and the corresponding costumer ratings. Results of this paper will specify significant environmental and programmatic elements in the reviews and their correlations with the ratings. We will also present a design guideline based on our analysis to be followed in the redesigning of the Las Vegas strip. We believe online reviews provide strong empirical evidence for user experience in built environment projects. We hope Landscape Architects, Urban Planners and Policy Makers might realize the potential of implementing our approach and change the future of design and research related to the built environment.

Gareth Doherty, 498*, Landscape Fieldwork*

In recent years, landscape architecture has been rediscovering its long roots in fieldwork—extending back to the origins of the profession with Frederick Law Olmsted and Charles Eliot. The teaching of fieldwork was particularly strong at the University of Pennsylvania under Ian McHarg's leadership in the 1970s and 1980s, but this period is not well-documented because scholars have generally preferred to foreground McHarg's environmental credentials over his anthropological interests. This paper explores this historical ground with the intention of centering fieldwork, in practice and education, within a larger disciplinary context that engages people and landscape architecture scholarship. Fieldwork means different things to different professions. Anthropologists, for example, will typically spend at least a year in the field, living among a community, building trust, learning language and codes and patterns of behavior, and carefully and methodically noting details not only of peoples' daily lives but also aspects of their objects and environment. Usually the goal is to understand various phenomena through their study in situ. Through fieldwork anthropologists begin to understand patterns and unearth relationships that might have gone unnoticed before. Such in-depth analysis is what has come to be understood as "thick description," a term coined by Gilbert Ryle and popularized by Clifford Geertz in his seminal book, The Interpretation of Cultures (1973). For landscape architecture, a profession fundamentally concerned with the interactions between people and the land they inhabit, a faster form of fieldwork is required. The world moves much more rapidly than anthropological fieldwork can follow. In contrast with anthropological fieldwork, landscape architects are also concerned with the design and the changing of the land, considering the needs of the inhabitants. Landscape fieldwork implies a projective nature that moves beyond description to action and prescription. This paper aspires to address a gap in the literature by demonstrating how engaged fieldwork can inspire and inform landscape architecture innovations. Using case studies to articulate forms of fieldwork especially pertinent for landscape architecture and borrowing from anthropology and other disciplines to complement existing disciplinary methods, the presentation will demonstrate that fieldwork is more than a method: it has the potential to unearth novel design challenges, and illuminate robust design solutions, and generate new knowledge and theories of site.

Olivia Shotyk, 375, *Two-Eyed Seeing: Redefining indigenous cultural landscapes*

There are few recognized examples of contemporary Indigenous landscape architecture in North America, despite the great number of rich cultures and their strong relationships with the land. A possible reason for this gap in representation includes the impact of colonization on Indigenous design principles and precedent examples, with communities having been deprived of opportunities to evolve culturally. Therefore, sites predating colonization must be used as precedents of possible Indigenous design. Unfortunately, proper classification of these types of sites does not currently exist in North America. Despite the World Heritage Committee adopting the term 'cultural landscape' in 1992, little progress has been in made in North America to broaden the range of heritage sites to include those that contain cultural artifacts or hold cultural significance. In comparison, Australia and New Zealand adopted three new categories of UNESCO classification of cultural landscapes in 1995 that predominantly recognize and protect Aboriginal places. This research examines a number of pre-colonial sites of significance to North American Aboriginal communities that should be recategorized as cultural landscapes or even vernacular design: examples such as these could stimulate contemporary Indigenous landscape design. By studying literature that centers around the relationship between culture and environmental design, reading the landscape for cultural cues, and understanding Indigenous design, the delineation of this new classification of heritage site becomes apparent. Furthermore, using a semiotic square model to analyze what are currently classified as natural sites across North America, tangible cultural connections can be distinguished from intangible ones, and intentional versus unintentional alterations, to establish a new category of cultural landscape that can be identified as vernacular design. In order to create authentic Indigenous design today, landscape architects cannot assume that the design principles and processes that have evolved from 17th century France or 18th century England will form a suitable

foundation for Indigenous cultures. To decolonize Indigenous design, it must first be determined what the authentic Indigenous foundation may be, by looking at vernacular landscapes that pre-date European arrival.

POSTER ABSTRACTS

Chen Yan, Rui Duan, Zijun Fan, 32, *From Idle Land to Livable Habitat: A resilient regeneration of historical districts in Seoul, South Korea*

The 21st century is already known for unprecedented and fundamental changes and new trajectories, in consideration of climate change, global economics, migration and population growth. Hence, being an open and complex giant-system, the city faces increasingly uncertain and unknown risks. Haebangchon, as a historical district in the center of Seoul City, has shown its huge vulnerability when it suffers unpredictable natural disasters and social contradictions. Specifically, problems as earthquakes, hurricanes, floods, biological barrier, vacant space, high-density population, traffic jams and economic depression, have threatened the survival and development of historical districts. For the historical area to be sustainable and resilient, vacant and underutilized parcels are stressed as key facets. In this case, several strategies based on the utilization and transformation of those idle lands are proposed, aiming in enhancing the resistance, resilience and adaptability of Haebangchon. First, on account of the analysis of GIS, idle lands could be fully utilized as public green space and open emergency shelter, to strengthen the capability of each neighborhood to attenuate natural disasters. Second, it is suggested to transform existing high-density mixed communities, making the most of vacant space, while wildlife corridors and habitat mainly built on roof gardens are supposed to bring biodiversity and livability to communities in these historical blocks. Third, the encouragement of urban agriculture and forestry and more relevant industries could not only enrich the function of idle lands, but also better the social and economic sustainability.

XueLing Zhang, ShuHua Li, 126, *A Quantitative Research of Vegetation Landscape Character in Chinese Buddhist Mountain Environment Based on eCognition Image Interpretation Technology: A case study of Jizu Mountain, Yunnan Province*

Chinese Buddhist mountains are situated in places with fine landscapes. Under the continual constructions of monks and disciples, they have eventually developed into comprehensive environment compounds with specific vegetation patterns and landscape characters by adopting the landscape as the main body and the temple architecture as the core; they have become the symbols of large-scale Chinese traditional scenic spots and taken on striking landscape characters with orchards interweaving with tea gardens, landscape mingling with scenery, and natural vegetation coexisting with artificial vegetation. Currently, the professionally analytical approaches to the vegetation landscape characters have shifted from perceptual stage to rational stage, from qualitative analysis to quantitative analysis, and from electronic cognition to numerical analysis and algorithm description. In recognizing the vegetation landscape and its characters with the help of remote-sensing technology, human vision is being rapidly replaced by the satellite vision, offering us a more scientific and macroscopic approach and technique to our research. As a newly-emerging smart image analysis technique, eCognition can help us to conduct research on and analysis of the vegetation landscape characters and realize the instant output of the drawings and the corresponding vector data. The present paper is about the quantitative analysis of and experiment conducted on the images of the vegetation landscape of the scenic area of Jizu Mountain on the basis of the multi-spectral remote-sensing image data of China Resources (ZY-3) satellite. In the analysis and experiment, the eCognition object-oriented classification method is employed. With the spectral heterogeneity, multi-scale segmentation function and normalized vegetation index as the standards for image analysis, the mathematical algorithm suitable for the research on landscape garden is obtained by the membership function, with the characters of six kinds of vegetation landscapes extracted, such as the coniferous forest, broad-leaved forest, bamboo forest, sparse forest land, gardens, and orchards. The

distribution of the vegetation landscape in Jizu Mountain is scientifically presented, with the algorithm description and drawing generation of vegetation landscape characteristics realized. Evaluated with the error matrix, the classification accuracy is great. The study provides a quantitative survey and analysis method for a highly spatial analysis of contemporary landscapes and analysis and design of urban green space it also provides valuable and promising remote sensing interpretation platforms and special technologies for scientific research on human settlements such as urban and rural planning and architecture.

Bin Wen, Jon Burley, 146, *Landscape Spatial Patterns for Three Cultural Settings: Farmers on the Old Mission Peninsula, Michigan; Tujia and Miao minorities in Hunan, China; Saginaw Chippewa Tribal Nation, Isabella County, Michigan*

Planners, designers, historians, and geographers are interested in general cultural landscape spatial land-use patterns, as illustrated by Pregill and Volkman (1999). However, there are numerous contemporary patterns that are localized which is promoting the formation of regional diversity. In this study we present: the spatial patterns of orchard and vineyard farmers on the Old Mission Peninsula, Grand Traverse County, Michigan and their plan to preserve the orchards and vineyards against housing development pressures; the natural resource spatial patterns of the Tujia and Miao minorities in Wuling Mountain of Hunan Province, China, which are material reflection of social and life form of people living in mountain; and the pattern of sacred land recovery by the Saginaw Chippewa Tribal Nation, in central Michigan. Our investigation revealed that the orchards and vineyards of the Old Mission Peninsula are linear in nature, residing along the crested spine and immediate side-slopes of the crest (Burley, Westphal, Rauhe 1998). The township has an agricultural preservation zone, where property taxes support the purchase of development rights to assist in preserving the orchards and vineyards (Burley et al. 2004). Environment suitable for housing outside the agriculture preservation zone were sought and identified (Burley, Westphal, Rauhe 1998). In comparison, Tujia and Miao minorities (a group of non-Han people that be allowed to keep their way of life) reside in Wuling Mountain are unique harmonious symbiotic with nature, placing rice fields, irrigation networks, and fishing activities within the river floodplain, terraced rice fields and dwellings along the mid-slopes, forests and wood production along the crests and hilltops (Li and Liu 2009). Finally, the Isabella Reservation is composed of parcels of land administered by the Saginaw Chippewa Tribal Nation (Anishinaabe First Nation) and held in trust by the federal government. These people form three Chippewa ancestral groups: Saginaw, Black River, and Swan Creek. The first nation was placed on these reservation lands and urged to pursue a pastoral way of life. By 1998, the Saginaw Chippewa Tribal Nation opened a resort and casino (Soaring Eagle Casino & Resort) which has allowed the nation to manage and purchase the scattered sacred lands important to the nation, often distant from the reservation. This recovery of sacred sites reflects the active and living nature of the Chippewa (Anishinaabe) people. In conclusion, we suggest that the earth may be considered a mosaic of these localized conditions, each unique, and often ungeneralizable beyond their borders.

Christopher Nelson, Andrew Castanheira, Bryan Pepper, 157, *Water Wise: A water informed education model*

The project, Water Wise focuses on Abhyuday, a K-12 public school in Kawardha, part of the rural state Chhattisgarh, India. The area's annual rain fall is concentrated to the three-month monsoon which is expected to provide all necessary water to sustain the growing population of 50,000 for the remainder of the year. The water crisis is one of national concern extending beyond the limits of Chhattisgarh and has the potential to force a dynamic shift in perspective of its people and attitudes toward the individual's contribution to a worsening condition. Understanding how education can help in developing an informed and conscious public, Water Wise aims at developing learning landscapes influenced by how students of the Abhyuday school naturally engage with campus open spaces and the water which accumulates there. Developed as part of a design proposal for the campus, Water-Wise counters traditional models of campus planning where the project takes its design cues from the Indian State

proposed curriculum models CBSE and NCERT. Through an examination of course curricula, the project identifies opportunities where students can engage with the landscape in support of a water-centric education that deals with issues of water pollution, water scarcity, management, storage, and distribution/consumption. The project takes shape developing lesson plans for science and arts education classes at all three levels of the educational system of the Abhyuday school program. These principals build on each other toward identifying areas on campus for creative, complimentary, and educational water treatment solutions students can directly interact with. Integrating cultural influences, regional concerns, and identity, the designs take shape revealing a campus that not only functions ecologically but builds awareness beyond utility. Abhyuday students become stewards of their water resources and are encouraged to protect and promote a future which ensures improved water quality, and water equality for all its citizens.

Moohan Kim, Jong-Sang Sung, Chang-Hyun Ryu, 178, *A Study of Salutogenic Environments Settings for Older People*

The residential environment issues of older people belonged to a socially disadvantaged group is being magnified as a new social phenomenon in Aging South Korean in South Korea. The permanently public rented housing has been one of the solutions for the issues. However, it still required more attention to the improvement of health promotion environment for the group of older people. The study conducted a case study for discussing the direction of the health promotion environment focusing on the group. The study selected permanently public rented apartment complexes, which has a rate between 40% and 50% of older residents. The study purposes to analyze the outdoor using behavior in the apartment complexes and then to discuss the direction of salutogenic environments meaning health promotion environment. To analyze the user behavior, it has two types of equipment; a time-lapse camera for seeing the top view, and a video camera for eye-level observation. The results show frequency on a place, using pattern, statistic using trend firstly with the top view observation, and secondly detailed information of a using pattern with place contents with the video camera. According to the results, we discussed the direction of the salutogenic environments in the stage of design. The study helps to confirm the direction of the health promotion design for older people in South Korea.

Hossein Saedi, Arthur Rice, 179, *Tehran Azadi Square Complex: Utilization of opportunities in forming lively and vibrant urban plaza*

Landmarks are an integral element of a citizen`s image of the city (Lynch, 1960). Defining a specific use for a landmark may lead to better utilization of the space and in turn make the space more vibrant and memorable (Norberg-Schulz, 1988). Azadi Square Complex is one the most important urban plazas in Tehran, Iran and is also considered as the western gateway to the city. In the past, many of the city's residents perceived this square as the symbol of the city and Tehran`s major landmark (Saedi, 2014). Today, this space has changed and there is a sense that it has lost much of its iconic value. In ancient Persian culture, the urban plaza was considered a place for social gatherings, economic interactions, parades, demonstrations and an important urban symbol (Tabarsa, 2009). These historic spaces share a variety of characteristics such as expansive scale, inclusiveness for a variety of activities, and adaptability. After the invention of motor vehicles, the attitude toward these urban spaces changed. At this time urban planning and design projects in Iran tend to embrace the accommodation of motor vehicles at the expense of other factors. As a result, they often disregarded or place a lower priority on other factors. The changes in Azadi Square and its surroundings have impacted how people interact and utilize the space. This engagement shift has also affected how people perceive Azadi Square. This research explores how perceptions have changed and the factors that have contributed to this perceptual shift. This research uses an exploratory case study strategy, as defined by Robert Yin (Yin, 2018), using a mixed method approach including field studies, and interviews with over one thousand local citizens to begin to determine how the perception of Azadi Square has changed and what elements have most contributed to the change. Data from field studies and interviews were analyzed to reveal user perceptions

and correlated with other data. The results were used to develop recommendations intended to enable the project to regain its important iconic and symbolic value. At this time a number of recommendation have been implemented.

Yaser Abunnasr, 207, *Contested Space: A participatory process for host communities and refugees in Ghazze Park, Lebanon*

The Town of Ghazze, located in the Bekaa Valley, faces many issues resulting from the influx of refugees into Lebanon from Neighboring Syria during the past seven years. Lebanon hosts close to 1.5 million refugees (UNDP, 2016), approximately one fourth the Lebanese population. About 35,000 of these refugees reside within the town of Ghazze outnumbering the local host community of 8,000. The lives of host and refugee communities are equally impacted by stresses and competition on resources resulting from this 440% population increase. These stresses include competition on jobs and school seats; water pollution and waste accumulation; degradation of agricultural resources; competition on land use and shelter; and illegal practices. Competitive practices between Lebanese and Syrian communities to use 'Ghazze Park' are an example of how the larger issues manifest at the local scale. The park was established in 1998 and incrementally built by the local community. Today the park usage hovers between both communities, depending on the time of day and week; and the whims of the Municipality. The park suffers from extensive pollution to its agricultural open swale drainage systems resulting in repeated flooding, extensive garbage, lack of amenities, and overall deterioration due to disinvestment. As a result, European donors offered to re-design the park in partnership with the author, his students, and Dutch designers. The objective of the process is to develop a preliminary design and implement a prototype. Part of the design process was to understand current patterns of park use through a participatory workshop to better inform the design. While the project design remains in progress, this presentation will focus on the participatory workshop completed in February 2018 by the author and his BLA students from the American University of Beirut. The workshop was conducted over two. During the three months preceding the workshop, four full day prospecting visits were carried out to establish local connections and familiarize the team with the context. Five main constituents were identified and invited to the workshops with a total number of participants of 137 divided as follows: the host community (12%); refugees (28%); elementary to high school students from both communities (46%); the local municipality (7%), and random park users (7%). A half day workshop was dedicated to each stakeholder group. Several tools were employed responding to each stakeholder group: questionnaires (adults), participatory mapping (adults and students above grade 7), outdoor games (elementary students) and focus group discussions (all stakeholders). The results of the process demonstrate that: 1) there is competition for and segregation of park use; 2) mutual blame for park deterioration; 3) communities are disconnected and do not converse about mutual issues; and 4) there is hidden resentment across communities while all express admiration to the other. On the other hand, there was consensus on the importance and pride in the park as a shared space; that trees and vegetation are significant expressions of either community; and play space is important to express difference. The presentation will conclude with brief reflections on the role of landscape architects in the process of community engagement and student service learning in addressing transformative real-life problems.

Mandi Roberts, Elizabeth Scott, 264, *Sustainable Solutions for Visitor Access at Yellowstone National Park*

Yellowstone National Park is experiencing unprecedented congestion levels, particularly in the heavily-visited Geyser Basin from West Yellowstone to Old Faithful. Congestion threatens unique geothermal features, rivers, natural vegetation, and habitat due to off-trail foot traffic and parking outside designated areas. Park visitor surveys indicate congestion levels are detrimentally effecting the quality of the visitor experience. Because vehicle volumes are frequently above the capacity of parking areas in the Geyser Basin in summer, this study investigates the potential to introduce a shuttle system to this area. Research methods include case studies of shuttle systems at other national parks, secondary analysis of visitor surveys and studies of visitor impacts in the Geyser Basin, and

interviews with National Park Service (NPS) experts who plan and manage shuttle systems at other parks. The case studies examine visitation levels, system capacity, scheduling, parking, and operations. Research findings suggest that capping private vehicle use to existing parking lot capacities and delivering additional visitors via shuttle could be a more sustainable means for access to the park. Key findings include: shuttle systems should connect heavily visited areas, rather than serving the entire park; convenient, attractive park-and-rides are critical for encouraging ridership; and opportunities to promote bicycling and sight-seeing with the shuttle program can enhance visitor experience. A conceptual transit system plan proposes three services between West Yellowstone and Old Faithful (Express, Explorer, and Trekker) with synchronized timetables.This plan could remove up to approximately 45 percent of private vehicles from the congested corridor during summer peak months.

Fernando Magallanes, 310, *Going Back to The Drawing Board: Perception, the body, the mind in landscape architecture*

Going Back to The Drawing Board: Perception, the Body, the Mind in Landscape Architecture ABSTRACT The work of exceptional perceptual theorists like E.H. Gombrich (1960), Rudolf Arnheim (1971), Kent Bloomer (1977), Stephen Kaplan (1978), Rachel Kaplan (1978), Donald Appleyard (1976), and others from the 1960's through the 1980's paved the way for thinking about perception, psychology, landscape, and design. Current literature and research present a need to reconsider, revisit, and reframe the subject of perception. Inclusive are the topics of representation, space definition, the senses, design of spaces, and determining significant site influences on humans are also relevant. The 20th century Modernists studied Gestalt psychologists and certain philosophers (Kant, Hegel) to understand the human relationship with what is experienced and perceived in our environment. Today we have hundreds more neuroscientists, psychologists, and philosophers undertaking research who can inform us about humans and their relationship to the environment. I suggest that today several other groups affiliated with landscape and perception must be added to understand the 'whole' of human environmental relationships. The author has chosen to focus on Psychology, Neuroscience, and Biology because these sciences have introduced research that is giving way to uncovering new ways of thinking about how the brain and body work in achieving tasks that are part of a designer or citizen's everyday life. The way we perceive, interpret information, and transform what we experience into knowledge, and the application of thinking to inspire and innovate new changes in the environment are being studied. From Psychology, Neuroscience, and Biology academic instructors and designers can better define the systems at work in the brain and the mind. Leading with Psychology and with Neuroscience, we can consider future options in the development and creation of future of environments. If we know how our neocortex organizes information through a linear sequence of steps, can we guess how to direct our students in being more perceptive in environments? Can they perceive better so that they can then design a better environment experience for the human user? Can we use the new principles from these disciplines to anticipate the future interpretations by humans in our landscapes so that our design decisions are more palpable for humans? David Eagleman, Neuroscientist, states we perceive the world intuitively until someone or something demands that we study it further. When we are made conscious of something, we suddenly consider scrutinizing it. (Eagleman, 2011). Knowing that we are very poor observers and our established perceptions are strong impediments to learning, the author has sought out the knowledge of the Neuroscientist, the Psychologist, and the Biologist to integrate, synthesize, and connect in the teaching of drawing and design to Landscape Architecture students. Understanding perception and the brain has allowed for better ways of approaching teaching and understanding the environment. The author will demonstrate with sample applications in his own work and his students.

Matthew Kirkwood, Yang Song, 312, *Fargo, ND Safe Route to School Innovative Study*

Safe Routes to School Program (SRTS) is a national program that aims at creating safer routes to school by way of walking and biking. The issue of creating and encouraging safe transportation is becoming a critical issue for designers, specifically landscape architects. Climate plays a critical role in defining seasonality to transportation

modes. We will exam how to create an improved atmosphere.. The National Safe Routes to School has surveyed 800 schools (parents, students, and teachers) for 5-18 year olds. They determined six barriers. 1. Distance to school (61%), 2. Traffic related danger (30.4%), 3. Weather (18.6%), 4. Crime danger (11.7%), 5. Opposing school policy ((6%), and 6. Other reasons (5%). This study presents a comprehensive project to tackle these barriers by planning and designing safe walking and biking environment in Fargo,ND. In order to determine appropriate routes for students, we will create GIS databases to model traffic demands and stress, pedestrian and bicycle level of services, amenity accessibilities, landuse distributions, etc. We will also survey students and parents at 32 schools (20,000 students in attendance) to understand existing travel behaviors and mode choices, and we will anticipate a total of 800 hours of field observation for all school sites to gain insights of circulation patterns, dangerous behaviors, sidewalk deficiencies, etc. All these data will be analyzed using SWOT methodology and network connectivity measures. Then a gap analysis will be made to for the 1 mile working zone of each school. Therefore, we could prioritize design interventions such as sidewalk improvements, site amenities, signage crossing zones, traffic control devices, parking restrictions, mobil speed limit, etc. We will also provide policy/administrative suggestions on employing school staff overseeing road crossings and road speed control. The results of this study will provide an example of creating safe walk environment for US public schools with cities of population density about 3000 per square mile.

Adina Cox, 363, *A Literature Review: Examining the relationship between children and wildlife*

Children seem to have a natural affinity for wildlife. Families frequent zoos to give the children opportunities to view large animals collected from all over the world. But are we providing enough opportunities for children to engage with local fauna, including caterpillars, birds, frogs, and butterflies? We know very little about human-wildlife interactions and even less about the interactions between children and youth and wildlife. It may help designers and communities prioritize wildlife plantings and designs for children and wildlife if we can examine and explain the effects of these encounters. The encounters with nature that we experience as children can have positive life-long effects on pro-environmental behaviors (Chawla, 2007). A recent study found that concern for living creatures helped explain children's perceived connection to nature (Cheng & Monroe, 2012). Upcoming changes in climate can bring about drastic changes in global biodiversity. If we expect to have future generations make the necessary efforts and sacrifices to prevent species loss, it is imperative that we allow children to experience native wildlife encounters in order to assure a future connection to nature and interest in environmental stewardship. This presentation will summarize existing literature from varied disciplines to share what is known about human-wildlife connections. Studies from psychology examine topics such as empathic responses to animals, emotional attachments, and values of individuals. Studies from natural resources have examined adult responses to wildlife encounters and conservation. The summary of literature will be presented to demonstrate the evolution of potential research questions. From a designer's point of view, the primary research questions of the child-youth wildlife encounter focus on the types of encounters and the dosage of the encounters. What do children think when they encounter caterpillars or butterflies? How does this affect their future behaviors? How does watching a caged animal compare to holding a frog? Potential methods for future research will be presented as a conclusion to this literature review.

Emily Vogler, 377, *The Future of Dams: Strengthening the scientific basis for decision making around dams*

Dams have shaped complex social ecological systems across vast territories of the United States. They are a symbol of economic prosperity and cultural identity as well as a potential source of clean energy and opportunity for recreation. However, they have also had dramatic impacts on our freshwater and coastal ecosystems. Dams place a fixed object in a fluid and dynamic landscape; preventing the passage of migratory fish and altering the nutrient and sediment flows between freshwater and coastal ecosystems. Currently in the United States there are over 100,000

dams and in New England the number exceeds 14,000. Many of these are over a century old, less than ten feet high and no longer are used for their original purpose. Thousands of dams across the United States are coming to the end of their life cycles and will either need to be repaired or removed in the coming decades. Each dam has its own unique trade-offs and a diverse group of stakeholders that will need to be engaged in the decision about the future of the dam. For the past 3 years, a group of landscape architecture professors and graduate students from the Rhode Island School of Design have been participating in an interdisciplinary National Science Foundation grant looking at decision making around dams in New England. The larger team is made up of over 40 researchers including scientists, and social scientists from six universities. This presentation will discuss the RISD team's 3 main areas of research on this project. These include studying the role of visualizations to support decision making and interdisciplinary research, studying methods to engage the public in decision making around dams, and the role of design in helping to maintain a sense of place when the dammed landscape is transformed. In addition, this presentation will discuss the role of landscape architects on large interdisciplinary teams working together to address complex environmental issues.

Xiangrong Jiang, William Sullivan, 379, *Daily Variations in Exposure to Green Infrastructure and Health Outcomes*

Exposure to Green Infrastructure (GI) can benefit human health. Because access to nature can be limited, it is important to understand the dose of nature required to promote health. Previous research on the impacts of nature on human health has measured the concentration of nature from photographs, LiDAR, and satellite images (Jiang et al., 2013, Ulmer et al., 2015). Yet people do not experience landscapes as static images. The vegetation density that people experience changes as people move through a landscape. Thus, an overall measurement of green density cannot represent the actual exposure people have to vegetation. Such potential measurement error calls into question the validity of findings from previous research. To address this potential source of error, we conducted a study that assessed people's actual exposure to GI and their health over a month. We collected data using an online survey. 212 adults participated in this study. We collected data regarding demographics, home address, three principle travel locations, and health outcomes. We used a tool developed by the National Center for Super Computer Applications at UIUC that measures the density of GI in Google Street View images. We made two kinds of measurements. First, we calculated the density of GI along participants' daily travel routes. Second, we will calculate the GI density along the streets around participants' homes and their three most frequent destinations. The tool can capture 4 images (north, east, south, and west) from Google Street View at a point, and for each image, produce a GI density Index on a scale from 0 to 100. We sample points at 20m intervals and will produce a summary score for each route and location. We measured participant's health using three standardized questionnaires (Attentional Functioning Test, Perceived Stress Level Test and the short form version of the General Health Index). We will analyze the data using a general linear model that examines the relationship between the two GI density indicators and each of the three health outcomes. We will also measure some possible covariates that are included in our models (e.g. transport modes, participant demographic characteristics, and duration of stay at the destination location). This is the first study that combines estimation of daily exposure to GI with supercomputer technology in the field of built environment and human health. The results will provide a more accurate simulation of people's daily exposure to vegetation from images with continuous human perspectives.

Bin Jiang, Jielin Chen, Jibo He, Hua-qing Wang, Christ Webster, 381, *Identifying Environmental Factors that Have Significant Impacts on Sweatshop Workers' Stress and Anxiety Status: A photo-narrative study*

Stress and anxiety are pervasive and serious mental health problems in the workplace, especially in manufacturing factories. They can lead to severe disease and social problems. Most previous studies ascribe workers' mental health problems to social-demographic and employment factors. Few have explored whether, and to what extent, the outdoor environment impacts workers' stress and anxiety. This is a significant knowledge gap because we will lose

the opportunity to promote thousands of millions of manufacturing works' mental health through outdoor environmental interventions in the developing and underdeveloped countries. This participatory photograph survey study focused on one of the biggest manufacturing factories in the electronics industry, where many suicides have occurred. We recruited 106 workers for the study. Each worker shot three photos for three different settings which had remarkable impacts on her/his mental health in the past. Then the worker was interviewed and made a narrative about their feeling and memory of each photograph setting. Through text analysis, we identified key environmental factors that have the significant association with workers' stress and anxiety status. Last, we suggest prioritized environmental interventions to promote workers' mental health in manufacturing factories.

Yalcin Yildirim, 448, *Examination of Soundscape: Is it new urbanist development or shopping mall?*

New Urbanism represents an alternative approach to traditional suburban sprawl in the U.S. since the 1990s. It promotes ecological, economic, and social diversity with characteristics that include higher density, mixed-use, appropriate public transit with ample pedestrian and bike routes, public spaces, and strategically designed architectural components (Duany et al., 2001). Since the 1990s, new urbanist developments have transformed into many projects that range from HUD's public community design guidelines to private context such as master-planned neighborhoods. Providing crucial elements into urban life such as well-connected streets, mixed land use developments, these developments are claimed to create higher quality-of-life standards (Talen, 2001). On the other hand, malls have been fluctuating for their efficiency and implications for people for decades. While there has been a successful era for pedestrian malls, it did not last because of many reasons. This research also seeks to examine whether new urbanist developments and malls are successful in terms of soundscapes in a comparative study. The research question of the study is whether NU developments and shopping malls share common soundscape and does this circumstance result in any "cliché" among the developments? In order to answer the research question/s, this research relies on two types of data. The quantitative data includes both sound pressure level (SPL) and the sound sources (SS) measured through grid sampling method (Kang, 2004) of selected study areas. The qualitative data relies on an experiment in an office room with high caliber headphones involving only sound recorder. The study centered on a quasi-experiment that was sampled from the equal number of new urbanist developments and malls in Dallas-Fort Worth metroplex. The experiment was evaluated through mixed-method approach that was taken into account of participants experience and socio-demographic features for further analyses. Considering the discourse of findings from the sound measurements and experiment from the essential characteristics of both new urbanist developments and pedestrian malls, we examined key dimensions of new urbanist design and planning that are determined from the literature (Calthorpe and Fulton, 2001). The results of the study provide a richer understanding of the relationship between diverse soundscapes and users in new urbanist developments and shopping malls. Since the role of soundscapes in the urban forms and structures is somewhat forgotten in landscape architecture, we anticipate to "transform" the implications of soundscape into the field.

Hope Hui Rising, 477, *The Role of Salient Canal Structures in Environmental Adaptation of Flood Refugees*

More frequent flooding has brought more flood refugees and waterscapes upstream, creating opportunities to facilitate environmental adaptation with waterscapes (Andoh, Declerck et al. 1997, Najarian, Goenjian et al. 2001, Hartmann and Driessen 2017). Compared to men and residents, women and newcomers do not navigate as effectively in an unfamiliar environment because they tend to rely on an egocentric (eye-level) instead of allocentric (map-like) perspective (Devlin and Bernstein 1995, Malinowski and Gillespie 2001). Water tends to be the most salient elements in people's cognitive images (Yabiku, Casagrande et al. 2008, Faggi, Breuste et al. 2013). Salient environmental features can potentially mediate wayfinding differences due to gender and familiarity (Vinson 1999, Chen, Syvitski et al. 2012). This study hypothesizes that mappable waterscapes mediate the wayfinding differences due to gender and familiarity. Waterscapes were classified using Lynch's elements of imageability, landmarks,

nodes, paths, edges, and districts (Lynch 1960). Measures of spatial cognition coherence, waterscape mappabililty, and waterscape identifiability were derived from sketch maps, cognitive mapping, photovoice recall results from 21 female and 39 male participants sampled from 8 water towns. Among them were 31 residents and 29 newcomers, who had been in the city for less than three months, the length of visitor visas. Mediation analysis results show that gender do not significantly influence dual-perspective coherence (β= -.42, p>.10) while the group effect of newcomers versus residents has a marginally significant influence (β= 1.35, .05<p<.10,). No significant gender or group difference was found for canal mappability (β= -1.83, p>.10; β= 1.32, p>.10) while canal mappability significantly enhances dual-perspective coherence (β= .35, p<.01). Canal mappability fully mediated the significant gender effect on water-based allocentric coherence (βa= -1.74, pa<.05; βb= .21, pb<.001; βc= -.62, pc<.05; βc'= -.25, pc' >.10). Canal mappability mediated the gender difference by making women as likely to use allocentric perspective to navigate as men. While the group effect of resident versus newcomer on water-based allocentric coherence was not significant (β=-.30, p>.10), canal mappability mediated the significant group effect on dual-perspective coherence with a marginal significance (βa=1.35, 0.5<pa<.10; βb=.30, pb<.05; βc=1.13, pc<.05; βc'=.64, pc'>.10). As canal mappability significantly influenced water-based egocentric coherence (β=.14, p<.001), canal mappability may have enabled newcomers to better sequence their egocentric views to acquire a cognitive image as coherent as the residents'. The findings show that mappable canals help facilitate environmental adaptation of women and newcomers by encouraging the allocentric perspective or sequencing the egocentric perspective.

Yiwei Huang, 489, *Culture Representation in Campus Design*

An estimated 2.5 million students and scholars attend institutions of higher education abroad (Altbach et al., 2009). Understanding the psychological, sociocultural, and educational experiences of this large group of people is important in promoting intercultural understanding within the campus as well as continuous intellectual exchange between countries. Many literatures emphasize students' adaptation performances, including social and friendship networks for cultural learning (Zhou et al., 2008), social skill acquisition and stress relief (Cutrona & Russell, 1987; Durlak et al., 2011), and self-esteem and social identification (Schmitt et al., 2003). However, very limited attention has been devoted to the physical structures of the campus design itself. This research aims to understand what features of the built environment promote or constrain single-culture expression and multi-culture exchange activities, and how they do so. This paper uses a psychological mapping approach to understand the definition of "cultural elements" from the viewpoints of international students on the campus of University of California Davis. The primary goal of this investigation is to uncover the elements that international students most build attachment to, as well as their understanding of existing cultural representations on campus. Through this investigation and analysis, I hope to identify the improvements campus designers and planners can make to create a more culturally inclusive campus that welcomes ethnic minorities and supports their persistence in school. Cognitive mapping was first used in Tolman's book Cognitive Maps in Rats and Men (1948). This method became popular when Kevin Lynch used it in his famous urban design book The Image of the City (1960) to understand the interpretation of urban features by giving pens to residents. Gieseking (2013) defines mental mapping as the "representation of an individual or group's cognitive map through hand sketching or computer-based design, including information, emotions, and ideas associated with them, whether real and/or imagined" (Gieseking, 2013). Dolores Hayden (2014) claims that cognitive mapping is a tool for discovering fuller territorial information about contemporary immigrants. As Michale Dear and Jennifer Wolch (1989) put it, "Social life structures territory... and territory shapes social life". Hayden (2014) sees the cognitive maps that laypeople produced as striking images of inequality of access to the city. Research Questions: How is culture represented in material format on campus in the eyes of international students studying at the UCD campus? What is culturally inclusive design, and what can be done better to build a more culturally inclusive campus?

9. RESEARCH AND METHODS

PAPER ABSTRACTS

Sinan Zhong and Chanam Lee, 138, *Intergenerational Communities: A systematic literature review of intergenerational interactions and older adults' health-related outcomes*

Background: Demographic aging, resulting from declining fertility rates and increased life expectancy, has brought serious economic and health challenges. The population aged 65 and over in the US is estimated to almost double from 47.6 million in 2015 to 86.5 million in 2050, corresponding to an increasing share from 14.8% to 22.2% [1]. Aging in place is an increasingly popular concept to respond to these challenges and trends. Intergenerational activities are considered to be particularly important for supporting aging in place, promoting active lifestyles in old age, and reducing negative aging stereotypes (i.e. ageism). Purpose: This systematic review, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, focuses on assessing the current state of knowledge about the impacts of intergenerational activities on older adults' health-related outcomes and behaviors. Methods: A series of literature searchers was conducted in 2017 via MEDLINE, SocIndex, PsycINFO, CINAHL Complete, and Scopus. Based on the pre-determined exclusion criteria (e.g. non-English, non-US based, published prior to 2000, non-empirical studies, qualitative studies), we identified 24 peer-reviewed journal articles for inclusion in the review. Findings: All of the 24 reviewed studies focused on evaluating intergenerational programs and their intervention effects. The significant influences of program-based intergenerational interactions on older adults' health-related outcomes have been well documented by many empirical and quantitative studies. Specifically, intergenerational interactions have been shown to be positively associated with older adults' overall self-rated health [2], physical health [2-4], psychosocial health including reduced depression [2], and life satisfaction or self-reported quality of life [5, 6]. Moreover, engaging in intergenerational activities has been linked with an increase in walking [4, 7], physical activity [4, 7, 8], and social activity (e.g. social participation) [4, 9]; and a decrease in sedentary activity (e.g. TV watching) [4] and social isolation [10]. Implications for future research and practice: This systematic literature review recognized several major knowledge gaps in the existing studies exploring the associations between intergenerational activities and health among the elderly. Future studies are needed to understand the health-significant roles of various other types of non-program based intergenerational interactions that can occur near one's residential/work locations (e.g. parks, streets, stores). Such studies can contribute to creating intergenerational communities with both physical environmental and social program supports, and therefore addressing many aging-related societal challenges that communities in the US and beyond will continue to face.

Shan Jiang, David Allison, and Andrew Duchowski, 117, *Natural Views and the Impacts on Wayfinding: A study of hospital circulation spaces through immersive virtual environment technology*

Large hospitals are often complex, sophisticated environments due to their functional complexity and how they evolve over time. As such, their often excessively institutional environments can have negative effects on hospital occupants, such as wayfinding difficulties and spatial disorientation (Allison, 2007; Pati, Harvey, Willis, & Pati, 2015; Ulrich, Zimring, Quan, Joseph, & Choudhary, 2004; Verderber & Fine, 2000). Research about hospital circulation spaces remains neglected compared to the design and research in other domains of healthcare spaces conducted and reported to date. Visual engagement with nature, which has proven therapeutic effects, has been hypothesized to provide wayfinding cues and facilitate spatial cognition in healthcare complexes. However, hospital circulation spaces, typically defined as spaces for the movement of people, equipment, and supplies between

departments, have been neglected compared to the emerging evidence-based research on other topics (Carthey, 2008; Jiang & Verderber, 2017). This study hypothesized that visual access to nature from within hospital circulation spaces provides identifiable and memorable landmarks and facilitates spatial cognition and wayfinding in a typical diagnostic and treatment healthcare environment. The design of hospital circulation spaces with and without such access will be compared with regard to spatial orientation and wayfinding performance. People's environmental experience of visual engagement with nature and the distribution of visual attention in hospital circulation spaces will be explored. This ongoing study will also examine the Immersive Virtual Environment (IVE) technologies as complementary tools in healthcare design research. Participants will complete various wayfinding tasks in hospital IVEs as their eye movements and heart rate changes are tracked and analyzed, and a series of variables will be measured to compare the task completion time and route selection. Participants' navigation strategies will be assessed, and they will report their mood status (Heuchert & McNair, 2012), rate the attractiveness of the hospital environment, and report the level of immersion and presence in the IVE (Schubert, Friedmann & Regenbrecht, 2001), and their sense of direction (Hegarty, Richardson, Montello, Lovelace, & Subbiah, 2002). Six college students participated in the pilot study to refine the research design. The official data collection should complete by the end of December 2018. This emphasis on user participation in caregiving and healing makes this study meaningful and desirable. Results will be translated to design recommendations to guide the layout of medical compartments, corridors, and courtyards and provide alternative solutions to hospital wayfinding issues.

Li Tan, Shiyang Zhang, and Danzi Wu, 76, *Impression of Hutong: Research on the value recognition of contemporary Hutong landscape based on community public participation methods*

Hutong is another name for the streets of the old community in Beijing, China, which is an important public space for the residents of historical districts. With the rapid development of the city and the transformation of the community's living mode, the residents are transforming the Hutong spontaneously to adapt to the great changes in people's lifestyles. The landscape of the Hutong public space has been transformed from simple in history to complex and diverse in contemporary days. However, different people have different sense of worth for these emerging contemporary elements. There are many conflicts between the protection of historical landscapes, the requirements of residents and the needs of government management. The aim of this research is to find the value of contemporary landscape elements in different group of people and how to deal with the problem in urban renewal process by communicating with different people in a visual exhibition. The research is a three-step process: survey, exhibition and analysis. First, the team conducted image collection on 20 typical Hutongs in the Dashila area of Beijing, collected nearly 300 contemporary Hutong features of public space landscape elements, flattening and mapping these elements for their emergence and function. Secondly, cooperating with the community renewal organization team and the local government, the team use the international exhibition opportunities such as Beijing International Design Week to conduct public participation chances. We reveal the characteristics and values of contemporary Hutong landscapes to local residents, government agencies and tourists through interactive exhibitions. At the same time, we used own magnet collage device that is a interesting visual and interaction way to invite the visitors to participate in the elemental collage of their impression and future expectations of the Hutong, and finally collected a large number of collage images. Finally, the team conducts statistical analysis on the collage images after the exhibitions, analyzing the correlations of the functions, space positions, comprehension fitness, and participants' social identities in order to obtain the contradictions and future opportunities of the public landscape requirements in different groups. The team finally combined the research results, conceived the renewal and development strategy of the local Hutong public space, and provided reference plans for local government agencies.

Pai Liu, Yang Song, and Matthew Powers, 272, *The Integration of Behaviors Mapping and Connectivity measures: A new method for interpreting healthcare environments*

The current extended lifespan of people makes healthcare a fertile topic in the field of the built environment (Glanz, 2015). Most previous studies regarding the healthcare environment has been conducted using traditional methods such as interviews, focus groups, and on-site observations. However, those traditional methods rarely are integrated with network connectivity measures which have been widely used in transportation planning, urban design and indoor circulation simulation. This research aims to develop a new method by interpreting the importance of various spaces in an assigned healthcare environment by using behavior mapping and network connectivity calculation. A senior center designed for Chinese immigrants in the United States was selected for this study. Using 42 points selected in this center as observation points, two well-trained observers conducted behavior mapping hourly from 9 am to 1 pm following the same route but starting from different directions. Based on these maps, a value was assigned to each point indicating its importance of the users' daily activities. The connectivity significance of each point weighted with its corresponding value was then calculated based on the Graph theory using customized parametric tools. The results will inform the relationships between differently spaces and usage; future research can use these relationships to develop appropriate design principles. The resulting method can potentially inform the future research and design regarding healthcare environments, for example, for retirement communities, hospitals and children daycare.

Kanglin Chen and Yaohua Chen, 28, *Evaluating the Implementation of Master Planning of National Parks of China*

From the 1980s, remarkable achievements have been made in China's national parks, but there have been a series of problems regarding resource protection, community management, tourist management, and so on. A few provinces have taken a lead in conducting national parks evaluation in the local, however, due to the lack of nationally uniform standards, the specific contents and depth of the evaluation report are lacking in detailed definitions; problems such as different local assessment priorities and unclear assessment criteria arise as well. Related evaluation research led by Ministry of Housing and Urban-Rural Development of People's Republic of China (MOHURD) has officially started from 2017. In summary, evaluating the implementation of master planning of National Parks of China show great importance, necessity and urgency in the current social context. This paper aims to construct a set of quantitative evaluation methods of the planning implementation of national parks of China through analytic hierarchy process and Delphi method. By analyzing different monitoring management mechanisms and evaluation standards of protected sites in China and abroad, we define the connotation and some important contents, and summarize goals and principles of the evaluation of National Parks of China. Next, we establish a 4-level, 62-index indicator system, modify the indexes and determine their weights via questionnaire of 17 experts around China, including scholars on campus, practitioners in both central and local departments. Then, we explore the standard survey requirements, data prerequisites and core procedures for the nationwide evaluation work, and study Fangshan_Changyudongtian National Park of China in Zhejiang province as a case to verify our indicator system. This paper contributes to promote the development of the protection, management and planning of national parks of China in the future.

Fangzheng Li and Shiyi Guo, 100, *Integrating Ecosystem Services Demand with Landscape Ecological Security: A green space pattern optimization approach in central Beijing*

Ecosystem services demand means where and what kind of ecological services are needed. Ecosystem services demand of urban green spaces includes not only ecological service demand but also cultural service demand. The mapping of ecosystem service demand is regarded as helpful references to inform land use planning and green space conservation. In contrast to previous studies that usually solely consider ecological service demand or cultural service demand, this study tries to make a more comprehensive theoretical framework based on multi-criteria (soil erosion sensitivity, geological hazard sensitivity, water management, vegetation coverage, permanent farmland, accessibility, population density, direct use frequency of green spaces, cultural heritage). In addition, the

actual usage frequency of green spaces is obtained by utilizing the location information of check-in spots on social networks by crawling check-in data from the dominant social network of China, which fills the research gap of the various understanding of ecosystem service demand. According to the evaluation result of ecosystem service demand, areas with high ecological-cultural demand are selected as sources and corridors, making up the landscape ecological security pattern which includes key ecological sources, ecological corridors, key cultural sources, cultural corridors and other potential areas. Results show that mountainous areas, public parks, water bodies with high ecosystem service demand, are main components of landscape ecological security pattern. These areas should be regarded as the baseline of green space conservation. This study broadens the methodology of assessing the ecosystem service demand in urban areas, and its result can guide the optimization of urban green space pattern.

David Tulloch and Wansoo Im, 317, *Comparing Parks Using Twitter*

While often disregarded as something lacking a serious edge, social media has grown into a global phenomenon. However, geocoded tweets represent a massive resource for examining the human of the landscape. This paper presents statistical analyses of the contents millions of tweets, posted in and near two of New York's most prominent parks. Collected comparison of tweets has been demonstrated as a filter through which to see the emotional state of park visitors and study the characteristics of their visits. Despite the popular conception of twitter as a trivial communication avenue or marketing tool, a substantial body of literature has emerged demonstrating that studies of social media (particularly Twitter) reveal new findings about fields as diverse as medicine, sport sciences, economics, and physics (e.g., Paul and Dredze 2011, Zimmer and Proferes 2014). Essential to this paper, is the emergence of research showing how textual analysis in Twitter reveals emotional states and personal experiences. The technology allows scholars to engage a new group of users (Bollen, Alberto and Mao 2010; Louloumpis, Wilson and Moore 2011). Other scholars have turned to Twitter as a tool revealing information about place (Mitchell et al. 2013; Walther and Kaisser 2013). Expanding on methods described previously (Tulloch and Im 2018), the primary focus of this presentation will be new analyses of Twitter geolocated data for comparing differences between user experiences in Prospect Park and Central Park. The analyses measure the difference in word usage rates between the two parks that reflect different characteristics and reveal different experiences. Statistically significant differences between the tweets in each park show how different these parallel experiences can be. The paper finds key differences between the parks, both in emotional state (Prospect Park visitors are happier) and in the features and experiences noted (Prospect Park visitor write more about water, the lake, rain and music). Although, just as telling may be words that used at relatively similar rates in both parks: leaves, ball, run, and cloud. Finally, this paper will show how the analysis results relate to design differences and context differences in the two parks. It will also raise concerns about locational accuracy and user bias. Ultimately, the tweets become a measure of user engagement by the parks' different features and spaces. What the users experience and how they write about that experience compliments other research measuring quality of experience and landscape performance.

Andy Kaufman, 400, *Aloha of Sustainability: Researching green roofs and living walls for Hawaii*

The intent of this project is facilitating landscape architecture learning through research, application, and outreach. Green technologies in Hawaii such as: green roofs and living walls are in initial stages of implementation, which is far behind other geographical regions. One reason is the lack of research in these green technologies for tropical/subtropical climates like Hawaii. There is a need in the State to help improve the quality of life by providing new techniques and products to save energy in residential homes and business; and to counteract the high cost of living in the islands. The research component includes the construction of five "Ecosheds" consisting of one shed having a typical asphalt shingle roof system; two having a modular type extensive green roof system (one with a mix of native species and the other with a mix of tropical ornamental species); and two sheds having a monolithic

extensive roof system (one with a mix of native species and the other with a mix of tropical ornamental species). Additionally, two of the vegetated roof sheds will contain two types of "Living Walls" systems on two sides of each of the sheds in order to test different edible crop and Hawaiian medicinal plants. Project data includes evaluation of tray vs monolithic green roof systems, as well as the living wall systems: 1) Plant growth, 2) Plant selection, 3) Plant establishment, 4) Stormwater mitigation, 5) Soil moisture retention, 6) Heat mitigation, and overall system performance. Landscape Architecture/Horticulture students have constructed all sheds and systems, and individual students as well as classes are actively engaged in system construction and data collection. This aids in students "real world" experiences on the practical aspects of design, installation and longevity of a project. Information of this long term project is being disseminated in landscape and horticulture classes, as well as field days with local residents, business, and green industry stakeholders in Hawaii about the design, installation and maintenance of these systems. This will begin to give needed information for all stakeholders to be able to compare the opportunities and barriers of these green technologies for use in Hawaii.

Samantha Stewart, Peter Miniutti, and Natalie Gray, 206, *Evaluating the Success of Making Equitable, Predictable, and Transparent Development Decisions by Encouraging Community and Stakeholder Collaboration Through Two Participatory Design Case Studies*

The University of Connecticut's Community Research and Design Collaborative (CRDC) is an organization consisting of the landscape architecture faculty, graduate, and undergraduate students. The CRDC mission is to do sustainable, equitable, and affordable outreach work with communities. We promote using participatory design strategies throughout the Design Process to fulfill the CRDC mission. Participatory design is an approach that encourages actively involving all stakeholders, clients, community members, and site users to make sure the solution meets their desires and needs. This holistic design approach was used throughout two community-based projects; Ecological Screen in Fairfield, CT and Wolcott Park in West Hartford, CT. We completed a series of public and client meetings, public workshops, and surveys to educate the public and build a strong consensus not only for the final design result, but also at each step throughout the process. Our presentation will provide a comparison of the two projects. To fully evaluate the effectiveness of its participatory design component, we used different evaluating methods for each project. For the Ecological Screen project, we used simple data collection methods that mostly resulted in qualitative information. For the Wolcott Park project, we teamed up with a social scientist, Dr. Miriah Russo Kelly, an expert in blended research methods. Working with Dr. Kelly, we were able to develop a more thorough evaluative method. We created a blended data collection strategy using surveys and other tools to evaluate the success of the participatory design component for the Wolcott Park Project. We will explain the participatory process as a fully integrated component of the overall Design Process throughout each project. Project success will be evaluated through the separate methods as explained above. We will show how using blended research methods, instead of single/intuitive methods, leads to a more concrete and thorough assessment of the process as well as building a foundation for clear objective communication both within our trans-disciplinary team and the general public. We will conclude by sharing a Design Process Tutorial of an improved model created from the successful parts and pieces from both case studies. Our hope is that our easy-to-follow tutorial will make it easier for other landscape architects to successfully incorporate participatory design into their work.

Sarah Little and Adina Cox, 329, *Advancing Design Research: Creating a new framework from three approaches to case study research*

Landscape architecture is morphing into a hybrid discipline combining knowledge from practice and research. While the historical focus of landscape architecture education has been on practice, the evolution of design research and the rise of design PhD programs over the last 20 years serve as the catalyst of this metamorphosis. Conducting multi-disciplinary research as an academic may be challenging. Communicating landscape architecture research to

researchers in other disciplines is frustrating. Most people do not understand landscape architecture as a design discipline much less a research discipline. A remedy may be adapting language that reflects a more accepted and traditional version of research. Case study is a good example. For example, the term 'case study' can encompass a variety of activities within the design profession from novice investigations, such as precedent searches and post occupancy evaluations, to rigorous research endeavors. For clarity, the authors are utilizing the term 'case study' to refer to the latter. In landscape architecture, Francis' (2001) article "A Case Study Method for Landscape Architecture" is the accepted standard for case study research. While the article greatly advanced landscape architecture research, it exacerbates the problem of non-conformity to traditional research terminology in that the method as defined by Francis is largely descriptive of the design and construction processes with little attention given to relationship between place and socio-physical factors. The Francis case study resembles a post occupancy evaluation more than a case study as defined by Yin (2009), the leading authority of case study within social science. Furthermore, Francis' method relies on an opportunist selection of case in that cases are selected due to proximity to the principals involved in the design and construction of the project instead of selecting the case to explore a specific research question (Swaffield, 2017). In this paper, the authors will explore case studies within adjacent fields in order to establish Yin as the model for case study inquiries and then compare and contrast the work of Francis to the work of Groat (2002) in Architectural Research Methods and Swaffield (2017) in Research in Landscape Architecture Methods and Methodology and Yin (2009) in Case Study Research: Design and Methods. The authors examine how case study research can be tailored to the needs of designers and design researchers, while enhancing rigorous methodological processes by applying knowledge from the social sciences. This new framework can be used to enhance future research in landscape architecture.

Jun-Hak Lee, 431, *Automated Individual Tree Detection and Canopy Segmentation in an Urban Context using Airborne LiDAR Data*

Spatially explicit information of urban trees is essential for urban green infrastructure planning, monitoring, and management (Davies et al., 2011, Matasci et al., 2018, Nowak et al., 1996). Among various remote sensing methods, light detection and ranging (LiDAR) technology is a highly effective tool to extract detailed biophysical characteristics of urban vegetation because LiDAR provides detailed 3D surfaces (both ground and non-ground) data with high spatial resolution and accuracy (Lee et al., 2016). Automated mapping of individual trees and retrieving 3D tree canopy models using LiDAR can provide key information for assessing the benefit of urban trees while reducing time and labor. In this study, we explore the feasibility of extracting individual trees in urban areas using the University of Oregon campus, located in Eugene, Oregon, as a study site. Using automated procedures, we create a campus tree map with airborne LiDAR data. To compare the performance of different methods, we experimentally employ two different tree isolating methods 1) a marker-controlled watershed segmentation (raster-based method using image processing technique (Chen et al., 2006)) and 2) layer stacking, which slices the tree canopy point cloud at 1-m intervals and delineates trees in each layer (Ayrey et al., 2017) . In addition, we derive individual tree attributes (e.g. tree height, canopy volume, tree biomass, leaf area, etc) from the isolated tree canopies. The results are evaluated using the accuracy index (AI), which incorporates omission and commission errors (Pouliot et al., 2002) with the "University of Oregon, Atlas of Trees" data. We expect the derived 3D tree attributes and location information from LiDAR will enable an enhanced assessment of the ecosystem functions and services provided by urban trees.

Yalcin Yildirim, 449, *Associations between Sound and Transit Oriented Developments*

Transportation-related noise influences more than 90 percent of the U.S. population even though the effect is not usually at a high enough level to be considered a threat to public health. There is no doubt that exposure to noise is a part of daily urban life; however, all different types of human settlements, including urban, suburban, and rural, risk exposure to potentially harmful levels of vehicle and traffic noise. This research aims to examine sound levels

and determine the contributors at the TOD station and neighborhood levels. The site selection was performed to determine the final locations of the research and, eventually, the research ended up studying 45 light rail stations out of 82 in Dallas-Fort Worth Metroplex. A hierarchical-level analysis is performed to model the likelihood of whether neighborhoods and TOD stations have effects on sound levels by controlling characteristics related to socio-demographics, such as income and total households and the built environment, such as street connectivity. The sound samples were collected from the selected site on various time intervals. Socio-demographic and built environment data were mainly extracted from ACS, GIS, and transit agencies. The research team found that amenities, built-environment characteristics, and neighborhood features have significant implications on sound level at both the TOD station level and neighborhood level. TOD stations that include more amenities have greater impacts on sound levels. Neighborhoods with more grid street configurations, neighborhood facilities, as well as built environment densities are likely to increase the sound levels. Increasing population density and intersection density decreases the likelihood of being in a high-level sound environment. These patterns provide an "arena" for landscape architects, urban planners, and policymakers to generate engaging design solutions and policies.

POSTER ABSTRACTS

YeongSeo Yu, MooHan Kim, 92, *Quantitative Assessment Method in Aesthetic Quality of Landscape, Focusing on Wetland in South Korea*

Our purpose is to develop a method of quantitative assessment in Aesthetic Quality of Landscape (AQL) from the Cultural Ecosystem Services, for effective monitoring to wetlands in South Korea. AQL is a subjective aesthetic quality for visible landscapes that visitor experience. It is one of the non-material benefits values usually considered in cultural ecosystem services. AQL is important as it helps us to understand the relationship between visible perception and the environment. However, there have been difficulties in gathering subject's response data from field survey for its evaluation as well as in analysis by un-unified analysis standards. Thus, the Ministry of Environment in South Korea has requested for the development of cultural ecosystem services' unified quantitative assessment indices including AQL, using only open-sourced data; without any social survey, to encourage government officials in monitoring the current situation of wetlands with ease. We developed a various evaluation method for AQL objectification that corresponds to the subjectivity of perception analysis, by using open source data only. We chose Upo-wetland, Ungok-wetland as research sites, as they are representative of Ramsar conservation wetlands in South Korea. We chose and deemed the characteristics of landscape naturalness and landscape diversity as key influential factors of AQL, based on the results of various literature (Dobbs, Kendal, & Nitschke, 2014; Frank, Fürst, Koschke, & Makeschin, 2012; Syrbe & Walz, 2012) which shows that those elements positively correlate with the estimation of landscape aesthetics that subjects perceive. In the evaluation, we considered a vertical and horizontal approach in order to capture the multi-facets of landscape naturalness and landscape diversity. Approaching horizontally, we defined landscape diversity as the frequency and amount of various landscape patches' calculated within each 50sqm grid. We also defined landscape naturalness using Hemeroby Index, which classifies landscape types into six levels of human interference with nature. Through discussions, we modified the Hemeroby index to five levels because we felt that it contained inadequate guidelines for wetland landscape analysis. Subsequently, we evaluated and scored the current research patches Classified Land Coverage map. Finally, the sum of each landscape type area with their Hemeroby level and median were calculated to evaluate the horizontal naturalness AQL per square meter. Approaching vertically, we defined landscape naturalness as the greenness amount appeared through the Green View Index(GVI). GVI is the percentage of occupied greenness in a frame of videos filmed continuously along the routes in the wetlands. Since the change of those values is related to structural changes represented in each sample, we can define vertical landscape diversity as the degree of change in those results. We analyzed and elicited trend-lines by smoothing spline estimation and counting inflection points based on those GVI results. We were able to conclude from the above process: Horizontally, Upo showed 2.75/ m2 in landscape diversity and 4.75/m2 in landscape naturalness. Vertically, it showed 54.85% of GVI for landscape naturalness. There were 11 macro and 27 micro-spatial visual variations for vertical diversity. Ungok, on the other hand, showed 1.97/m2 for diversity and 4.83/m2 for naturalness, horizontally. Vertically, it showed 65.25% of GVI for landscape naturalness. There were 29 macro and 9 micro-spatial visual variations for vertical diversity. The AQL evaluation covered in this study has considered that the factors and perspectives addressed in each assessment were different. Further discussion is essential as it is dangerous to specify any one specific AQL index. We hope that this research would help researchers and decision-makers understand and plan future conservation and regional planning as it will enable wetlands and other regions of interest to be effectively and briefly assessed and monitored at the national and local level.

Hana Lee, 181, *The Image of Place : A collective sense of place on social media*

The sense of place is constantly evolving, as over time places are restructured with new meaning, reflecting urban dynamics (Batty et al., 1999), evolving sociocultural perceptions or significant events (Crooks et al, 2015). Mobile technologies and new media platforms offer new opportunity in reading the sense of place shared by local inhabitants and many visitors. A proliferation of narratives and images has been providing avenues for reading history differently, away from the institutionalized spaces of museums and official archives (Ibrahim, 2007). Social media outlets, such as twitter or Instagram, as well as their tags and descriptions, presents a window of opportunity to understand contemporary city life. The role of social media contents in the formation of place identity needs to be taken into consideration along with various perspectives from its residents, tourists and its governments about either place identity or destination image as it is depicted on social media. A case study of Union Square, New York, will demonstrate how social media can be used to communicate a sense of place. The USP is an great example of organizations that actively utilizes all social media channels including Twitter, Instagram, Facebook, Flikr and their own website. The instagram account of USP has 2,433 posts, 14.6K followers and following 573 users as of April 1, 2018. Among those images, 1,281 posts from June 18, 2013 to December 31, 2015 are analyzed for this study. To understand the uses of social media by organizations the contents on Instagram will be analyzed to determine the association between the post type and two interaction metrics: likes and comments. A few number of typology proposed by literature will be evaluated its suitability including the "Public Life Data Protocol" by Gehl Institute. The data protocol is released on October 2017, in efforts to create a common language for cities to compare different spaces within their city limits, and to then compare their data with other cities. It provides a set of metrics that are important to the understanding of public life.

Lingyun Liu, Bo Yang, Lei Chen, 219, *Study on the Self-Organization Characteristics of County Urbanization and its Fractal Urban System in Hubei Province*

County is the basic administrative unit that has the largest number and widest coverage in China. A healthy functioning county system is essential for China's economic and social development, as well as the construction that permeates the urban-rural gradient. However, counties are becoming marginalized in China's urbanization process, due to its lowest administrative level, agri-based economy, remote geographical location, blocked traffic, ecological functions. For the reasons of tardy development of the county economy and the urbanization. As a result, the urbanization process in counties experienced lagging, especially in the mid-west China, such as the case represented by Hubei province. In the backdrop of New Urbanization in China, there are widespread interests and needs to explore county urbanization characteristics and principles. This study explores the county's urbanization characteristics and mechanism of population, industry, and space in Hubei province. The study combines the self-organization theory—which has becoming an effective means to expose the urbanization evolution mechanism and spatial features—with methods of literature review, survey, expert interview, and field investigation. Results show that the urbanization process of counties in Hubei province follows the self-organizing mechanism "weak external role-restraint of boundary role-polarization of internal role"? which has the characteristics of "county town polarization of population", "secondary production polarization of industry" and "dominant region polarization of space". These research findings can provide theoretical foundations for the establishment of guidance strategies that inform the spatial organization of counties during China's urbanization process.

Runzi Wang, Gang Zhao, Ming-Han Li, 253, *The application of Google Earth Engine to Landscape Architecture Research—An example of data collection and analysis procedure in a water quality study*

Google Earth Engine (GEE) is an advanced cloud-based geospatial processing platform. It enables high-impact, data-driven science in environmental data analysis at a large scale, especially the global scale. GEE is relatively new and there are few applications to landscape architecture research. This study aims to introduce how GEE can be applied to collect and analyze data more efficiently in landscape architecture fields with an example of a water quality study in Texas. In the longitudinal water quality study, we investigated the long-term trends of land use and water quality change in Texas gulf region from 1985 to 2012. With the big data approach enabled by GEE, we

created profiles of land-water characteristics in the study area. Two main tasks to accomplish in this study include: 1) Creating consistent annual land cover maps from 1985 to 2012 in the Texas gulf region using Landsat 5 image classification executed on GEE platform; and 2) Clustering the 1353 sub-basins in the Texas gulf region to several distinguished groups according to the landscape characters extracted from GEE platform and water quality indicators obtained from Texas Commission on Environmental Quality. Landscape characters include land cover percentages derived from the annual land cover maps, topographic variables, hydrological variables, climate variables and population variables. Two main applications of GEE in this study are longitudinal land cover classification and data collection of time-series landscape characters. We applied random forest classifiers with spectral, textual, and ancillary features to generate the 28-year land cover maps in the study area. Overall accuracy of land cover classification is 83% and R2 of all land cover categories is 0.94 in the year of 2011. Several underlying sub-basin clusters are found using spectral clustering algorithm based on long-term landscape characters and water quality indicators. Sub-basins in the same cluster share homogeneous land-water characters and might be suitable to impose similar water quality management policy on. In conclusion, GEE demonstrates great potential to improve data collection and computation efficiency and is a promising tool to be applied to more landscape architecture research.

Heather Whitlow, Forster Ndubisi, M. Elen Deming, 257, *A Case Study Method for Landscape Architecture: A 20-year review*

This year marks the twentieth anniversary since A Case Study Method for Landscape Architecture (1999) was published. In 1997, the Landscape Architecture Foundation (LAF) commissioned the study to support the advancement of landscape architecture research and education. The study was prepared by Mark Francis, Professor emeritus and past Chair of the Department of Landscape Architecture at the University of California, Davis. Goals for the initial project were to: • Advance and improve the level of practice and scholarship in landscape architecture through critical documentation and evaluation of projects and issues; • Develop a case study method for use in undergraduate and graduate education, which can be easily adopted by teachers, students, researchers, and practitioners; • Create a way to provide accessible knowledge of built and managed landscapes so that future practice is better informed by past experience; and • Expand the depth of critical analysis in landscape architecture so that the value of landscape architecture can be more effectively communicated. The resulting document has provided an approach for systematic project documentation in landscape architecture, employing rigorous research methods, providing uniformity in format, and giving access to relevant multi-dimensional case studies. Since its publication in 1999, "A Case Study Method" has been adopted widely in the profession and remains frequently cited. A number of schools have incorporated the method into their curriculum, and several have adopted its format for student theses. This interactive panel reflects on the history, relevance, and potential future modifications of A Case Study Method for Landscape Architecture. Setting the stage with a series of brief presentations, panelists then engage the audience on a variety of pressing questions: for instance, how are case study methods currently utilized to advance the goals of CELA-member schools as well as the broader disciplines of landscape architecture and design in general? Emerging case study research objectives will be discussed, such as: (1) increasing emphasis and range of performance measurements; (2) including contemporary design values and appropriate ways of measuring them (e.g. ecosystem resilience and social equity); (3) showing trends for how landscape architecture projects are conceived, funded, constructed, managed, and/or maintained; and (4) accounting for a greater range of stakeholders to provide input and reception data? In light of contemporary needs and uses for case studies, is there is a need to update the method? How can universities, CELA, LAF, and others help to increase the contribution of case studies to the knowledge base for landscape architecture?

Brian Lee, Adina Cox, Christopher Sass, Chase Clark, Demetrio Zourarakis, 258, *A Focused Accuracy Assessment of the 2016 National Land Cover Data*

On 28 December 2018, the Multi-Resolution Land Characteristics Consortium (MRLC) will release the 2016 National Land Cover Database for the Conterminous United States (NLCD 2016). These products use a 30-meter geospatial raster grid across the country to delineate one of sixteen land cover classes for each grid cell. Previous MRLC products (NLCD 1992, 2001, 2006, 2011) exhibited differences in accuracy, presenting analytic challenges for NLCD users. Although the MRLC completes an overall accuracy assessment, results vary across the country's geographic regions. Our local users need to know how accurate the nationally based product is for a number of uses in our state. Using the already available 2016 National Agriculture Imagery Program (NAIP) data along with a variety of ancillary data, an Anderson Level I accuracy assessment of the NLCD 2016 will be completed. The project approach uses multiple human interpreters with experience in the academic, government, and the environmental consulting sectors to classify the 2016 data by leveraging the previously established remote sensing observation array of 1290 sites across the state. The observation array has been used for decades and endeavors to have 40 locations of each land cover class on each Landsat Mission scene in order to cover the entire state. The array sites were established in places that allow for on-the-ground access so that additional ground-truthing can be performed in more detailed future work. In addition to a primary land cover class being determined, a second best land cover class will be assigned to all observation site locations. Interpreter confidence levels and second best classifications are recorded for each site during the initial classification pass. Following the acquisition of relevant ancillary data, all sites are classified a second time. Using error matrices, the NLCD 2016 classifications will be compared with interpreter classifications. Errors of omission, errors of commission, producer's accuracy, user's accuracy, overall accuracy, and Kappa coefficients will be calculated for initial, second best and ancillary data interpreter classifications. This research follows a process performed to access the accuracy of previous NLCD land cover where the overall accuracy was found to be 78.22%, 16.13%, and 76.43% for initial, second best, and tertiary pass using ancillary, data respectively, based on the human interpreter classifications. This accuracy assessment is an important step in providing engaged scholarship, the CELA 2019 Conference theme, for data consumers in our state.

Xing Xiong, Jun-Hyun Kim, Ming-Han Li, Xiao-Lan Tang, Lan Liu, Chen Xu, 275, *A Spatial Division Method Towards Sustainable Development of Traditional Rural Areas Based on Landscape Security Pattern*

Traditional rural landscape in China represents the cultural values of human settlements in different regions. However, with the rapid urbanization, the efforts of preserving China's traditional rural landscapes have been facing a number of challenges. This research proposes a spatial division method, focusing on ecological and cultural aspects, to promote sustainable development of traditional rural areas by applying the theory of Landscape Security Pattern(LSP). LSP was put forward by Kongjian Yu in 1995, based on the theory and method of landscape ecology. By establishing the landscape security pattern, some certain landscape processes can be effectively maintained or prevented. In recent years, LSP has been used in the fields of the traditional village conservation and the residential community planning. In this study, A traditional town of Xishan in the east of China, as an integral part of Taihu Lake Scenic Area, which is seriously affected by tourism and urbanization, was used to demonstrate the spatial division method in four major steps. First, several significant patches were selected as ecological landscape sources for soil and water conservation, and biodiversity preservation. In addition, major cultural landscape patches of productive landscapes, traditional settlements, and religious landscapes were selected as cultural landscape sources. Second, potential factors, whether promoting or resisting the expansion of sources, such as land use types, slope and vegetation coverage, and distances to roads and lakes were evaluated as the different intensity of resistance surfaces in the study area. Third, based on selected sources and resistance surfaces, two main landscape spatial patterns focusing on ecological and cultural values overlapped by several individual landscape processes were developed by utilization of the minimum cumulative resistance model in ArcGIS. According to our analysis, rural landscape in Xishan could be categorized into three main types, including ecological and cultural landscape preservation area, general traditional rural landscape area and industrial development area, which accounts for 38.3%, 17.9%, 49.2%, respectively. Finally, optimization strategies were proposed regarding diverse

subareas to promote sustainable development. The research results emphasize the synergistic protection of the ecological and cultural environments in traditional rural areas, which not only provides theoretical support for traditional rural landscape protection plans but also provides a reference for future development plans.

Brian Lee, Demetrio Zourarakis, 292, *A Process to Identify the State's Large Forest Blocks for Landscape Conservation Planning*

Large forest blocks in the landscape matrix are a well-documented, important element for a comprehensive conservation portfolio. The purpose of this ongoing engaged scholarship project serves our state stakeholders in a number of ways. For example, government and private land managers and conservation organizations use the results to focus their efforts on achieving organizational mission objectives. The geospatial approach used to conceptualize the model is similar to the way a sculptor might create a subtractive clay block sculpture. The final form is a result of removing material from the whole or in this instance, the forested landscape. This project utilizes a previously developed and tested ArcGIS ModelBuilder framework based on the conservation and geospatial literature that automates identifying and quantifying the number and size of large forest blocks in our state. We apply the ModelBuilder process in order to continue a project that utilizes the National Land Cover Data (2001, 2006, 2011, & 2016) to temporally characterize landscape change. A generalized six step analysis process is described and visualized, with a detailed ModelBuilder depiction provided to demonstrate the analysis process. It is important to recognize there is known error in each of the land cover datasets according to the data originators. All known public road and active railroad datasets are available from the state's geospatial repository and were used in the analyses. The resulting statewide maps illustrate the size and extent of forests blocks of at least 1,000 acres. In addition, a graph is used to illustrate five quantitative measures of forest blocks from each period that represent landscape change over 15-years in 5-year increments. In addition, the results are visualized in the context of the United States Geological Survey, National Gap Analysis Project (GAP), Protected Area Database of the United States (PAD-US v. 1.4) to identify opportunities and threats to existing conservation lands.

Tong Wang, Shuqi Shang, Yingjun Mao, 488, *Research on Landscape Performance Evaluation and Optimization of Sponge Community Reconstruction Project Based on the LPS System*

Under the background of the 30 sponge project pilot cities in China are in the acceptance phase, it becoming an urgent issuee that how to evaluate the performance of the projects. This paper takes the community-scale and sponge reconstruction type project as the research object, based on the analogy of the LPS (Landscape Performance Series) released by the LAF (Landscape Architecture Foundation) to build a landscape performance evaluation system, which is more suitable for China, with environmental, social and economic benefits as the core. First, identify the evaluation indicators. From the existing 147 CSI (Case Study Investigation) studies, four items with the keywords of "community" and "stormwater management" were selected, comparative study of the actual situation of the domestic community sponge reconstruction project such as control indicators, technical strategies, engineering measures, post-use evaluation and so on commonly used performance evaluation indicators of the same type are extracted; Second, select the indicator analysis tools. Select the appropriate analytical model from the existing 22 Benefits Toolkit to evaluate the environmental benefits, select the appropriate calculator to evaluate the economic benefits and develop a questionnaire to evaluate the social benefits Finally, advise the data collection method. Common methods include on-site monitoring, model simulation, questionnaire distribution, online survey, and retrieval of file data. There is a comparative analysis of 7 Chinese projects in the CSI to select some more suitable database. Through comparative analysis with the same type of project, we will seek a landscape performance evaluation system in community-scale that is more suitable for China's national conditions, including evaluation indicators, analysis tools, and data collection method. The landscape performance evaluation system of community-scale sponge reconstruction project will provide practical theoretical support for the acceptance of sponge pilot cities.

10. SUSTAINABILITY

PAPER ABSTRACTS

Hong Wu and John Hall, 144, *Exploring Maintenance-Friendly Planting Design For Green Stormwater Infrastructure* *

Green Stormwater Infrastructure (GSI), like gray infrastructure, requires persistent upkeep to ensure that they continue to function as designed in the long-term. The conventional "build'em and walk" approach produced numerous examples throughout the country where initially well-functioning GSI facilities gradually lost their environmental performances, let alone aesthetic appeal and public acceptance. Despite ongoing advocacy for the importance of maintenance, establishing rigorous and cost-effective maintenance programs has been a tremendous challenge nationwide, due to various reasons including the dispersed nature of GSI facilities, substantial operation and maintenance (O&M) costs, and inadequate understanding about the maintenance activities and associated frequency required to achieve desired performance levels. Significant potential exists in design itself to help reduce long-term O&M costs. For example, with regard to one of the most expensive GSI maintenance tasks - vegetation care (ranked 1st most expensive task by Philadelphia Water Department), careful selection of plant palettes with appropriate planting densities can help reduce competing weeds and foster desired vegetation community. Extracting such design lessons from first-hand professional knowledge is extremely valuable for re-examining and improving current design protocols. Specifically targeting right-of-way bioretention facilities, this study develops an inventory of maintenance-friendly GSI planting design strategies through interviewing experienced landscape architects, engineers, maintenance staff, and public officials in the cities of Seattle, Portland, San Francisco, Denver, Manchester (NH), Philadelphia, and New York. Moreover, covering broad geographic contexts, we identify both generalizable principles and nuanced regional differences among various planting approaches across the country.

Ebru Ozer and Berrin Tansel, 401, *Climate Considerations for Design, Implementation, and Maintenance of Green Stormwater Infrastructure in Urban Areas*

The "green infrastructure" approach to urban land management has been gaining traction in the recent years. Its utilization for adaptation to changing climates has been widely studied, however, it is still unclear how the climate itself affects the design and implementation of green infrastructure, particularly green stormwater infrastructure. Climate has been identified as one of the biophysical factors that potentially delimit the utility of green infrastructure in addition to other factors such as available area for greening, urban morphology, site contamination, geological issues, and vegetation characteristics, and therefore its impact on green infrastructure needs to be better understood. Understanding of climate parameters and their implications for stormwater management systems allows the decision-makers to evaluate climate related risks and opportunities, and implement GSI practices that address resiliency concerns. Although noteworthy literature exists on green infrastructure, little information is available for the effects of specific climate parameters on the selection of appropriate GSI systems. This research provides an evaluation of appropriate GSI systems that are aligned with specific climate conditions to (1) analyze the relationship between climate types and the existing GSI practices; (2) classify GSI implementation impediments related to climate conditions; and (3) identify appropriate GSI practices for different climate conditions. In order to formulate a conceptual framework of associations between climate and appropriate GSI

practices, we critically analyzed existing GSI practices as case studies in four different Köppen–Geiger climate regions in view of their climate specific GSI attributes. Our findings indicate that (1) climate is an important factor for the implementation of GSI practices and therefore specific climate factors need to be considered when designing GSI; (2) climate flexibility of GSI that utilize combinations of different systems improve their ability to effectively function with climate variations; and (3) effective GSI practices can provide multiple benefits to communities, including climate resiliency.

Sohyun Park, Jaehoon Lee, and Seungman Kim, 451, *The Relationships between Urban Green Spaces and Fine Particulate Matter in Six Largest Cities in Texas*

Outdoor air pollution is one of the most significant environmental threats to both human health and ecosystems (Brook et al, 2011; Han, 2015; Kelly & Fussell, 2015). Literature has found the roles of urban trees and plants on outdoor air quality (Nowak et al, 2006; Kennen & Kirkwood, 2015). Some research examine the physiological characteristic of plants that reduce exposure to air pollutants, while other studies focus more on phytoremediation performances such as filtration of pollutants from the air (Kennen & Kirkwood, 2015). Few studies, however, have examined urban green spaces as a building block to shape a cleaner city. With the case of six largest cities in Texas, one of the most polluted states in the United States, this study aims at illuminating the relationships among different variables that influence city-wide PM 2.5 pollution level. The variables were categorized into three groups for statistical analysis: 1) urban components (city size, urban population, population density); 2) green space components (green space coverage, green space percentage, tree canopy percentage, green space connectivity, and green space shape); and 3) metrological factors (ambient temperature and wind speed). To identify the relationship between meteorological features and daily PM 2.5 concentration, we used descriptive statistics for each city and all four cities considered. We also examined the correlation between urban and green feature components and city-level PM 2.5 using bivariate statistical test. To avoid collinearity problem, the combination of variables that have perfect correlation (e.g., city size and population) was excluded from the statistical model. Lastly, the Hierarchical Linear Modeling (HLM) technique was used to estimate the effects of the meteorological features and urban and green space features on the daily particle pollution level, which accounted for the clustering of particulate measurements within cities. The analysis results showed that both temperature and wind are a strong and significant predictor of PM 2.5 (the higher temperature and the weaker winds, more fine particulates). The population density was a significant predictor, but city size was not. It is notable that green land cover percentage and green space shape were a significant predictor of PM 2.5 as well, while it has a positive correlation with the metric of green space connectivity. The study indicates that the quantity, proportion, and spatial configuration of urban green spaces are associated with urban air quality. Although more sophisticated design with more variables would be needed to explain the complex pattern of fine particulate matter in cities, the preliminary findings demonstrate the spatial allocation and arrangement of green spaces can be a consideration for urban air environment management and city planning and development.

Yekang Ko, 331, *Resolving Conflicts of Greens in Energy Landscapes: The Role of innovative design and spatial planning*

Renewable energy development is critical to mitigate the effects of climate change while securing energy needs. Under many national and state policies setting green energy goals to meet greenhouse gas emission targets, utility-scale renewable energy (USRE) facilities are rapidly spreading across various landscapes including rural areas, remote wild areas, and large rivers and oceans. Given that solar and wind energy development requires vast lands to generate the same amount of energy produced by fossil fuels (McDonald et al. 2009), USRE has become the major driver of land use change in recent years in the U.S. (Trainor et al. 2016). Although USRE could still be much "greener" than conventional fossil fuels, they bring about increasing conflicts over cultural and ecological

resources (Brunette et al., 2013; Mulvaney 2017), so-called "Conflict of Greens (Ko et al., 2011)." The purpose of this study is to examine the role of innovative design and spatial planning to resolve Conflict of Greens, particularly focusing on biodiversity conservation vs renewable energy development. Simply put, we need more green energy. How can we ensure that we locate them in the right place with the least-conflict, particularly for biodiversity? Beyond legal and regulatory aspects, what role should environmental designers and planners play to resolve Conflicts of Greens from site to landscape scales? We will take a case study approach to illustrate both the attributes of green conflicts and the innovative design and planning tools to address these conflicts across the globe. As an in-depth case study, we discuss the recent green conflict between proposed solar farms on endangered bird habitats in Southwest Taiwan and their planning and design efforts in resolving the issue. The Taiwan case study is chosen to demonstrate how national-level, top-down renewable energy policy goals bring about local land use conflicts. Through additional case studies, we demonstrate various tools to increase land use efficiency including: developing USRE on already built or disturbed lands that are close to existing infrastructure; integrating renewable energy with the built environment (e.g. parking shade structures, noise barriers along highways); floatovoltaics on man-made water bodies of low ecological values; co-location of renewables (e.g., solar and wind); co-location or mixing with other uses such as agriculture; and innovative multi-stakeholder participatory planning using spatial mapping (Pierce et al., 2016). Given the rapidly increasing impact of renewable energy development on landscapes, this study informs designers and planners to address the Conflicts of Greens from site to regional scale.

Bianjie Ji and Mallika Bose, 484, *Residential Preference, Residential Satisfaction and Sustainability: Lessons from a campus town**

Americans lead an unsustainable or unhealthy life (Mirowsky & Ross, 2010). They drive excessively, consume prepared and packaged foods, and sit as long as possible (Mirowsky, 2011). Among these consumption patterns, housing is a significant contributor, accounting for 30% or so of average expenditures and income of all consumers (Bureau of Labor Statistics, 2017). Debate on consumer choices leading to housing and neighborhood unsustainability has been ongoing for a while (Gordon et al., 1998). However, few have studied the role of sustainability in residential preference, and residential satisfaction; the focus of this paper. The purpose of this mixed method study is to examine the role of sustainability in residential choice and residential satisfaction. In other words, do people think of sustainability when they are deciding where to live and what kind of house to live in? How do they conceptualize sustainable housing, and, what are their attitudes towards sustainability in general? Conceptually this study is framed within theories of housing preferences (Fornara, et al, 2010), residential satisfaction (Addo, I. A. 2016), and sustainability attitudes (Leiserowitz, 2006). The study contributes to sustainability research, especially sustainable consumption by examining to what extent housing preferences (in State College) is impacted by concerns for sustainability and about tradeoffs made in balancing sustainable lifestyle choices with other goals. Selected items from the Perceived Residential Environmental Quality (PREQ) indicators is used to assess residential preference, while the Sustainable development Goals (or SDGs) are used to assess attitudes towards sustainability. In order to be able to examine the linkages between residential preference and sustainability, three neighborhoods of varying sustainable urban forms were selected for this study (high, medium, low). Within the three selected neighborhoods, a stratified random sampling strategy was used to select households for data collection. A door-to-door survey is used to collect data in the three selected neighborhoods. The plan is to survey 30 households in each of the three neighborhoods for a total of 90 surveys. Data collection is ongoing. Descriptive statistical analysis will be conducted to examine preference for perceived residential environmental quality, residential satisfaction, and attitudes towards sustainability in each neighborhood. Analysis of Variance will be used to compare differences in attitude towards sustainability, residential choice, and preference for perceived residential environmental quality between the three neighborhoods. Multiple linear regression will be used to study the relationship between residential satisfaction, attitude towards sustainability and preference for perceived residential environmental quality.

Gary Austin, 84, *European Green Capitals: Performance in sustainable development**

BACKGROUND Although the government of the USA has abandoned the international effort to mitigate climate change adaptation and mitigation as well as other sustainable development goals, the European Union and its cities fund and implement projects to meet these goals. The annual European Green Capital competition highlights this effort. PURPOSE The purpose of this study is to evaluate the performance of Green Capital cities and compare this performance with American cities. A second purpose is to present photographs of sustainable development projects implemented in the Green Capital cities. The techniques and value of these landscape architecture projects will be presented. METHODS The study complies and presents data collected by the European Commission to document sustainability performance of competing cities. On-site photographic documentation of sustainable projects has been collected by the author during visits to eight of the Green Capital cities over the last five years. Projects of particular interest to landscape architecture will be presented. FINDINGS The study demonstrates the achievements of sustainability programs by the European Commission and the participating cities and illustrates the gap in performance of American cities. Carbo dioxide emissions, public transportation, pedestrian and bicycle infrastructure and stormwater treatment measures are documented, presented and compared to American efforts. For example, some of the Green Capitals are on a trajectory to be carbon neutral within the next five to ten years. Similarly amazing use of public transportation, bike and walking systems has reduced private vehicle use to as little as 20% for workers and students for commutes to work or school. IMPORTANCE Someday, the USA government will be forced to contribute to climate change and other sustainable development programs. When it does landscape architects will be called to create sustainability proposals. They will need models of successful programs and projects to rapidly make-up for decades in inattention.

Paul Coseo, 130, *An Urban Climate Design for More Thermally-Comfortable and Equitable Communities*

Over the past 150 years, societies have been excellent at designing cities that produce extreme and dangerous thermal conditions. Extreme heat and cold kill more U.S. residents than all other weather related phenomena combined (Berko, 2014). Yet, these hazards do more than kill. They disrupt residents' routines, steal income through high energy costs, degrade quality of life, and create challenges for urban sustainability and resilience. In addition, extreme heat and cold discriminate by individual or social factors – targeting the most vulnerable amongst us (Harlan et al., 2006). Landscape architects struggle to find relevant and generalizable strategies to this complex environmental problem. Unlike other environmental problems, thermal extremes are invisible – we sense temperature in complex ways filtered through nerve-endings that are affected by exposure to air temperature, radiation, wind speed, and relative humidity. Thus, the sensing of how it "feels" out or our personal thermal comfort experience is quite subjective, modified by physiology, psychology, weather, and design of spaces (Wong & Chen, 2008). No wonder designers addressing extreme temperatures in cities struggle to find meaningful strategies. The design professions must move toward a more comprehensive way to design better urban climates to support more sustainable and resilient communities. This presentation discusses the concept of Urban Climate Design (UCD). UCD is a comprehensive planning and design approach to intentionally reshape our urban atmosphere for more thermally-comfortable and equitable communities. The goal of UCD is to support successful adaptation to extreme heat and cold due to 1) natural variation in climate, 2) urban-modified atmospheres, and 3) global climate change. To date, design processes have resulted in unintentional modification of our urban atmospheres; UCD promotes a different design process aimed at creating more moderate urban climates that are equitably distributed across metro regions. The UCD approach leverages the best methods for sensing and documenting urban atmospheric dynamics from urban climatology and combines this with more grounded, experiential, and participatory practices from planning and design. This study reviews the history of urban climate as an area of landscape architecture research and practice using a systematic review method developed by Pullman and Stewart (2006). The review covers historical and contemporary 1) social, 2) biogeophysical, and 3) technological dimensions of city design that contribute to this problem. The presentation will discuss a series of UCD principles

addressing each of these three dimensions to move landscape architecture toward design processes for creating more thermally-comfortable and equitable communities.

POSTER ABSTRACTS

Kelsey Brooks, Jon Calabria Calabria, 457, *Assessing Granite Outcrop Plant Species on Extensive Vegetated Roof Modules*

Trialing Granite Outcrop Plant Species on Extensive Vegetated Roof Modules examines the performance of a Piedmont-native and threatened plant community grown in typical extensive vegetated roof conditions. Granite outcrop plant species exhibit characteristics that would suggest a unique adaptability to the rooftop environment. Vegetated roofs are characterized by increased wind, drought, sun, temperature extremes and shallow, rocky substrate. These relatively harsh growing conditions, compared to those found on the ground, require plants specially adapted to these extremes in order to ensure the survival and success of vegetated roof plantings. The harsh environmental conditions found on vegetated roofs are similar to those atop granite outcrops, where specialized plants grow in shallow pits on exposed rock surfaces. Over centuries, granite outcrops form shallow depressions, as a result of erosion, which slowly fill with soil after lichens and mosses colonize, die and break down. These depressions led to the evolution of a unique plant community that is often found nowhere else in the world. Various plants evolved to take advantage of these depressions in distinct stages of their development, as they fill with different depths of organic materials and water. Seasonal displays are beautiful and striking atop a granite outcrop as they are clustered in serpentine depressions surrounded by a rocky expanse. Winter, spring, summer and fall offer unique aesthetic displays of annual and perennial flowers, and pools that form in depressions during the early spring witness special blooms of short-lived pool-sprites which lay dormant the rest of the year. Granite outcrops are not well known, and around ninety percent of all the Piedmont's outcrops occur in Georgia (William Murdy, Guide to the Plants of Granite Outcrops, (Athens, GA, University of Georgia Press, 2000), ix), which has a special responsibility to protect and promote granitic outcrops. Vegetated roofs offer one opportunity to safeguard some of these plant species while re generating displaced green space in our urban areas and providing connectivity for the birds and insects that rely on these plants for food and shelter. This research project gathered survivability data on the performance of eight plant species over the course of one growing season (May 2018-November 2018) in replicated and blocked vegetated roof modules with two planting depths (2.5 and 4 inches) and two different media mixes (10% and 20% organic matter) in Athens, Georgia. The species, Opuntia mesacantha, Helianthus porteri, Sedum glaucophyllum, Coreopsis grandiflora, Phemeranthus teretifolius, Oenothera fruticosa, Packera tomentosa and Tradescantia hirsuiticaulis occur on granite outcrops throughout the Piedmont and are currently underrepresented in the nursery industry and vegetated roof planting inventory. Preliminary results indicate variability in plant performance within the two planting depths and planting medias. These results differ between the individual plant species, suggesting some species are better suited to vegetated roofs designed with more organic matter, or less, while other species require a deeper, or more shallow, growing substrate for optimal success. Findings will encourage the adoption of these specialized plant species into standard vegetated roof designs. This, in turn, can serve to promote further research into overlooked native plant communities that may be suited to vegetated roof conditions and other urban areas in need of increased biodiversity and ecological resilience. By encouraging the safeguarding of granite outcrop plant species while providing valuable data to the vegetated roof industry, which has historically struggled with a lack of plant diversity due to their heavy reliance on non-native sedum species, this study aims to offer evidence-backed advantages to both the green industry and Piedmont ecology.

11. Urban Design

POSTER ABSTRACTS

Hyeyoung Choi, Young-Ai Seo, 60, *The Concept of Resilience and its Integrated Design Strategies*

Many cities are suffering unpredictable damage due to global climate change. Cities also face new challenges not only in natural disasters by climate change but also in social and economic fluctuation. With the existing simple reconstruction method, it is difficult to solve the overall problem that the city or the region has. As a new approach to coping with various changes, the concept of resilience is emerging. The theme of the recent urban design competition is also the resilience. The "Rebuild by Design" competition in 2013 is a reconstruction project of the East Coast cities in the US that have been damaged by Hurricane Sandy. Subsequently, in 2017, the "Resilient by Design/Bay Area Challenge" competition for the prevention of potential disasters was conducted for the West Coast cities in the US. The purpose of this study is to derive a design strategy for resilience that emerged as a contemporary issue through two design competitions - Rebuild by Design and Resilient by Design. The results of this study based on deep analysis of projects above by 5 categories - process, analysis, design, execution, and governance - are as follows. 1) The significance of the preparation phase to design the entire process of the project, 2) The risk analysis through the participation of local experts and residents, 3) The landscape-based macro solution through integrated design, 4) Sustainable execution strategies with specific operations and budget plans, and 5) The way to organize and expand governance system that affects the whole process of project. The implications and possibilities for designing resilience through lessons learned above are as follows. First, it is important to design the entire process from the beginning of the project to the long-term execution. Second, it must be an integrated design method combining budget, policy, designers, residents, stakeholders and implementation. Third, considering global environmental change and speed of urbanization, the concept of resilience is likely to develop into a new design strategy that can cope with various changes of urban space rather than a temporary epidemic. This study has significance in that it explores the possibility of expanding the concept of resilience. Research on design strategies applying the concept of resilience to urban space that responds to various changes outside the disaster related issues is left as a future task.

Xiyao Zhao, Qing Lin, 80, *Local Creation and Professional Practice: Greening the landscape of Beijing traditional streets*

Hutong is a traditional narrow street or alley in Beijing. Now many hutong are designated as cultural protection areas. Hutong has the tradition of greening public space in ancient times, but the contemporary hutong pattern has changed greatly. A large and complex group lives in modern hutongs, making the streets chaotic and crowded. Compared with other parts of the city, residents enjoy few open Spaces, green Spaces and plants. This paper focuses on how to combine the professional practice of landscape architecture under the background of residents' spontaneous creation to carry out the green renewal of hutong landscape. Through field research and data collection, starting from the current situation, this paper summarizes and analyzes the forms of residents' participation in greening, the planting space model of hutong greening and the plant species preference of each space model. Inspired by the survey results, the research team proposed a "rose plan" focusing on the green micro-renewal of hutong streets. By planting Beijing's "urban flower" -- rose, combining with modular climbing device, the hutong surface is transformed into a three-dimensional rose garden, which will greatly increase the amount of greening in the hutong and become a new landscape with theme characteristics. As one of the projects of Beijing

design week, this project has received extensive media attention and will be promoted in other hutongs with the support of investment in the future.

Paul Spittle, Taner Ozdil, 118, *The Role of Temporary Installations Towards Permanency in the Built Environment*

Heralding a new wave against "business-as-usual" planning and development practice that had in part brought about the Global Crash of 2008 (Marcinkoski, 2016), the rise in rapid and temporary design typologies (CNU Next Gen, 2010), suggested a new direction that recognized that if you wanted to make a positive change in the built environment, it was easier to act first and apologize afterwards (Lydon et al, 2012). Taking the responsibility of living in the city into their own hands, a new guard of designers looked to the unfinished skeletons of civic construction to open up possibilities, test scenarios and subvert preconceptions of what our cities should be like, and how we should behave in them. Set against the backdrop of catastrophic civic public space development (Kunstler, 2003), the research investigates the rise of temporary installations (such as Tactical Urbanism) over the last decade, and its current state of practice within allied design fields, accessing whether these short-term temporary solutions are a viable mechanism for long term "place making" (Casey, 1996). The research specifically focuses on understanding landscape architecture's position in this arena. The research primarily uses qualitative techniques (Deming & Swaffield, 2011), adopting a three-step procedure to assess temporary installations within the context of landscape architecture practice. First it conducts a comprehensive review of the literature amongst design and planning fields to understand the state of temporary installations in landscape architecture. Then, using convenience sampling methods researcher selects ten temporary projects across the globe for in-depth evaluation with secondary data. Where possible, post-occupancy evaluation methods are also utilized to assess the impact on long term place-making in subset of cases (Marcus & Francis, 1998). In conclusion, this research reveals that despite its detractors suggesting temporary installations being just a cover up for failing governments (Minkjan & Boer, 2016), this does prove to be a preferred method of generating long term positive change (Kent & Nikitin, 2011). It is this researcher's view that short-lived projects can remedy existing urban norms, activating not just those landscapes in transition, but also the public imagination. This research also reveals, however, that the role of landscape architecture appears minimal in contrast to the success of those in the allied fields of architecture and planning. Based on lessons learned, future study will focus on in-depth interviews with allied design professionals to document their perspective on the impact of temporary solutions towards permanency in the built environment.

"Ground Truthing", 194, *Environmental Barriers to Human Well-Being: Translational outreach and engagement research using a multi-site, multi-city approach for Iowa's diversifying small towns*

Of Iowa's roughly three million people, one-third, or one million live in small towns with a population below 10,000 (American Fact Finder 2017). Small towns tend to be rural locations with a strong connection to agriculture and limited access to typical amenities needed to support human well-being. Urbanization and small-town shrinkage is well-known but a lesser-known issue is the stabilization of small town population size with immigrant and refugee communities. The invisible change in population has multiple consequences, with some researchers suggesting that a growing urban/rural dichotomy evidences a public health crisis due to a parasitic relationship between cities and rural environments (Kelly-Reif & Wing, 2016). The current state of research on local life in small towns reveals a critical knowledge-gap linking open space with healthy behaviors: (1) currently, little data exists on the impact of small town environments to contribute to healthy behaviors for vulnerable populations (Riffe, Turner, & Rojas-Guyler, 2008) ; (2) few post-occupancy evaluations of such environments have validated efforts to overcome known social and physical barriers (Chaskin & Joseph, 2013; Ozkan, Alpak, Yilmaz, Duzenli, & Ozbilen, 2015). This lack of fundamental knowledge limits human and natural ecosystem services to support physical and social activity. Our 'Ground Truthing' research used (1) transects to determine barriers to healthy lives due to conditions in small-town peri-urban environments; (2) geolocated focus areas across three cities for post-occupancy evaluation; and (3) in the process of surveying residents, local work force, and decision makers for connections to existing ecosystem

services. Findings hope to aid small towns in designing, planning, and developing policy to develop sustainable human and natural ecosystems. The presentation makes an important contribution to designers, planners, and researchers interested in improving small town environments for vulnerable populations.

Yang Song, McKayla Kolb, 222, *Fostering Real Connections: Commercial strip revitalization through social media data and transportation engineering models*

Throughout many U.S. towns, the commercial strip is a typical form of developments for shopping, dining, working, or recreation activities. The implementation of commercial strips evolved during the Post-World War II period accompanied with a large demand for suburban development. Since the 1980's, commercial strips have been criticized for their free-standing stores amongst large parking surfaces, wide multilane roadways, and overbearing signage that distinguishes adjacent buildings (ICF International et al, 2011). Consequently, a series of studies and principles have been created to restructure commercial strips from auto-oriented development to compact, mixed-use, and pedestrian-oriented 'lifestyle centers' during the last decade (Leinberger,2008). Alongside, transportation planning literature has established analytical models to measure level of service(LOS) and trip demand scores for allocating bicycle and pedestrian-focused facilities (Landis, 1996). Many cities are restoring their overbuilt arterial roadways by implementing urban design interventions such as improved sidewalk zones, bicycle lanes, speed reduction mechanisms, and public transit systems. However, transportation engineers have become more interested in working at the regional and city scale. Very few urban design studies provide strategies to prioritize and design circulation networks connecting neighborhoods and commercial strips at the community level. Following the previously stated analytical processes, this study will fill the gap through a collection of online reviews from Google Places to estimate the popularity of destinations and utilizing demand-based transportation planning models to predict pedestrian and bicycle level of services (LOS)(Landis et al, 2001; Lowry et al, 2012). These analytical methods will be applied to an urban design project aiming for commercial strip revitalization located in south Bismarck, North Dakota. The results will provide new insights to landscape architects, urban planners, and stakeholders on policy implications and development paradigms related to commercial strip revitalization. They also present the potential of implementing social media data and transportation engineering models on urban design practice and research.

Carey Clouse, 433, *Help Yourself: Food security through insurgent citizenship*

As communities seek new opportunities to integrate sustainable local food sources into city form and structure, urban arboriculture appears to be a promising solution. Urban street trees already have a place within city fabric, and the application of food production onto this living framework results in minimal impact to extant processes. Moreover, as planners address the challenges of food deserts, food security, and the high environmental cost of food miles, cities and towns have an opportunity, if not an obligation, to invest in alternative provisioning strategies (McLain et al 2014). The conversion of the existing urban tree canopy into productive agricultural space is both an avenue for urban food security and a radical re-appropriation of the commons. This guerilla self-provisioning practice involves the grafting of fruit-bearing species onto common street trees, the open source mapping of these foraging opportunities, and the dissemination of instructional materials (Haughwout 2015). In splicing fruit-bearing varietals onto trees in the public domain, grafters intentionally site their interventions to invite unrestricted participation and access. Urban foraging systems highlight new models for direct action in the future city (Douglas 2014). In cultivating a place for public gleaning, guerilla gardeners act out their urban desires in service of the common good. In so doing, their work represents a realm in which participatory urbanism leads to real transformation, and the radical reimagining of the city is in sight (Brenner and Schmid, 2010). This paper explores the economic, social, and ecological factors impacted in the productive planting of public urban greenways, through the lens of two case studies. Methods draw from literature review and field assessment, with a focus on the implications for design and planning. Findings include images of the two case studies, historical background, and

tables of social, ecological and economic features. Finally, a discussion addresses opportunities and constraints for DIY urban arboriculture, including legal frameworks, maintenance, and organizing strategies.

12.RESEARCH BY DESIGN

PAPER ABSTRACTS

Liska Chan, 399, *Braiding Grass: A speculative practice problematizing the pastoral landscape aesthetic*

I braid sculptural forms into fields of tall grass. The work of braiding acts as a form of maintenance, contemplation and construction. Usually a solitary figure in the field, I'm bent over, weaving handfuls of grass together, my posture recalling that of a farmer at work. Yet, in contrast to one raising crops or cultivating the land, this labor is not practical, but instead is a critical practice. The Braided Fields series problematizes the pastoral landscape aesthetic through the act of braiding large swaths of tall grass in fields as both a time-based activity and a form of land art. The braids add a layer of strangeness to the ordinary landscape piquing interest and shift the public's perceptions. By layering a new aesthetic layer into an old one, the work highlights the tension between the idealized landscape and the realities of the work and maintenance it takes to make the place. Pastoralism is a common aesthetic that has had a deep influence on European and American landscape design for centuries. Its roots lie in ancient texts like Virgil's Eclogues, where the pastoral is the serene joining of nature and art. In the pastoral landscape, one can be in nature, but safe from the dangers of the wilderness, wherein one is free, like an idyll shepherd, to create music, art and poetry. But this pervasive aesthetic, which comes from anachronistic values and has little to do with the ordinary lives of most urban people is rarely challenged and often taken for granted. This work seeks to capture and shift the public's imagination around the ubiquitous pastoral aesthetic. This work is not alone in its open ended creative landscape inquiry. For example Karen Lutsky and Sean Burkholder, both professors of landscape architecture, wrote recently about their own work at Gunnison Bay in the Great Salt Lake, "Field projects like ours can be tricky, testing the line between serious inquiry and affectation". They describe their work as Curious Methods that "probe" rather than "prove" in what they call open-ended ground level exploration. Similarly, the work of Braided Fields is not only about speculating on the limits of the pastoral aesthetic, but it adds to a broader conversation around creative practice as a mode of inquiry in landscape architecture.

Nicholas Sund and Michael Geffel, 271, *Adaptive Social Space: Tactical design in the urban landscape*

Streets are transforming from basic transportation corridors to complex social spaces that support multiple functions and activities. While many car-dependent cities are replacing traditional multi-lane thoroughfares with 'complete streets' that promote walking, biking, and transit, the technological advances of ride-sharing services and driverless vehicles promise to drastically reduce the amount of street space needed for transportation altogether. Because urban public land is largely composed of streets and public right-of-way, the opportunity exists to think of streets not just as connectors between places but as places in themselves. Yet the call to rethink streets has so far resulted in wildly conceptual designs that cannot be supported by shrinking city budgets. Thankfully, the growing Tactical Urbanism movement improves livability in urban environments with low-cost, temporary interventions such as seating areas, parklets, or the widespread use of mobile food trucks to catalyze social activity in otherwise lackluster spaces such as vacant land or parking lots. Tactical interventions signal unmet social needs that have been overlooked by traditional planning strategies, and by demonstrating potential solutions they also reveal new possibilities for urban social space. In light of contemporary budget crises, it is likely that large-scale adaptation of existing social space will be driven not by long-term (strategic) plans and capital improvement projects but by the (tactical) collective efforts of ordinary people. However, the traditional planning framework of public vs. private

ownership is far too simple to reflect the complex social reality of streets and is a barrier to the use of tactical design. Drawing from the work of Henri Lefebvre and Jamel Akbar, a more nuanced and flexible framework is used which combines ownership with the concepts of use and control. Following this framework, a typology of tactical interventions is developed for adapting public land (such as sidewalks and parking strips) or private land (such as driveways and front yards) along a typical suburban street. The typology is applied through a series of conceptual designs developed at both site and neighborhood scales and is field-tested through real-world tactical interventions. For planners, tactical urban design can be used to complement traditional land-use codes and contemporary form-based codes to manage urban development. For designers, tactics are a way of testing and demonstrating design solutions to clients and stakeholders to raise funding and support. Finally, tactics allow ordinary people to improve the urban environment for themselves and others.

Tori Murphy and Roxi Thoren, 496, *Co-creation with Animals*

Co-creation with animals as a method to ecological restoration is under explored in the field of landscape architecture. Co-creation, in this case, is the collaboration of animals and humans where animal impact contributes to the design. There is a lot of literature about our relationship with animals and how we regard animal and human spaces as separate. There is also a lot of literature on animal relationship to landscape, such as the field of zoogeomorphology, that looks at how animals shape the landscape. There is not a lot of literature on how designers might be able to harness these animal impacts to co-create landscapes. A wildlife biologist, named Bruce G. Marcot, developed the Species Environment Relations database consisting of Pacific Northwest species and their functions but it is not organized to identify potential for co-creation. Also, there are a number of case studies that look at using animals in ecological restoration but there is no overarching framework for how to approach co-creation. Ecological restoration is a field that is constantly evolving as we learn more about how much we do not know about our surroundings. This research looks at the potential for native animals to do restoration work that results in cost-effective, suitable, and non-human imposed outcomes. This research will be a foundation for additional research in implementation of interventions that encourage animal participation. This research aims to propose animal functions that could address restoration issues. This research examines examples of co-creation with animals to support a framework for how to approach designing with animals. The case studies include a network of oyster beds designed to clean the water in NY harbor called "Oystertechture" by Kate Orff, an avian seed dispersal project by Stave Handel at Fresh Kills Landfill in NY and analogue beaver dams built in Oregon by Anabranch Solutions. Co-creation can be facilitated by first identifying the landscape issue then the animal mechanism that addresses it. Human interventions are designed to encourage the desired animal mechanism. This research also provides a database of species in the Pacific Northwest that have the potential to perform the animal mechanisms necessary to solve landscape issues. Successful co-creation is determined when a set of criteria are satisfied. Successful co-creation will make animal impacts more visible and will enhance aesthetics and functionality of design. Co-creation can be realized in spaces on a spectrum from human spaces to animal spaces. In a primarily urban setting, structures are retrofitted for co-creation with animals. In a space that is primarily animal habitat, an intervention is installed that encourages co-creation with animals. Humans do not make enough of an effort to include animal needs in development even though we depend on their health to contribute to ecosystem functions. Co-creating with these animal functions could contribute to improved efforts to develop spaces with more awareness of processes that humans cannot replicate.

Michael Geffel, 47, *Transitory Public Works: Maintenance as a design instrument in landscape architecture**

"Change" is an essential component of the landscape medium, and over the last twenty years the dominant interpretation of landscape has described the medium as a set of processes. Unfortunately, the professional model continues to favor durability over change, in a large part because of how design and construction contracts are

typically administered. Within this mode of practice, landscape architects principally respond to changes in their designed landscapes during the one or two years following final-completion, described as the "maintenance phase" of the construction contract. The seemingly banal realm of maintenance therefore presents an important and underutilized opportunity for landscape architects to respond to novelty in the landscape. To understand the generative capacity of maintenance as a design instrument in landscape architecture, "Transitory Public Works" introduces a theory of maintenance before presenting a series of field experiments that use maintenance design as the research method. These field experiments use mowing – the most apparent form of maintenance – to investigate how maintenance operations mediate landscape, and what spatial, ecological, and material potentialities may be possible through a maintenance design practice. Ten axioms of maintenance design are offered synthesizing the findings of this design research and theoretical inquiry. Despite the connotation of maintenance being solely focused on control and preservation, this paper proposes that the essence of maintenance is care, and that when a landscape is maintained successfully, the associated maintenance operations are far more diagnostic, parametric and adaptive than given credit – despite their pragmatic emphasis on efficiency. Furthermore, a maintenance design allows landscape architects to engage the medium in a fundamentally different way: through process. This alternative design practice is wholly within the scope of the landscape architect yet opens entirely new opportunities for the profession – particularly within the territories of novel ecology, design activism and landscape infrastructure.

Judith Stilgenbauer, 403, *Public-Interest Design as Applied Research: The case of Wahiawa Freshwater Park*

Context The Hawaiian archipelago and its inhabitants are vulnerable to the effects of global warming. With changing weather patterns and coastal saltwater intrusion, access to freshwater has become a pressing issue. A team comprised of the author, design/research staff, and student project assistants from the University of Hawaii Community Design Center (UHCDC) is developing concepts for Wahiawa Freshwater Park. Located in central Oahu, this 60-acre park stretches along the banks of the largest body of freshwater in the state: a reservoir created in 1902 for irrigating sugar cane fields that no longer exist. Aims This paper summarizes the analysis and watershed-scale study of Freshwater Park in its greater Lake Wilson and Wahiawa town context, as well as park-scale design strategies. The park site is underutilized, impacted by water-quality, environmental and socio-economic issues, and lacking in resilience. This design research project, through a collaboration between the UHCDC and the State of Hawaii Department of Land and Natural Resources (Division of State Parks), seeks to contribute to enhancing the park's ecological, cultural/historic resources, and public open space amenities for future generations. The project aims to create more resilient open space systems, stimulate public awareness, and further the discourse on water-sensitive design. Methods UHCDC is a non-profit teaching and research practice that provides a platform for applied research and public-interest design across disciplines. Faculty members guide graduate students in academic courses and through paid positions. Such a service learning approach connects research and teaching with the goal of benefitting the community. The Freshwater Park project provides hand-on opportunities for students to gain design research experience. As a vital part of the study, the project team facilitates stakeholder and community involvement to obtain insights and knowledge from experts and park users. This includes community surveys and participatory design charrettes, as well as public concept presentations to the community. Conclusion This presentation highlights the benefits of collaborative, research-based public-interest design that investigates and advocates for connected, ecologically and socially sustainable, water-sensitive built environment interventions. Process-driven proposals aim to increase biodiversity, improve water quality, provide ecosystem services, and, at the same time, create culturally- and socially-sensitive, climate-change-resilient lakefront amenities and activities for park users. The Freshwater Park project merges the goals of ecological performance and placemaking into a mutually beneficial, resilient relationship. Lessons learned from this design

research broaden the contemporary discourse on freshwater design and planning strategies for a sustainable Hawaii.

Emily Vogler, 382, *Littoral Commons: Using art and design to shape the future of the water's edge*

At the Rhode Island School of Design, the landscape architecture department exists alongside other arts and design disciplines which have a unique relationship to craft and materials. The Landscape Architecture Department at RISD seeks to bring this knowledge of materials and critical making into the design process to address regional ecological, social and infrastructural issues at the site and material scale. In her presentation, Emily Vogler will discuss 2 interdisciplinary research studios that were co-taught between landscape architecture and ceramics over the past two years. These studios brought together the site-based knowledge of landscape architecture with the materials-based knowledge of ceramics to explore the commons that exist at the interface between land and water. One studio was looking at the irrigation ditches of Albuquerque, New Mexico and the other was looking at coastal adaptation strategies in Narraganset Bay, Rhode Island. Although dramatically different landscapes with distinct hydrological regimes, both are dealing with issues of erosion. Municipalities and agencies in both locations respond to this erosion by hardening the water's edge. These engineering driven responses often lead to the loss of the ecological and hydrological richness of these landscapes and also reduced use by citizens because of the shift in the aesthetic experience of the space. In these research studios, students were asked to design and fabricate a ceramic module that could help reduce erosion while supporting the ecological and social function of the water's edge. Some of the material, formal and performative questions that were asked in the studio include: Can the module support and provide habitat for plant and animal species? Can the module enhance the human recreational use and aesthetic experience? How does the module aggregate and disperse to response to different site conditions? How long should the materials persist? Could they degrade overtime once the plant roots get established? Can community groups construct and install the forms? From a pedagogical perspective this studio taught methods of cross-scalar thinking and design (from regional strategies to the 1:1 design of their module) as well as interdisciplinary thinking that bridges between art, design and science.

Simon Bussiere and Zachary Streitz, 440, *An Ecotourism Model for Kekaha Kai State Park, Hawai`i Island**

This paper and presentation will describe a year-long research and design project at Kekaha Kai State Park on the Island of Hawai`i. In support of an agreement between the State of Hawai`i Department of Land and Natural Resources(DLNR) Division of State Parks and the University of Hawaii Community Design Center (UHCDC), an interdisciplinary team of students and researchers produced an analysis and conceptual masterplan for an off-grid cultural education facility and campground. Following applied research, the team developed programming and concept design documents in collaboration with DLNR administrators. University of Hawaii faculty supervised students both in an academic design studio and later through paid positions in the development of the project. The work provided significant opportunities for students and recent graduates to gain practical experience, and offered compelling insights into how a public University design center could work with a State agency client to help frame an inter-agency conversation concerning project goals and priorities, and generate new projects for the professional community. Kekaha Kai State Park faces a range of design challenges including difficult accessibility and increasing pressure from tourism. The park is primarily impacted by informal passive recreational use, but with increasing tourism, including expanded beach uses and other activities, the site is expected to experience increased pressure over time as it becomes more popular. The possibility of larger site interventions to support extended programming further argue the need for a comprehensive masterplan. Despite a growing tourist footprint, the site is relatively pristine and holds the Ka'elemakule House, the oldest wooden structure in the State of Hawaii. Historic and ecological preservation and stewardship were therefore a core design consideration. Difficult accessibility, lacking informational signage, wayfinding and overall connectivity with the larger Kona context were also

addressed in the study. The new conceptual masterplan focuses on future stewardship efforts, and contributes to protecting the site's ecological, social, and cultural/historic resources through the careful design of enhanced publicly accessible amenities for future generations of park users.

Jamie Vanucchi and Sarah Dooling, 360, *Positioning Design Research for an Uncertain Future*

Positioning Design Research for an Uncertain Future We position design research as a complement to natural science research, social science research, and action research that has the potential to diversify research focused on landscape change, especially desirable change. We posit three reasons why design research is emerging and why it is needed now: 1- the increasingly wicked nature of problems (climate change, ecological gentrification) combined with the imperative for action demands creativity in addition to analytical rigor within a framework of experimentation and scenario building; 2- the loss of historic ecosystems and the emergence of hybrid and novel landscapes creates a tenuous connection between historical and future species assemblages, and requires designers and ecologists to imagine sustainable and livable futures without natural referents; and 3- conflicting values of landscapes and diverse perceptions of risk are often minimized in conventional natural science research; design research aims to involve diverse communities in in order to better navigate the attending cultural complexities in rapidly changing environments. Empowering diverse communities to face uncertain futures with confidence requires researchers to co-create multiple modes of knowledge production in the analysis of existing conditions and the co-construction of future scenarios. Our paper aims to make a case for the value of and need for design research, and compares design research to conventional research models. We call for a design research partnership between designers and ecologists based on a whole project collaboration and workflow. We present design research approaches to climate change-based risk to demonstrate the value of exploratory research that makes uncertainty central to the research design. Our approach emphasizes the translation of uncertainty into a feasible research question through experimentation that concurrently acknowledges the plurality of stakeholder perspectives about the value of changing environmental conditions and perceptions of near-term and longer-term risk. We share both design studio and research outcomes, and conclude with a conceptual framework for use by for practitioners, researchers and instructors in building resilient futures through design research.

Sean Burkholder and Brian Davis, 346, *Healthy Port Futures: Design research as a foundation for project collaboration*

This presentation will describe an ongoing project by the authors that deploys design research methods in order to inform project development within a large multi-agency team with a complex set of values. The Healthy Port Futures project is a research and implementation project that explores the role of passive and adaptive sediment management strategies as agents in developing more ecologically and socially valuable landscapes in and around ports within the Great Lakes Basin. The project additionally demonstrates disciplinary efficacy at responding to contemporary calls for a creative, landscape synthesis between infrastructure, ecosystems and public space. Within the Great Lakes, many ports are located at highly urbanized rivermouths. These rivermouths not only contain many of the largest urban populations within the larger region, they also serve as essential ecological mixing zones between the lentic and lotic, the riverine and the lacustrine. Historically these areas were rich wetland resources that through time have become largely degraded due to human development. The interactions between these ecological and social systems at these rivermouths is highly engineered, and one of the fundamental components of this engineering are the regimes of sediment management that ensure navigation depths. Healthy Port Futures acknowledges this fundamental act of sediment management as potentially linked to a wide range of value creation possibilities, including habitat improvement and a more socially conscious, sensuous urban landscape. It also stresses the use of natural systems as performative actors in the sediment management process, typically replacing or augmenting one of its three phases - uplift, transport and/or placement-- in order to improve the function,

experience, and complexity of these places over time. Motivated by these ends, design research is positioned as an exploration of the possible from a set of givens. Using conventional design methods (drawing, modeling, field work, and experimentation) the work provides contextually sensitive options for sediment management that generate more value(s) for less money than the standard practices. Additionally, the project is understood as a research experiment in itself, generating insight for future work while staying within the bounds of acceptable risk applied by project partners. The presentation will walk through the process, methods, and initial outcomes of this project, looking specifically at two pilot projects underway in the state of Ohio

Mick Abbott, 191, *Designlab 2012-18: An ongoing experiment in design-directed landscape architecture research*

The examination of the role of design in landscape architecture research methods continues to develop in both theoretical studies, surveys and peer reviewed articles (Abbott, 2018; Abbott & Roncken, 2018; Lenzholzer, 2018; Milligan, 2018; Copley et al, 2015; Van den Brink et al, 2016) Lincoln University's Landscope DesignLab, established in 2012, is a landscape architecture research group that has adopted a lab-based approach to undertake a sustained 6 year investigation into the manner and potential design and designing in landscape architecture research. This article provides a first review of the lab's activities and, through a process of reflective practice, identifies ways a design lab model has been able to contribute to university imperatives to contribute new knowledge to both academic disciplines and society including: a) Developing innovative conceptual understandings of intra-disciplinary relevance. Design-directed research has been focused on working with collaborators from soil science, agricultural life sciences and conservation management and includes development of novel understandings of productive landscapes and protected areas. b) Research within the lab involves the iterative adoption, development and review of design methods and include the role of visualization, scenario development, generative cartographies, synthesis, and the generation of hybrids across forms, methods and collaborators. c) Building the imaginative scope of contested landscape contexts in ways that resist containing landscape within normative understandings – for instance the reimagination of earthquake impacted areas and also land use tensions in Aotearoa New Zealand. d) Structuring research studio values within the undergraduate and postgraduate student program, to mesh these within wider research studies and peer reviewed outputs. e) Following a sciences model enabling clusters of postgraduate researchers to work on common research questions While the above are presented as positive benefits of a lab-based approach to design-directed research it also identifies key challenges. This includes reticence by landscape architecture scholars working in methodological paradigms embedded in the sciences that expect high levels of replicability. These can find design processes that include the researcher/designer as an embedded methodological agent problematic, notwithstanding general acceptance of this aspect within humanities-based research. Also, program's professional drivers can consider a focus on designing's intellectual dimensions esoteric, that lack adherence to professional norms. However, we suggest the at times awkward location of design-directed research in landscape architecture is most likely due to the landscape architecture's emergent quality as a scholarly field that is seeking establish itself at the interfaces of design, ecology, sustainability, phenomenology and place-based studies.

Nicholas Pevzner, 356, *Rethinking Resiliency in Puerto Rico*

In September 2017, Hurricane Maria dealt a devastating blow to Puerto Rico's infrastructure, landscapes, communities, and economy. It exposed and exacerbated long-standing structural weaknesses and trends. In the storm's aftermath, there has been a high degree of interest from academic design programs looking to offer solutions and speculative rebuilding agendas. Local communities are predictably weary, wary, and skeptical of such "problem solving" by outsiders who are not firmly grounded in the island's political or economic realities. In this challenging context, what is the role of landscape design research in supporting conversations about recovery, rebuilding, resilience, and sustainability? This paper argues that participatory design research can act as a mode of

collaboration, both with local communities and across disciplines. Using examples from a design research studio that included collaboration between landscape architecture and city planning students and faculty, local university partners, and local community representatives, the author demonstrates how collaborative research and design were used to assemble local knowledge, engage stakeholders, and define clear problems and design objectives based in collective experience and visioning. Designers spatialized concerns and experiences of communities through iterative mapping of infrastructural systems using a participatory charrette framework. Through this on-the-ground design research process, a robust set of variables could collectively be fleshed out and synthesized — variables which had often previously only been considered in isolation. With resilience identified as a key goal by multiple stakeholders in our group, the likely origins of large cascading failures could be identified; robust local networks could be privileged in the design of the recovery framework, and those stakeholders in the local networks could be elevated within the larger stakeholder matrix. Given the importance of the blackout in driving many interconnected infrastructural failures, community-based energy hubs were identified as having a radical potential to reframe the spatial distribution of resources, physical landscapes, and political control.

Kees Lokman, 91, *Shifting Shorelines: Adaptation strategies for the Fraser Basin Delta*

The goal of this research by design project is twofold: 1) to analyze and visualize coastal risks resulting from future sea level rise and storm surges on communities in the Fraser River Delta, and 2) to envision adaptive approaches related to planning, engineering and designing anticipated yet unknown future conditions. Climate change is arguably the greatest challenge facing contemporary societies. The effects of sea level rise, hotter/drier summers, warmer/wetter winters, and increased frequency of extreme weather events will have far-reaching implications on coastal communities, including people's livelihoods, critical infrastructures and ecosystems. At the same time, sea level rise provides an opportunity to envision new ways of living with coastal dynamics. In this context, the Fraser River Delta provides a perfect case study to test how geospatial analysis, visualization and systems thinking can be applied to envision novel coastal adaptation approaches across a range of spatial and temporal scales. Situated along the Cascadia fault line and Pacific Flyway, and home to a rapidly growing population of nearly 3 million people with the largest port on the west coast of North America, the region is in urgent need of integrated approaches to coastal resilience. This presentation highlights outcomes of phase one of an ongoing funded project involving a collaborative team of academics, student researchers, design professionals, local experts and decision-makers. Key research questions for this initial phase include: Which communities and environmental areas in the Fraser River Delta are at risk as a result of projected sea level rise? What are the potential impacts of flooding on critical infrastructures? And, how can visualization help to change people's perceptions about current risks as well as their receptiveness to potential solutions? The work is organized as a series of visual narratives (maps, timelines, diagrams and animations) that aim to reveal the implications of sea level rise on important regional topics, such as urban growth, logistics, intertidal habitats, and food security. It also provides novel ways of visualizing opportunities and limitations for coastal adaptation with respect to current local, provincial and federal regulations, policies and zoning guidelines. Future phases of the project will focus on engaging those communities and areas that are most vulnerable to coastal flooding in order to explore how physical design interventions combined with new planning frameworks can inform flood adaptation strategies that combine safety, spatial quality, and ecosystem regeneration. In doing so, this project aims to offer new tools, knowledge and insights to support policymakers, scientists, planners, engineers, and designers in analyzing, visualizing and re-imagining resilient coastal landscapes.

Kathleen Kambic, 235, *Water and Infrastructure in the American West*

The West is becoming more urban, setting up conflicts between urban centers and rural interests such as farming, ranching and mining. Until about 2008, the Southwest had the most intensive growth of any part of the US. It is

estimated by the Brookings Institution that the population of at least five states in the Colorado Compact could double by 2040. Meanwhile, water supplies are dwindling. Elephant Butte Reservoir on the Rio Grande is holding 4% of its total volume and climate projections suggest another 25% of the volume of the Colorado River could disappear in the future. And, the US Drought Monitor has seen an increase in exceptional drought throughout the West. It is here in the American West that the future of landscape architecture emerging- where design concepts meet new environmental challenges and old institutions meet new ways of thinking. Studying the effects that the Colorado Compact (1922) and the Rio Grande Compact (1938) have had, and continue to have, on cities like Denver, Los Angeles and Albuquerque is an important step to conveying the ontological meta-narrative of living in the West. Manifest Destiny and the settling the West, issues of extraction and consumption, the role of the Federal government, and the erasure and suppression of indigenous cultures are all major considerations to explore within the study of western water infrastructure. Unpacking the many layers of cultural, political and environmental narratives in which we use and abuse water opens doors to other ways of thinking and being that can dismantle the hegemony of this singular historical narrative built on control and suppression of both human and natural systems. Through a course developed specifically to unpack the complexities of green and grey water infrastructure, climate and water concepts, BMP details, and the political ecology of the West are explored. This three-pronged approach creates a well-rounded body of knowledge for students that is also used to test new ideas and develop further research on western water issues, assemblage theory and governance structures. The students use their research skills and critical eyes to develop projects on real sites within which they live. The course explores new avenues for design to mitigate and respond to climate change in flexible ways that normalize and integrate green stormwater infrastructure into all types of landscapes.

Abigail Anacki, Jacob Mitchell, and Kristi Cheramie, 319, *Patent Legacies and Wastewater Futures*

The human necessity of clean and healthy cities is apparent in the vast network of wastewater infrastructure that lives and flows beneath the surface of the ground. The manipulation of water through various technologies over the last few centuries has resulted in water systems that are no longer able to clean themselves naturally. Efforts to manufacture this system have been consistently influenced by disease, politics, industry, technological advancement, and invention. Patents, a physical and legal manifestation of technological advancement, paralleled the transformation of these wastewater systems and the methods in which to construct them. Infrastructural feats like water pumping houses, dams, and wastewater treatment plants were frequently commemorated as souvenirs and celebrated on postcards, however, today innovative WWT components are buried, hidden or locked away from public access, earning little to no public engagement. Despite longstanding traditions in innovation, Columbus is also one of the many aging cities in the Midwest that has had to respond to consent orders from the state and national government to reduce the environmental impacts caused by combined sewer overflows that are exasperated by issues such as population growth, development, and climate change. This research examines the largest capital improvement project undertaken by the City of Columbus to date, and the most recent innovation in wastewater infrastructure, the deep sewer tunnel. At this critical moment in the landscape of wastewater infrastructure, design research offers a way to shift away from a "status-quo" mentality and reclaim design as a critical voice in infrastructure futures that has long been ceded to engineering. This research separates itself from normative landscape wastewater projects, instead examining the function, ideology, policy, and the reactive nature of current wastewater practices to alleviate our environmental and societal problems. Our current strategies buy us time, but what happens when the time is up? The outcome of this research stands as a valuable communicative tool detailing the ways in which wastewater systems have transformed the landscape, society, and the way we think. This research is an extremist experimental design typology that is not necessarily created to manifest itself in a physical nature, but rather an intellectual one. The research products serve as a radical – yet realistic – discussion catalyst that pushes the boundaries of conventional policy and wastewater tactics to help facilitate future wastewater innovations and a smarter implementation of contemporary sewer networks.

Daniel Roehr and Amalie Lambert, 12, *Climate, Stormwater and the Pacific North West: Reimagining water management and community on Vancouver's North Shore**

To respond to increasing weather extremes and a quickly growing population on Vancouver's North Shore, the UBC School of Architecture and Landscape Architecture created an interdisciplinary design studio in September 2016 on the integration of stormwater management (Low Impact Development-LID) into the urban fabric. The studio proposed that design collaboration as a method of research is key to the survival of healthy communities, bringing together students from the faculties of architecture and landscape architecture, as well as municipal engineers and professionals. The studio also adopted a new stance on scale: students designed urban drainage solutions as complete integrated systems, from the roof gutter to the watershed. Traditionally landscape architects design from the region to the site, but in this studio, scaling was reversed for pedagogical reasons so that students could gradually grasp the scales in the environment. Students designed the garden first followed by street, block and then region to understand the complexity and interdependence between scales of urban and regional drainage. The studio used different media representation techniques, starting off with hand drawing and hand-crafted models at the garden, a mix of hand and digital representation at the street and urban, and digital at the regional scale. Exploring various media provided them with the experience of the different speeds of design and representation techniques and their capabilities of describing specific details that could be represented across scales. Students had to present their ideas multiple times to the public and constituencies to learn which chosen media technique communicated their ideas best. The studio had the following research outcomes: (1) LID is a complex drainage system linked across all scales and should be designed across all scales (2) understandable technical communication and fast graphic representation skills for the non-expert community are important to convince private and public stakeholders to accept LID measures (3) being aware that the choice of the mode of graphic representation impacts not only the creative working speed of the designer but also the decision if LID will be employed. This paper will present the key pedagogical components of the syllabus and time management components of the schedule. It will provide an alternative method of assessing the various stages of the studio, which was well received by the students teaching evaluations and provide feedback from the municipalities and public on the outcome.

Karen Lutsky and Sean Burkholder, 409, *Curious Methods: Contextual interrogation as design**

The motivation of research and its associated methods tend to exist as pre-requisite segregated component of the design process, assuming it is even considered as part of the design process. Whether undertaken to define or situate landscape conditions for design engagement or justify a preconceived notion, site analysis, or the process of studying a particular place, is often utilized as complete and separate endeavor that largely appropriates information originated and researched by other fields of expertise (geologists, climatologists, botanists, engineers, etc.) While such expertise is important and essential, designers often rely too heavily on information generated by these other fields as 'objective' points of departure for design. As landscape architects, we should be cautious of the seemingly objective application of research from other fields, not as fraudulent but as bias to that given field. As a geologist may look at a sloping hillside and see ancient glacial formations or a hydrologist may look at the same slope and focus on erosion, as landscape designers we must also own the expertise of our own gaze upon that slope. As fundamentally critical and subjective synthesizers of information trained above all to understand landscapes as collections of dynamic relationships, we believe our approaches to site analysis should also be designed and engaged through the process of iteration, adaptation, representation, and testing. As designers and researchers, we are interested in ways we might embrace our role as biased and limited tools of site analysis and how we may critically re-calibrate our practices and approaches with the recognition that how we understand site and context under pins all design interventions and approaches. This talk will highlight examples of such exploration and ongoing practice by way of two publication projects and a series of studio exercises undertaken and taught by the

authors that engage these 'curious methods' of site investigations. These examples will demonstrate how "curious" design/research methods aim to uncover relationships that link spatial and temporal scales and investigate transcalar approaches to highly dynamic coastal sites.

Martin Koelsch, 175, *A Garden of Conscientious Intervention*

A Garden of Conscientious Intervention is a critique of a commonly occurring separation between landscape architecture research and physical interaction with the land. Separating landscape architecture research from the tactile activity of breaking ground prevents academics from developing a more personal understanding of site history, characteristics, and evolution. This research uses the land as the primary location for all analysis, design, and construction while the studio is a supplemental place to reflect, draw, and curate. A Garden of Conscientious Intervention looks to ideas brought forth by philosophers of site-specificity, object-oriented ontology (O.O.O.), and thing-power. In her text "One Place After Another," Miwon Kwon discusses ideas of site-specificity emerging in the land art era of the 1960s and 70s. Kwon states that sites are not bound to physical properties; they also include the phenomenological, ephemeral, subjective, and intersectional experiences of each and every visitor. Sites are dynamic and in constant flux. Jane Bennett would concur, as she states in her ideas of thing-power that non-human forces exist and interact with one another outside of human manipulation. A comparable idea is brought forth by Timothy Morton and his idea of the "hyperobject." Morton defines a hyperobject as an object of immense complexity with a vast timeline and an incomprehensible number of contributors, such as climate change. In addition, this project also takes precedent in the work coming out of 1960s/70s land artists like Donald Judd, Nancy Holt, and Michael Heizer. These artists share an interest in human intervention colliding with natural forces. The logic presented by these philosophers drove decision making when developing the design. This project uses concrete as a vehicle to engage with site forces. When left to cure outside, precipitation, humidity, and temperature manipulate the texture/composition of the concrete. With this idea in mind, a project framework was designed to provide an outlet for making a personal mark on the site (via relocating soil, introducing materials, and adjusting microclimates) and to study how the products can begin to record/narrate a site's ephemera, phenomenology, and entropy. For ten straight weeks, one concrete column measuring 6" x 6" x 90" was created. During the design research window, each identifiable change on the site was heavily documented via analytical drawing. A dynamic web of interaction exists on each and every site and this project explores the impact that the design research has made on the site's dynamics, evolution, and timeline.

Timothy Baird, 297, *The Landscape Lab: Urban vacancy as testing ground*

Many approaches have been tried in American and European cities to re-purpose, revitalize, and reclaim dormant, vacant land. This paper will explore variations on an approach that considers the site as a Landscape Lab, a testing ground for experimentation, exploration, research, production, and monitoring of selected landscape components. The paper will begin with an overview of the Urban Voids International Design Ideas Competition that spurred discussion in Philadelphia about how to revitalize that city's vacancies. One of the finalist's proposals, Urban Arboretum proposed tree production as a means of infusing new life and ecological performance into unused properties. The evolution of this idea has led to the installation of a prototype nursery that will provide native plants for riparian remediation, city streets, and public parks and open spaces. The Swedish Agricultural University's (SLU) Landscape Lab, was created by Professor and landscape architect Roland Gustavsson to monitor this urban test forest over time in terms of not only ecological performance but also its formal, spatial, and visual qualities. The form and spatial distribution of this forest is the result over time of "creative forest management," combining the silvicultural requirements of a healthy forest with the innovative approach to form, particularly in terms of species, adjacencies, and the elevational levels of a forest ecosystem, i.e., canopy, understory, and ground layer. This form of design research has produced multiple drawings that represent change over time and can be used to extrapolate the principles needed to produce vibrant urban forests that contribute to the health and well-being of

city residents. The landscape architecture department of a U. S. university has been developing a proposal in collaboration with SLU to continue the legacy of the SLU Landscape Lab through a possible installation on the U.S. campus. University design studios have also been used to explore how such a lab might be developed on disused vacant sites in the U.S. Through design, thoughtful research, and engagement of critical resources, hybrid landscape proposals are emerging that are both performative, inhabitable, educational, and conducive to landscape research and testing.

Brett Milligan, 83, *Design Fieldwork*

This presentation delineates a form of research by design called design fieldwork. I define design fieldwork as a hybrid practice of fieldwork and design intervention in which each informs and is embedded in the other. The method is fundamentally distinct from fieldwork or site analysis that seeks to passively or objectively construct geographic description of 'existing conditions', as such unbiased or complete readings of landscapes are untenable, since description and interpretation itself selectively constructs sites (Burns and Kahn, 2005). As a form of embodied and performative learning, design fieldwork embraces the active construction of sites. With a focus on affect - the relational capacity to act and to be acted upon – design fieldwork builds knowledge and understanding of landscapes through immersive and iterative encounters, actively intervening in the landscape and observing the events and novelty that unfold. This definition of design fieldwork is visually illustrated through a series of empirical design experiments performed on a series of actual landscapes. Most of these trials were sited on disused or 'vacant' lots within a city. In each of these interventions, the designer's own sensing and affective physical body is foregrounded as medium for exploratory research, either as prelude to design or as the design itself. Two claims are made based on this research. The first is that the aesthetic and performative experiences of the designer/researcher should be foregrounded in assessing any design research method, as they are pivotal to how sites and landscapes are perceived and constructed, which in turn lead to qualitatively different research outcomes. The second, is that design fieldwork is positioned as an iterative technique of engaging landscapes that provides unique access to indeterminate formative processes, novelty and serendipity. This embodied exposure to landscapes' elastic range of becoming can serve as a productive counterpoint to highly conceptual, abstracted and overly determinate design methods in research, teaching and practice. The presentation will close with a discussion of additional potential applications of the method for future research.

Elise Shelley, 64, *Re-Imagining Rubber*

For the last decade, an ongoing relationship with a government funded organization has enabled a unique hybrid of landscape architectural research, teaching and practice. The Ontario Tire Stewardship (OTS) manages the recycling of all tires in Ontario, Canada and through an educational mandate has sponsored three student design competitions. Re-imagining rubber, or more specifically tire-derived products, was the subject of these design challenges. Students were asked to find innovative ways to use the materials and products to revitalize and reinvent a series of public spaces. These short competitions exposed a large number of students to recycled rubber products, with the hope that this awareness would spark interest and promote use of these materials in the future. The OTS then went on to sponsor the construction of these projects at various public sites throughout Toronto. As an educator and practitioner, my role during the competitions was advising the development of the brief and adjudicating final submission entries. After each competition, I became the landscape architect in charge of working with student winners to develop the competition design into a built work. As the liaison between the client (OTS), site stakeholders, community members, contractors, and product manufacturers, I was able to involve students in all stages of the design and implementation process. The students were able to closely observe and participate in unique dialogues between the landscape architect, manufacturers, fabricators and installers to understand how research and development through design can happen. The process created a series of unique public spaces that use

tire-derived materials in innovative ways, and resulted in the fabrication of new products. This level of engaged scholarship, not typically feasible in the context of a design school, was made possible by this organization's interest in engaging future landscape architects in the realm of research, development and design. The partnerships fostered by these projects created unique relationships between teaching, research and implementation: In the realm of teaching, students were exposed to all stages of project development, from concept to built work; in terms of research, the entire design team had access to product fabricators, manufacturers and installers and actively impacted new product developments and installation practices; and in terms of implementation, students were stewarded through the step-by-step process of building new spaces in the public realm.

Forbes Lipschitz, 20, *Creature (dis)Comforts: Slaughter as design practice*

At the turn of the 20th century, slaughterhouses were common fixtures of the urban landscape. Cattle and hogs were transported by rail to stockyards in Chicago, Cincinnati, St. Louis and Kansas City, where they could be processed and distributed to nearby markets. In response to national trends of urbanization and industrialization, animal processing emerged as one of the first mass-production industries in the United States, from which Henry Ford is thought to have derived his mode of assembly line production. Slaughterhouses were not hidden from the public eye, but rather celebrated as icons of progress and innovation. After the publication of Upton Sinclair's exposé, The Jungle, however, the fascination with this industrialized slaughter was gradually replaced by a collective distaste for the brutality of the meat processing industry. As Richard Bulliet describes in his book Hunters, Herders and Hamburgers: The Past and Future of Human-Animal Relationships, contemporary American society "continues to consume animal products in abundance, but psychologically, its members experience feelings of guilt, shame and disgust when they think (as seldom as possible) about the industrial processes by which domestic animals are rendered into products." To assuage our collective cultural guilt, the slaughterhouse was relocated, but not reformed. By the mid-1950s, spurred by advancements in refrigeration technology and the expansion of the interstate highway system, packinghouses were relocated to be closer to livestock producers. We seldom think about where our meat comes from. This is no oversight – it is designed. The remote siting and placeless design of livestock production and processing allow society to avoid confronting the unsettling nature of slaughter. Hidden from public view, the ecologically and socially damaging nature of slaughter will remain unchallenged. Though design has facilitated the paradigm of industrial obscurity, it can also help to change it. If the realities of the system were rendered visible, society would be compelled to advocate for a more local, sustainable, transparent and humane model of meat production. This system need not be defined by society's collective nostalgia for a pastoral past and historic barnyard vernacular. Rather, design can define new models for contemporary animal agriculture that accept the industry's importance in developing a sustainable and healthy food system to support the world's ever growing population. To this end, this speculative project employs a synthetic, multi-scale approach to the design of an urban multi-species livestock and poultry handling and processing facility.

Catherine De Almeida, 227, *Landscape Lifecycles as a Speculative Design Research Practice Toward Waste Conditions*

Research-based design has been foundational for landscape architecture. Ian McHarg's Design with Nature provides a cartographic method for examining sites by superimposing individual layers of information, objectively determining their best use—a design formula that drives decision-making in landscape architecture. However, as James Corner warns, digital methods such as analytical layering have become a universally applied, siteless, formulaic approach that does not respond or adjust to its local context, resulting in similar spatial outcomes and designs throughout the world. For waste landscapes and brownfield reclamation, this has generated similar redevelopment strategies—green sites that make waste conditions invisible—for drastically differing waste landscape conditions. This site typology requires more nuanced approaches that move beyond conventional techniques applied to all site types. Waste landscapes and materials must be embraced as high value opportunities

for extending lifecycles and shaping culturally significant waste places, rather than dead-ending in single-stream, linear approaches. As a design-research framework, landscape lifecycles aims to tackle waste landscapes with integrative approaches, strategies, and techniques that reactivate waste as a legible and dynamic contributor to local and regional contexts; a method for integrating multiple diverse programs rooted in economic, environmental, and social performance to form hybrid assemblages in the transformation of perceived physical and spatial waste. This design-research method developed from a speculative project that explored the performative qualities of waste, and has since been tested and applied in multiple studios and research seminars. Outcomes from these courses illuminate the wide-ranging opportunities of engaging with waste as a hybrid, envirotechnical condition. This paper highlights design-research and representational methods that embrace speculation as a means of engaging with waste conditions at multiple scales—from the material to the region. These methods range from speculative mapping to scenario testing to time-based, projective design that explore and test an argumentative hypothesis and the multi-scalar design implications of research on the imaginative potentials of waste transformation.

Robert Hewitt and Hala Nassar, 463, *Design Research Based Development of Camouflage Landscape Features to Prevent Criminal UAV Activity*

The popularity of small consumer drones (UAVs) has prompted increased use of these vehicles in and around public outdoor spaces, with expected commercial drone numbers to reach nearly 7 million by 2030 (FAA 2016, Beasley 2016). Research in landscape architecture related to UAV (drone) use in public space to date, has just begun to address conceptual approaches to landscape assessment, representation, and park user behavior (Kullmann 2017, Park 2016). While research related to the development of countermeasures for security purposes is more extensive, no research to date addresses the development of landscape countermeasures for the use of UAVs in criminal activities. The paper presents design-based research (DBR) methodology and findings funded by a multiyear, multidisciplinary NSF grant to develop landscape architectural interventions that discourage the use of UAVs for criminal purposes at correctional facilities. Consistent with design based research (DBR) models (Brown, 1992), this project is complex, incorporating the development of a) landscape assessments for potential UAV launch and landing sites around prisons; b) the creation of UAV tracking and monitoring systems, and c) the development of model countermeasures. The paper describes the design and placement of embedded landscape features utilizing landscape camouflage principles for UAV detection systems in forested upstate North Carolina. Modelled camouflage mimicked landscape features at line-of sight and access/egress points and were fabricated in two stages: 1) landscape superstructure, and 2) landscape camouflage. The embedded landscape features incorporated a launch warning system capable of alerting prison officials of drone launch locations, identifying future drone operators, and predicting drone flight paths. DBR landscape camouflage modeling for embedded landscape features utilizing the three criteria above, offers promise for landscape architectural participation in expanding security planning and first responder capacity building taking place globally (Nemeth 2010); and builds on existing landscape security planning now confined largely to hardening site features against blast damage, Conceptually, in the context of small aerial UAV countermeasures, this DBR contemplates the development of new design theory based on differential situational awareness between two groups of people using the same environment for different purposes - one group using small UAVs to counteract security design and purposes of the other group.

Matthew Seibert, 156, *Gaming Landscape Representation: Creating knowledge through game engine model systems*

"[A model is] a mathematical construct which, with the addition of certain verbal interpretations, describes observed phenomena."[1] - John von Neumann, 1961 Models are ubiquitous in the modern age. They are at the heart of how we see and act in the world.[2] They image our realities. And are increasingly being employed in the study and design of landscapes, producing new knowledge in the process.[3] In situating this trend in a larger

epistemological context across multiple disciplines, a new, expanded utility for models and their use in design research methods for landscape praxis can be revealed. A newly accessible, uniquely versatile, and culturally significant model system as novel research tool is proposed: the game engine. Drawing on model-based lessons from Alphonse Favre's 1878 geologic study of bands of clay on stretched rubber to test the production of folded mountains by Earth's contraction, to the curious case of how game theory became "the E. coli of economics" during the Cold War[4], the author is developing a curriculum and methodology employing the game engine as a generative, phenomenological tool in landscape study. This also responds to ongoing conversations around the slippery nature of landscape as represented with drawing conventions repurposed from architecture (i.e. James Corner's spatiality, temporality, and materiality[5]). The methodology begins with a site visit, an inventorying of experience as directed by a selected lexicon of phenomena and / or sensing: light and shadow, openness and enclosure, mnemonic influence, chronoception, proprioception, etc. Students are then tasked with generating a static notational map informed by their lexicon, developing a notational language to communicate experience. This reading is then interpreted into a four dimensional, spatio-temporal, interactive visualization requiring the designer to take an explicit position on their selected phenomena's influence on landscape experience. The fully navigable, real-time environment as produced by game engines allows for manipulation of all worldly registers and processes (weather, time, scale, physics, etc), not only enabling ungodly efficiency in iterative studies but the investigation of critically integral, albeit often intangible, dynamics. The game engine enables novel research in its ability to probe qualitative forces like the influence of memory on experience, its ability to allow the player-reader to inhabit other life forms, its ability to simulate agency and actor-networks. Straddling both induction / deduction and objective / subjective dichotomies,[6] this methodology posits game engines as a new type of knowledge-generating model, a newly potent landscape tool in the Age of Entanglement.[7]

Stephanie Carlisle, 123, *Uncertain Futures: Using scenarios to untangle ecological systems*

Scenarios have a long and storied history within design and ecological science— outside their perhaps more well-known role in military and petro-industrial applications of the 70s and 80s— for example in the 1960s World Game experiments of R. Buckminster Fuller, multi-stakeholder fisheries management modeling in the early 2000s, or more recent work by climate scientists to model decarbonization pathways for the global economy. The crafting and writing of scenarios is an art that balances evocative plausibility with unexpected outcomes, allowing participants to expand their imagination of what is possible, if unlikely, to happen in a given system, and enabling them to play out new solutions that may have otherwise gone unexplored. When combined with iterative drawing, scenarios can become a tool of radical synthesis for quickly learning complex concepts, allowing designers to overcome assumptions, take risks, acknowledge uncertainty, and rapidly spatialize a diversity of outcomes. This paper presents an example of scenario-making and drawing exercises used as a tool for teaching about ecological systems and mechanisms—including concepts such as stress, disturbance, succession, patch dynamics, biodiversity, ecosystem services, silviculture, and plant communities. Stress and disturbance are integral to the successful functioning of many healthy ecosystems, but beginning landscape architecture and architecture students are often hesitant to impact a given site or employ proven techniques like designed disturbance. By writing specific disturbance events into site-specific scenarios, and asking students to play out the consequences over time in a series of drawing exercises, the author has found it possible to push students to more aggressively investigate ecological cause-and-effect, test out new vocabulary and concepts, commit to clear and coherent management proposals, and get over the fear of drawing disturbance. Scenarios can create a scaffold for the exploration of ecological systems and their complex feedbacks. They can create a series of clear conditions, introduce specific constituents, and force students to translate concepts and strategies into clear, spatial proposals. The paper will present a framework, as well as outcomes, that the author has successfully employed in a series of workshops conducted with both graduate and undergraduate students without prior environmental science background or training, in order to quickly introduce students to ecosystem function, environmental management, ecological

restoration, and basic ecological concepts. It will demonstrate how the use of well-crafted scenarios, combined with targeted drawing exercises, can be a powerful strategy for ecological design research.

Justin Parscher, 308, *Confidence Games: The Ethics of the design fiction*

Landscape architects have long been entangled with fictions, from hypothetical studio prompts to the creation of ecological planning scenarios, to the habitual action of submitting a design to a client as a provisional reality. However, a current wave of exhibitions and ideas competitions appear to extend the function and power of the landscape architect's fiction. Open-ended competition prompts like LA+'s Imagination or Blank Space's Fairy Tales solicit and receive deeply ambiguous or downbeat "proposals" from landscape architects and architects. Such initiatives can be seen as converging toward a larger trend in the design disciplines toward the design fiction. The design fiction, as advanced by science fiction writer Bruce Sterling, imagines an alternate reality through the creation of objects and texts that claim to hail from that reality. What the resulting objects lose in utility, desirability, or plausibility, they gain in the ability to provoke and spur reflection. As landscape architects joining in this endeavor, we should ask ourselves our habitual question – how do such activities meaningfully and purposefully advance environmental and social health in addition to aesthetic engagement (Thompson 2000)? How does the ability to stage narrative through space (Potteiger and Purinton, 1998) transfer onto an ability to conjure narrative through image and text? Do such activities gain landscape architecture a broader audience? In particular, a design fiction is the perfect venue to explore how landscape architects construct and advance truth claims. What proof is needed? And how might a sufficiently compelling lie find its way into a form of reality? Beginning by taking stock of the emerging theoretical discourse around design fictions, the paper explores how a design fiction rooted in the techniques of an immersive, environmentally focused design field departs from the assumptions of one rooted in an object-oriented, industrially focused design field. This paper then examines the structure of three of the author's design fictions for competitions and studio courses, and details how each one works to critique the typical construction of truth claims in landscape design. Each of these fictions uses the common theme of the confidence game - the persuasive technique used by swindlers to extract money from a victim - to depict the unscrupulous possibilities of communication in landscape, including descriptive text, renderings, and sketches. Finally, the paper posits that a design fiction can be a vehicle of defamiliarizing (Shklovsky 2015) communication practices in landscape, calling into question the customary rhetorical role and storytelling habits of designers, and helping to clarify ethical approaches to practice and research.

Leonard Yui, 293, *Designing with Preservation: A Gilded landscape in the age of ecology and sea level rise*

The landscape historian Heidi Hohmann writes that the preservation of historical landscapes must prepare for a changing world by looking beyond "historic appearance." Climate change research suggests complexities that are likely to have no single or clear response, and sea level rise (SLR) threatens to erase existing landscape narratives. Yet, historically minded organizations maintain a strong desire to retell their cultural traditions through their physical and locational importance. This strategy idealizes relatively stable environmental conditions that incubated their stories. However, SLR predictions reveal a climate in increasing flux and an overwhelming impossibility to preserve or to replicate past circumstances. Instead, what if integrating SLR as part of the future story can help to shape new historical projections? Many project examples at the site and regional scale having to do with coastal resilience, such as the recent "Climate Ready Boston" initiative share the growing acceptance and urgency that SLR will have on urban communities. However, the general momentum underlying these efforts emphasize the commercial landscapes, or others with high economic value. Historical landscapes are generally not in a financial position to command such attention or large scale infrastructural improvements that commercial projects tend to be praised for. Constrained landscapes require deeper analysis and interpretation to overcome similar barriers. The following provides a case study of a prominent historical landscape from the Gilded Age in Bristol, Rhode Island

and considers how new sea level rise data and research applied through alternative future diagrams challenge conventional responses. A further study of resilient landscape strategies, projects and issues helps to reinforce the need to vary the approach. The project occupant's desire to generate a new coastal pathway to attract additional patrons must contend with the ongoing struggle to sustain the site's overall Country Place era garden style. Parts of the shoreline are populated by invasive species that impede access and views, and is already subjected to regular inundation when a significant storm event passes through the region. Coastal regulations offer a binary response to either sustain the status quo and resist environmental interventions or to engage larger, expensive actions with unclear cultural consequences. The analysis is suggestive of intermingling the two counter points: the site's cultural history and its ecological opportunities in a changing environment. Although the physical history may face erasure with rising sea levels, the preservation of ecological and educational opportunities to attract and teach future patrons has the potential to sustain historical intent.

Barry Lehrman, 300, *Patterns in the Dust: parametric design of large-scale dust mitigation and ecological restoration**

This paper explores the practice of utilizing parametric design tools to generate pattern-based large-scale dust mitigation landscapes. Parametric design tools, such as Grasshopper™ (Ruttan and McNeel & Associates 2008), utilize algorithmic parameters to generate forms and geometries, such as aperiodic and asymmetrical patterns. These patterns defy classical geometric classification into wallpaper groups, crystallographic groups, or periodic tessellation (Lehrman 2018). Pattern scholarship remains isolated in subdisciplines of math, physics, chemistry, or biology with a few notable exception (Thompson 1942; Weyl 1952; Ball 1999). In the design disciplines, scholarship of patterns focuses on superficial visual similarities (Kepes 1969) or on the application of patterns, such as M'Closkey and VanDerSys' (2017) survey of patterns in Landscape Architecture. Around the world, anthropogenic water diversion has resulted in numerous dead and dying terminal lakes, where the desiccation impacts the health of entire regions when the exposed lacustrine sediments laden with toxic levels of heavy metals, salts, pesticides, and other pollutants become airborne PM10 and PM2.5 particulates (Bullard et al. 2011; Gill 1996; Goudie 2014; Saint-Amand et al. 1986). In California, $1.5b has been spent to mitigate dust on Owens Lake (Inyo County) (Lehrman 2016; LADWP 2016), with only limited engagement of landscape architects. 300 miles south, the State of California (2017) is undertaking a decade-long planning effort to plan how to avert ecological collapse and dust from reduced inflow of agricultural drainage is lowering shrinking the 343-square mile (889 km2) Salton Sea, where dozens of square miles of playa with sediments rich in selenium, boron, and arsenic are now exposed (Cohen 2014). This presentation will feature projects and best practices developed from series of five landscape architecture studios (thus research by design) that utilized Grasshopper™ to design dust mitigation and ecological restoration strategies on Owens Lake and the Salton Sea. The mix of 3rd year BSLA and 1st year MLA students tackled two to eight-square mile project sites, and responded to multivariate conditions (sediments conditions, salinity, slope, surface roughness, available water, wind patterns, bird migrations, plant communities, et cetera) with micro and macro scale features and strategies. Compared to the monotonous engineered dust control methods encountered on Owens Lake or Imperial Irrigation District's Red Hill Bay pilot project, student-generated parametric pattern-based strategies provide a richer aesthetic viewshed and experiential landscape, while providing equivalent or better dust mitigation and ecological performance, and remaining constructible with standard earthmoving equipment.

Marc Miller, 468, *Remote Sense and Sensibility*

This paper considers the role of virtual technology and computational systems in design and their application in the global south. As part of design research and process, virtual hardware and software have become increasingly accessible. The ubiquitous use of technology is assumed to be a universal solution, but the consideration of appropriate application remains as a question. The software and hardware applications range from being relatively

simple; involving the use of readymade resources to sophisticated models created to make immersive presentations to clients. Paired with the increasing sophistication of representational models is the increased access to computational systems that allow designers to create rule-based solutions to find emergent scenarios. Given these advances and the push for technocratic progressivism, an important consideration is how applicable is are these applications. The presentation will describe work from the Rio Studio at Penn State University. As implied, the study area is located in Rio de Janeiro, Brazil. The course is an upper/graduate level collaborative design studio with shared instruction by faculty in the departments of Architecture and Landscape Architecture. The studio has also partnered with faculty in the Architecture program in Rio to share work. For the past two years, the studio has focused on the Santa Marta informal settlement, located in the Botafogo district as the basis for research and learning. Students learn rule-based design strategies, such as shape grammars to examine the formal characteristics of the informal settlement. They also learn how to construct recursive definitions in the grasshopper/rhino software environment in order to use shape grammars to create unique emergent systems. As a means of representation, students learn how to use VR software to create immersive models for local and remote presentation. However, a deep dive into the cultural conditions that give affordance to informal settlements are not present in the course. Also, spatial characteristics are used to examine the study area, but tectonic conditions which define form are also not thoroughly considered. Finally, what are the techno-colonial implications of using state of the art equipment to examine an impoverished informal development located in the global south? This paper outlines these problems with the intent of finding a way for the students and faculty in the studio to learn from the community in addition to the technology.

Fadi Masoud, 97, *Coding Flux*

In 2010 the Southeast Florida Regional Climate Compact was created to set the agenda for climate-based urban adaptation. Broward County, one of the four compact counties, engaged 60+ graduate students of design from MIT and the University of Toronto to imagine a more climate-ready and responsive urban future. The purpose of this study is to showcase the impacts of 4+ years of studio research work on public policy in the County. Working with a public agency, the research studios implored planning standards that enable the status quo, and asked why does land use zoning continue to remain static when we know that landscapes are dynamic? Urban development in Florida is tied to the management of water, creating a false binary of "wet" and "dry", when the reality is an ever-present fluctuating gradient of inundation and flux. As such, the research began with analytical mapping exercises that compiled historic and current cartographic information with flooding projections. Followed by intensive exercises in the form of an "urban codification workshop", where students were immersed in local planning policies and land use zoning codes. Additionally, the studios distilled metrics and innovative strategies from contemporary resiliency and adaptation design competitions. Fieldtrips to meet with officials and visit study sites took place, as did regular check-ins with County collaborators. Armed with a strong spatial understanding of context and existing policy frameworks, students imagined catalytic, responsive, and multi-scalar design moves, from which novel urban codes were then extracted. Projects ranged from rethinking roads and canals, to treating pollutant runoff through topographic / vegetated strategies, to imagining new linear suburban developments on levees, to establishing a relationship between building density, height and topographic elevations. The ultimate goal was to translate many of these design ideas into a type of landscape-responsive novel code for the County. Many aspects of the work are being discussed as near-term adaptation policy strategies, demonstrating the significance of research design solutions on public policy.

Emily Knox, 411, *Super-wicked Landscape [Architects]*

This paper explores the potential of landscape architecture and design research in thinking around super-wicked problems. In the face of anthropogenic climate change, we increasingly observe and engage in land-related

phenomena occurring over vast, social-ecological landscapes. In their simplest forms, these phenomena can be reduced to surface conditions familiar to the landscape architect (erosion, desertification, drought). But, these landscapes and the phenomena they host are much more complex; the degraded surface condition is a physical manifestation of a specific set of environmental, ecological, cultural, and economic site conditions. This paper argues that a different set of questions should be asked to engage with super-wicked landscapes, and that design research is particularly well suited to pose those questions. I use the cultural landscape of sheep-ranching in Argentinean Patagonia to explore that potential. Overgrazing of sheep has caused desertification over vast portions of the region in the last century. Rangeland landscapes are notoriously difficult to study – not just because they are so vast, but because they are constructed from many volatile and deeply entangled variables (weather, plant succession, stocking rate, market demand, lambing rate). In an effort to reach rigid conclusions that translate into solutions transposable across a landscape, researchers have tended to reduce those variables by treating them as linear across space and time. This type of analysis struggles to fully consider the complex realities of on-site conditions or the connections between social and ecological process. The project pushes beyond this limited interrogation of the landscape by directly engaging with its complexities. It uses visualization as a tool to disentangle the social and ecological components of sheep ranching alongside one another, deconstructing each as a set of discrete processes and man- (or sheep) made decisions that inevitably vary across space and time. In doing so, new knowledge about how the two are intertwined was generated. This new knowledge revealed an opportunity to design a new, projective form for the working landscape, one that can flexibly accommodate site specific variations in both the social and ecological processes. In super-wicked landscapes, rigid solutions have proven inadequate. The analytical framework described above opened the door to pose new questions in order to generate a flexible, ad-hoc strategy that more appropriately engaged with spatially and temporally shifting variables in this complex, cultural landscape.

Fionn Byrne, 98, *Uprooting Stowe: Designing new histories for the 18th century English landscape*

This panel presentation will show the work of an advanced Master's level studio that engaged disciplinary history as a site of research through speculative design. Students explored the relationships between physical form and social function in canonical works of building and landscape architecture completed in the eighteenth century at Stowe in Buckinghamshire, England. They then used design as a tool to envision alternative proposals which would give form to a set of contemporary ethics that would have been foreign to the eighteenth century. Stowe was critical in the development of the discipline of landscape architecture, as it provided the location, labor, and funds for William Kent and Capability Brown to formalize a new aesthetic, later called the "English landscape garden." This design direction moved away from an ordered geometric design and toward a less formal, more picturesque approach. This landscape tradition also anticipated the rise of ecological design and an ethic of environmental responsibility. Many contemporary designers continue to work in this style and adopt characteristics of degraded landscapes, using sinuous paths, curving panted areas, and clumped vegetation, which share more in common with those of Kent or Brown than just stylistic similarities. As in the eighteenth century, it remains true today that to "design with nature" is an aesthetic act rooted in an ethical attitude towards the environment. The naturalistic approach to design, developed as the Industrial Revolution began in Europe, resonates with the contemporary concern for climate change as a global capitalist system warms the planet. If an environmental ethic has found physical form in ecological design, then this design studio asked what physical forms other ethical commitments could take. This question is particularly important in academia today, where social justice and activism are attracting increasing attention. Yet by posing the question through a historical lens, even a socially moderate individual with today's mores would appear as a radical in the eighteenth century, especially remembering that throughout this period, acts of enclosure dispossessed many poor of their land; trees were most often seen as a resource to support the navy for imperial conquest, colonization, and participation in the slave trade; women could not vote; and homosexual acts were punishable by death. In this challenging context, the presentation will show how

design was used as the method to research these historically celebrated works at Stowe and to critically engage with history through the proposal of speculative alternatives.

Xi Zhang and Xiangrong Wang, 174*, Research on the Renewal Strategy of Park's Boundary under the Background of Urban Regeneration:A case study of urban parks in Beijing North Central Axis District*

The purpose of the research is to propose the renewal strategies of the boundary of traditional urban parks built in the special era of China's socialist planned economy. In recent years, China's major cities have experienced depletion of construction land caused by high urbanization. So, how to deal with multiple spatial demands with limited space has become a key issue for the urban construction in China. The boundary of the Chinese traditional urban park is often treated as the linear element, rather than three-dimensional space in today's construction. Many potential spaces are not used effectively. Meanwhile, the existing research on urban park's boundary mainly focuses on the summary of the theory, which are not implemented in landscape architecture design. The paper firstly analyzed the development of traditional urban parks and meaning of the boundary at different scales. On this basis, Liuyin Park, Qingnian Lake Park and Ditan Park which are located in Beijing North Central Axis District, were selected as main research objects, because these three traditional urban parks are the result of concentrated construction in the era of China's socialist planned economy. At that time, the construction only concerned about the increase in the quantity and proportion of green space, which no longer meets the requirements for good quality of life currently. The main issues engaged in this project are sorted out through the investigation as: 1. Lack of connectivity between parks. 2. Lack of functional and visual value at park's boundary. 3. The confusion of boundary traffic. 4. Lack of distinctive culture. Regarding to the research conclusion, the renewal strategy of park's boundary can be concluded from 3 scales through the design of these three parks' boundary: 1. The urban scale: using potential spaces at the boundary, such as green buffer, unused vacant land and occupied space, to integrate parks into the urban greenway and construct a continuous slow traffic system. 2. The community scale: repositioning the boundary space according to different surrounding urban areas; drawing inside the memory of the place and various community events. 3. The infrastructure scale: transforming from gray infrastructure of a single function to green infrastructure with multifunctional and resilient public space, so as to boost the city's vitality. Traditional urban parks are specific products of urban construction in China during certain periods. The renewal of these parks' boundary will provide a new vision for current urban regeneration in China.

Rob Holmes, Kathleen Kambic, Mary Pat McGuire, Kristi Cheramie, and Brett Milligan, 357, *Research by Design Track Discussion*

This panel provides a forum for response to and discussion of the Research by Design test track. Research that is done through 'designerly methods', rather than about design, is practiced by many landscape academics. A significant discourse surrounds the work of research by design in both landscape architecture and related fields. Standard reference works on research in landscape architecture acknowledge the place of research by design (Deming and Swaffield, 2011; Van den Brink et al. 2016) and articles in nearly every major journal of landscape research, both in the United States and internationally, have discussed the topic. Adjacent fields, such as architecture, are having similarly expansive discussions (Simon, 1996; Chi, 2001; Cross, 2006). Within the broader disciplinary discourse on design, research through design (or by design), is described as a method wherein design is embedded in the research process itself; that is, the design activity operates as the research (Faste & Faste, 2012). This research process often results in artifacts that improve the processes of the design researcher herself, as well as the dissemination of the artifacts, through which new knowledge is interpreted and explained (Briggs, 2002). In this sense, the goals of research by design are constructive, not descriptive, formative, or evaluative. Design explores and reframes issues in the research process, which is often well suited to addressing the complexity of landscape and landscape systems (Dorst, 2001). Research by design can produce new knowledge for landscape

design, develop new landscape design methods, and describe new landscape futures. This panel will discuss the role of Research by Design within the shared academic discourse of CELA. The panel is intended to help this track foster conversations that elucidate and expand the quality and depth of such work that many landscape academics have already begun producing, as well as reclaim and invigorate design-oriented and design-operative research practices in academia. Panelists will briefly set out a variety of positions on the nature, utility, and significance of research by design. Panelists will also briefly assess the work presented in this track at CELA 2019, aimed at drawing out some of the larger themes evident in individual presentations and panels in the Research by Design track. This work by the panelists will transition into open discussion by both audience and panelists of issues related to both the test track and the topic of research by design generally.

Timothy Baird, 302, *Design AS Research: Adopting creative work as a viable path to tenure*

This paper will address the questions, "Is the scientific research method the only valid model for the arts and design, and should the creative act of design be accepted as an act of research when undertaken with great rigor and critical thinking?" These questions will be addressed and case studies will be presented to reinforce the notion that Deming and Swaffield's "research attributes" can, in fact, be attained through the creative act of design AS research. It will be maintained that design as research and the production of creative work should be given equal standing with scientific research and publication as a viable path to tenure in landscape architecture, in other words, the act should be considered as important as the word in the academy. As Professor Jacky Bowring of Lincoln University has stated, "the mantra that we use in working with students and clients, is that design is about "expanding the imaginative scope," i.e. generating possibilities and new ways of seeing, rather than coming up with a singular answer and 'proving' something. We are really interested to see how design studios can be research laboratories, not in the science sense but as places of exploration." This definition of the design studio as research laboratory is critical to the formation of research questions that can be answered by responding to Deming and Swaffield's research attributes of new knowledge generated, generalizability, transferability, and replication by others. Another crucial component is peer review as a critical evaluation of design is required to elevate the level of quality and relevance to the standard necessary to attain tenure and promotion. The case studies presented will illustrate design as an iterative process of testing that evolves and changes reflecting a wide range of variables through the use of multiple tools from analog to digital.

Samantha Solano, 63, *Distinguished Landscapes: A comparative spatial atlas of ASLA's award winning projects from 1981-2018.*

This paper presents the initial results of a comparative spatial analysis of the American Society of Landscape Architects (ASLA) annual professional awards from 1981-2018. Since 1970, "the world's most prestigious juried landscape architecture competition", has recognized outstanding projects in landscape architecture, which have served as indicators into the nature and scope of the profession's focus. With this focus, comes agency—therefore the awards reveal a spatiality of landscape architecture both in its geographic concentrations and its vacancies. The research surveys the 970 project awards granted since 1981, in the general, residential, and analysis and planning design categories. Each project is comparatively mapped against its location, project type, ecological region, population and future climatic and growth projections to uncover a spatial narrative of recognized landscape architecture and its inherent landscape. The historic coverage of the awards reveals a time map the visualizes the growth and project evolution in landscape architecture while the recent project winners provide a critical lens into the current state of the profession. With the global challenges of climate uncertainty, scarcity, and population growth, understanding the spatial implications of where distinguished landscape architecture occurs, provides a guide for future catalyzation of agency in urgent and underrepresented landscapes. Envisioned as a critical atlas,

the research aims to portray and question the influence of the ASLA awards on design discourse and its future trajectories.

Marc Treib, 46, *Better than Just Research: Humanistic practice*

In recent years, a growing coterie of landscape architects has asserted that design constitutes a legitimate form of research. They could argue that practice should not only share equal validity with academic "research," but in fact, that design is more comprehensive, more engaged with people and places, and more involved with real life than those studies left only as publications. Design brings research into the real world, takes it further, and thus renders it more viable. I would not argue that all design constitutes research, however. Common practice often repeats tried processes and produce conventional results. Thus, we need distinguish habitual from involved design practice: the latter contributes knowledge and to experience in a new way. When does design represent research? Each involved design responds to a host of constraints normally left unaddressed, or addresses them in a new way and yields new knowledge; that is to say, because every design project is unique, the thinking and development behind it represent experiment in manner parallel to the normal sciences. Alas, the method or trajectory of designing is rarely as pure and precise as that of scientific inquiry. Unlike the laboratory, design must address an enormous number of factors that span those social, environmental, aesthetic, and material—quite unlike the laboratory where factors can be limited and controlled. When let out into the world, however, the bombardment of the hundreds or thousands of new factors left unaddressed in the laboratory often nullify these findings. Landscape designs that represent research include the social thinking behind Robert Royston's children's pool at Mitchell Park in Palo Alto and Georges Descombes's Parc du Lancy outside Geneva; the horticultural science behind Mario Schjetnan's Bicentennial Park in Mexico City; the behavioral response to Michel Corajoud's Miroir d'eau in Bordeaux, France; and the horticultural experimentation of Gilles Clément's Jardin en Movement in Paris. All of these are humanistic landscape designs in which the artistic/poetic dimension equals in merit the functional/pragmatic. Engineers better calculate structures; botanists may know more about plant systems; geomorphologists are probably better informed about topography, and sociologists, at least in theory, know more about people and behavior. If all this is true, just what do landscape architects contribute? Their most significant contribution is an overarching vision, an idea, a concept that enfolds all of these fields, at times rejecting the grand gesture, at times using it to shape a coherent work that surpasses functional criteria—and innovates.

Rod Barnett, 149, *On Not Knowing What You Are Doing*

My talk will make the following argument. According to the Oxford Dictionary, research is the endeavor to discover new facts. In landscape architecture, research by design discovers new facts through doing creative works. If it is to be research, then, design must be investigative and produce new knowledge that contributes to the evolving discourse of landscape architecture. The outcomes must be novel, not already known. If the discoveries are to be made by doing design, that is, by making, the making itself is the research. It follows that the making itself should be unconstrained by prior habits, rules, or directives. It should be open and free even as it is iterative and reflective. The designer, then, cannot really have prior knowledge of the process or the outcomes of that process. The talk will attempt to demonstrate that it is valid for designer to not know what they are doing.

Alexandra Lemke and Kristi Cheramie, 385, *The [in]Visible Road: Spaces of detention + deportation in the U.S.*

The rhetorical misappropriation of "criminal" for "detainee", and "illegal" for "undocumented person", contributes to the criminalization of migrants and is responsible for current detention practice's inappropriate reliance on American prison infrastructure(Conlon + Heimstra 105). Once detained, the strategic management

practice of far and frequent facility transfers leverage the remote locations of detention sites to disorient and disconnect detainees from existing resources which enable them to successfully appeal their Removals. Building on the work of political geographers, The [in]Visible Road positions the landscape architect in a critical role as political advocate by questioning the colloquial understanding of detention as static, singular, and isolated -- visualizing detention as a systems-scale problem in which cultural attitudes have discreet spatial implications. Through the development of a radial series, the researcher indexed each of Texas' 24 contracted detention facilities by surveying their context, and connectivity within the deportation process, noting the myriad service spaces, and facility typologies, which aggregate around them. Common patterns emerged which reaffirmed the inter-connectivity of detention sites, and necessitating the introduction of a new classification for "Deportation Space" as distinct from carceral spaces. Within "Deportation Space" the individual sites of detention, and liminal spaces between, are of equal import in the construction of this socially and politically suspended landscape. A vast and largely invisible network of displacement, surveillance, and control, "Deportation Space" continually exerts and magnifies it's experiential effects beyond the facility walls. Finally, as a means to test this new definition, speculative drawings confront detention as inseparable from its network of in-betweens, as an extension of both infrastructure and cultural attitudes towards detainees. The [in]Visible Road reconceives of the landscape as a space of state-wide protest, rendering the otherwise unseen routes of carceral surveillance and bodily control, carving an obtrusively direct path between individual detention facilities, and visualizing deportation space as intimately involved in the daily lives of US citizens and neighbors. These landscapes of deportation- viewed by bus, car, and plane – challenge our preconception of detention as singular sites of static incarceration, revealing an active network which exists, largely invisibly, to enforce narratives of abjection and expulsion. Without physically engaging the built environment, this project uses speculative research as a tool of political activism, and advocates for landscape architecture as a discipline capable of greater engagement and even deeper social critique.

Alyssa Schwann and Jan Haenraets, 36, *A Museum of Anthropology: Conflicted iconography, contested land*

The Museum of Anthropology (MOA) in Vancouver, BC, Canada is on unceded territory, the ancestral homeland of the Musqueam First Nations. MOA comprises the museum building, first completed in 1976, as well as the surrounding designed landscape. Together, the building by architect Arthur Erickson and the landscape design by Cornelia Hahn Oberlander, are considered masterworks that envision a 'total' environmental design. MOA was designed to be part of the University of British Columbia campus, integrating teaching and research with state-of-the-art collection management and interpretation. Though regarded as a representative and significant work of its era, its concept had shortcomings. The museum is currently planning a third expansion and landscape remediation presenting the opportunity to provide a vision that honours and celebrates principles of place and diverse knowledges. The current museum presents anthropology from various regions in North America and the greater world, yet it has to some degree ignored its own history and setting. A conflict results; reconciliation is needed. While the 1976 design spoke of a setting inspired by the Haida Nation from the northwest coast of Canada, MOA resides in the southwest of the province on Musqueam land. The placement of a Haida 'village' and other aspects of the museum's iconography have been controversial, while the Musqueam relationship to this place had been largely overlooked – in particular, their living culture. Typical design processes consistently omit Indigenous voices. Further, land is often minimised or avoided in design discussions, thereby profoundly undermining Indigenous culture. However, the long relationship that Canada's Indigenous people have had with land embodies an understanding of the complex natural environment and cultural landscapes. A research method starting with an understanding of land in all of its aspects provides a vision for the museum that honours and celebrates Musqueam culture, principles of place, and diverse knowledges. The new method proposes a design process that includes Indigenous voices. In partnership with the Musqueam, the result is the proposed development of an eco-cultural woodland restoration strategy for the museum, one which aims to balance the living culture of the Musqueam with the recognition that this is a 'Museum of Anthropology' which represents and interprets multiple layers of histories

and cultures. The research and design process aims to establish a 'laboratory' – a Living Forest – for understanding the evolving environment, a place to share diverse knowledges on the relationship between nature and culture and to define a model for nation-to-nation stewardship of the land.

Peter Ellery and Jane Ellery, 48, *Redefining Education in Africa: Creating African-centric learning environments through culturally identifiable landscapes**

The introduction of free government-school based education legislation in many African nations has led to increased government school enrollment. This legislation has also created a significant strain on existing schools, teachers, teaching resources, drinking water, and school health facilities. (United Nations Educational Scientific and Cultural Organization (UNESCO) 2015). However, the implementation of this legislation has also led to schools and curricula being focused on Western, and often colonial, educational standards, rather than standards that reflect the needs and ideals of Africa as a nation today (Woolman 2001). At the 2018 World Conference on Transformative Education (WCTE), in Kakamega, Kenya, teachers and academics vocally noted that much of Africa's identity, history, and culture has been lost in the pursuit of these Western ideals (Chepyator 2018; Mucherah and Mbogori 2018). From a design thinking perspective, school landscapes could be used to address existing environmental sustainability, food, water, energy, health, social and educational issues, while also including elements that promote African, national, and local, culture, language, identity and ideals (Marcus 2015; Brown and Wyatt 2010; Georgiev 2012). The purpose of this presentation is to show how a community-centred approach (Sanders and Stappers 2008) can be used as applied research to redefine educational environments in Africa. This approach involves the collection of information from school and educational administrators, management committees, principals, teachers, and students as well as community members using individual (e.g., the principal and teachers) and focus group (e.g., community and parent groups, school management committees, and students by age groupings) interview techniques, guides and procedures created for each stakeholder group (Fowler 1988; Bernard 2000; Ellery et al. 2015). There are two primary outcomes of value that result from using this research by design approach. The first is the design of schools that transcend the Western education system mindset and that better address African, national and local needs related to culture, identity and ideals. The second is the ability to compare and contrast information collected during the community-centered, design process used to determine if common design traits or strategies for promoting African, national, and local, culture, identity and ideals emerge. It is anticipated that with repeated applications of this community-centered, research by design process, a strong set of foundational elements, strategies and principles will emerge and used as a foundation for the design of future schools in Africa.

POSTER ABSTRACTS

Elise Shelley, Jane Wolff, 65, *Research, Methodology and Metrics for Design in the Public Realm: A Toronto case study*

Design decisions at the scale of the public realm demand research that situates the ecological, social and economic value of sites in contexts of space and time, beyond the immediate moment and the limits of property boundaries. Despite current enthusiasm for resilient design, not nearly enough information is available about the consequences of decisions made in the design and implementation of landscape architectural projects. Inside and beyond the design disciplines, there is an urgent need for clear, comparable data to demonstrate how well-intentioned proposals are actually affecting urban environments for better (or worse). Our research on this topic through the University of Toronto in collaboration with the Landscape Architecture Foundation concerns three Toronto waterfront parks planned, designed and developed by various levels of government to rehabilitate and redefine formerly industrial lands. This government initiative has used the development of these significant public spaces to catalyze public and private development of new mixed-use neighbourhoods near Lake Ontario and downtown Toronto. Public agencies had been collecting extensive data about the environmental, social and economic benefits of these parks since their construction. However, until our work, this information had not been tied to the study of physical design. Our use of the government's data enabled us to establish clear criteria for the evaluation and comparison of performance in different projects. In addition, we were able to compare abstract goals to the actual performance of built projects. Our measurement and quantification of site performance considers a range of social, economic and environmental values synthetically. Our analytical work involved collaboration with the firms responsible for project design. This enabled rigorous assessment that is not feasible within the usual limits of either design practice or scholarship. From this work, we have identified techniques that can be applied to a range of sites in cities beyond Toronto. The goal is to support designers' and educators' ambitions for sustainable design. Design teaching methods need to emphasize the close relationship between rigorous documentary work and defensible proposals. For educators, this research serves as a useful precedent for teaching and as a useful example of methods for student analysis of projects in process. For practitioners, the data offer arguments for the implementation of resilient strategies. For advocates, the study provides a useful demonstration of the social, economic and environmental value of the public realm.

Jacques Abelman, 96, *Radical Abundance: Infrastructural ecologies*

Radical Abundance is a research by design research project envisioning networks of diverse typologies of productive urban green spaces. In the first phase of the project, urban reconnaissance reveals a wealth of available spaces throughout urban fabrics. These spaces, apt for productive landscape insertions, include the space around infrastructure such as roads and highways, heavily hardscaped sterile public spaces, and abandoned lots and degraded "wild" local ecosystems that are periurban in nature. The combination of specific characteristics in each site reveals what typologies of productive landscape could be established there—permutations of agroforestry ranging from orchards to foraging sites to perennial permaculture food forests. As novel ecologies take shape, often marginalized social relations find a place in the ambiguity of emergent landscape systems. This project sets out to explore a re-conceptualization of infrastructure as a hybrid system of human and ecological systems, where both design intention and aleatory processes intersect, merge, and overlap, re-negotiating the boundaries between infrastructure and landscape, between formal and informal practices, between intention and accident. This inversion provides an alternative model for the redesign of infrastructure as complex socio-ecological systems, as infrastructural ecologies—interlinked, synergistic systems operating as ecological fabric at a landscape scale. This practice of prospective, research driven landscape architecture moves from fieldwork and analysis to normative illustration of spatial change, tracing a path from analysis of existing spaces to their ecological and social

transformation. The research by design methodology utilizes landscape architectural language to create and test visual narratives. The establishment of infrastructural ecologies as a medium in which new social and spatial negotiations emerge depends on the meditative potential of representation and narrative. Radical Abundance seeks to establish and give shape to the potential of these infrastructural ecologies as generative of a new framework for productive landscapes, urban agriculture, food system infrastructure and social relations.

Emma Mendel, 193, *Representing Intuitive Knowledge*

Landscape, as it exists, is situated between the abstraction of the engineered and the intensity of the sensorial. In the construction of the built environment, there is a lack of representation that addresses knowledge that is indigenous. Primarily, forms of representation rely on the precision of engineering and the agency of the designer. It is at this juncture that landscapes' potential is exposed, at the fulcrum of the environment as an evolved community and as abstracted cultural underpinnings. With this body of research, I am critiquing institutionalized forms of landscape representation, to reject determinism and to discover generative potential in a visual and aesthetic discourse. To avoid the trappings of cultural appropriation, my process has been unfolding contemporary techniques to find what they may be lacking or promoting when it comes to representing a diverse group of communities. This research was explored in a research seminar at UVA where students began by questioning their own knowledge, situating it within formative events. "Locating the self is a tactic common to feminist methodologies to acknowledge that knowledge comes from somewhere and is, therefore, bound up in power relations." (Sundberg) This set the tone for the seminar as scientific, quantitative mappings began to lack the ability to depict knowledge. The second assignment illustrated a cultural practice through orthographic drawings that presented the quantitative experience. "As David Turnbull suggests, 'Knowledge is performative. In the act of producing knowledge, we create space.'" (Sundberg) This process engaged critique of contemporary design tools and their lack of power to express the nuance of an indigenous knowledge, memory or routine? The final project investigated and developed novel modes of representation with analogue modeling, drawing and other forms of depiction. Students were introduced to cosmological and philosophical frameworks such as the Anishinaabe peoples depiction and understanding of land and dirt. "In this relationship with dirt, humans are responsible to land the way an owner might be responsible for a pet. This type of dirt is not First Woman; it is a plaything asking for attention." (Watts) The class ultimately revealed nuanced methodologies and processes, further catapulting projects to novel modes of thinking and designing. The representations and processes transcend the preconceived associations of intelligence, in order to conceptualize it as a set of cultural understandings that are embedded within the structural, experiential and tectonic formation of an urban and contemporary environment.

Christian Moore, Kristi Cheramie, 203, *Prairie Prototypes: Design as method for investigating temperate grassland settlements*

This presentation examines the use of design prototyping as a method of studying agricultural village development in temperate grassland environments. Following the Volga German cultural group, the purpose of this study is to explore and compare the evolving relationship between the grassland biome and the Volga German people as made manifest in the built form of their rural settlements. Originating in the steppe of southern Russia, the Volga Germans colonized the major temperate grasslands of North America, Central Asia, and South America, providing a unique opportunity to study how variations in the grassland and predominant political-social structures influence agricultural village evolution. Building on earlier phases of fieldwork and archival study, the design-research phase (subject of this presentation) utilizes prototyping to synthesize historical evidence for past built environments, present conditions, and potential futures for these grassland settlements. By constructing parallel prototypes of grassland communities (both in the Great Plains and in the Eurasian Steppe), we can see the influence dominant cultures, natural systems, and species exert on village development and use this knowledge to project alternative futures for these communities.

Halina Steiner, 213, *Habitat for Hard Places*

The Cuyahoga River has a rich history, like many rivers, it sits in a valley formed as the result of a glacial formation. The construction of the Ohio and Erie Canal, which includes a portion of the Cuyahoga River and connects the Great Lakes to the Ohio River, solidified Cleveland as a prime location for industry. Like many industrial waterways, over time the water quality in the river became severely impacted. In 1969 the river caught fire and along with growing concern for many waterways throughout the nation, led to the creation of the Clean Water Act 1972. Today, the river is much healthier. Fish and waterfowl have returned. Regulations on industry have limited the practices that once took place. However, the river still faces challenges with water quality and habitat. Additionally, the narrow shipping canal is still active, habitat, especially that necessary for migratory fish is in short supply. As the Cuyahoga River continues to evolve how can new development, parks, and places for people and industry allocate land and contribute to a more robust habitat and cleaner water quality within this corridor? In cooperation with the Cuyahoga River Restoration and the Cleveland Urban Design Collaborative, the studio - in its third year - has developed design strategies to provide new types of modular fish habitat. The studio focuses on sites and fish species vetted through a study conducted by the Cuyahoga RIver Restoration. The collaboration has received grant funding from the Ohio EPA, used to fund additional student work and boat access to the river. Work developed by the students is featured in promotional material used to further the Habitat for Hard Places initiative and has been covered by local news outlets. In addition, an RFP for students was created in May of 2018. The RFP asked students to propose a deliverable to explain the importance of fish habitat in the Cuyahoga River, the winning submission was to develop a coloring book. The Habitat for Hard Places studio has not only developed strategies for creating fish habitat within the Cuyahoga River, but has also produced more immediate content to further the initiative in the short term.

Mitchell Mansell, Carlos Perez, Alpa Nawre, 233, *Creating an Economically Feasible Sea Level Rise Solution*

By the year 2100, it is estimated that the rising sea level, caused by the changing climate, will affect nearly 2 billion people world-wide. Many leading cities are actively combating the water level that is rising at an alarming rate of 3 millimeters per year on average (NOAA). This average is expected to only increase in the coming decades which means solutions must be brought to the forefront immediately. Some of the solutions gaining popularity can be seen in cities such as New York, introducing floodable areas and publicly accessible dunes around coastal Manhattan, where as the coastal suburbs of Amsterdam are constructing communities comprised entirely of floating homes. These examples are setting innovative precedents for the future of expanding cities. However, these proposals tend to be extremely costly, ranging from hundreds of millions to billions of dollars, leaving little room for lower income cities to implement these solutions. A typical seawall, for example, can reach upwards of 1,000 dollars per linear foot of construction. By examining the cost of implementing climate change solutions across the world, this study uses projective design as a method to develop a kit-of parts consisting of multi-layered strategies that have economic gain embedded in them by utilizing the categories of the United Nations' Millennium Ecosystem Assessment (MA). This study thus addresses the economic barrier of fighting sea level rise for low-income communities by proposing a profitable and modular framework for adapting coastal cities to climate change. Designing each module of the kit-of-parts with an income generating, programmatic layer allows an economically implausible technological investment to become an achievable compound of public or private amenity and environmental mitigation. For each of the MA categories, provisioning services, cultural services, and regulating services, an economically feasible and income generating, programmatic layer is introduced. For example, by proposing an array of floating homes coupled with an aquaculture system, the cost of architecture that responds to rising sea levels is offset by the yield of the aquaculture system. This allows for any city limited by a lack of climate change adaptation funding to invest in the future by taking an innovative approach towards a solution.

Michael Sánchez, 299, *Designing Urban Rooftop Agriculture(URA) in Practice, Research and Education*

Urban Rooftop Agriculture (URA), a type of green infrastructure and an emerging form of living architecture, cultivates awareness of food production and food security in urban centers, while creating dynamic spaces for social interchange. How is the practice of URA being considered nationally and how is research of this field bridging the gap between practice, research and education? The purpose of this paper is twofold: to look at the current research being conducted on food roofs and the specific benefits food production bring to urban areas while simultaneously, in many cases, creating spaces which double as social "third places"; and, secondly, how is design engaging both those actively designing, building, and operating URAs and those learning about them. The methods implemented for this research will include an extensive literature review of extant writings of urban agriculture, rooftop agriculture, and green roofs specifically designed as places for people to socialize. Also considered will be interviews of faculty teaching living architecture, practitioners who design these unique places, and students learning about living architecture in schools that have specific courses or curriculum in living architecture. This combination of qualitative and mixed method research will be coded and analyzed through software specific to this type of qualitative data. What new types of knowledge will be gained by looking at how food roof design is being taught and learned and how those designs are being implemented? Will this new knowledge lead to an increase of living architecture courses in landscape architecture programs across the country? Will it lead to a greater number of projects in urban communities? While there is some awareness amongst URA projects, they are to a degree isolated and independent. Thanks to organizations such as Green Roofs for Healthy Cities and the Green Infrastructure Foundation that sponsor interdisciplinary conferences like CitiesAlive and Grey to Green, more connections are being made at the industry, policy, design, and research levels. Gaps, however, still exist between several of these platforms. Through awareness of what others are doing in the field and the sharing of knowledge among industry, researchers, educators and designers, this field of living architecture can be strengthened, ultimately improving technology, advancing effective policies, and sharing new knowledge through the design of innovative places that are productive as well as engaging.

Rob Holmes, Justine Holzman, Brett Milligan, Geneva Wirth, 318, *From Mudlock to Public Sediment*

Low-lying, vulnerable to climate change impacts, and dealing with a myriad of sociopolitical problems, California's Bay Area recently hosted the major international design competition Resilient by Design, which sought to identify new directions for climate change adaptation. Ten teams, primarily led by landscape architects, studied opportunities for both the Bay Area as a whole and individual sites. The Public Sediment team entered the competition with a unique lens. For most of the twentieth century, the Bay was characterized by an excess of sediment, described as 'mudlock'. Today, the Bay is in a new period of sediment starvation, where incoming sediment supply is insufficient both to meet the Bay Area's wetland restoration goals and to enable wetlands to accrete as sea levels rise. The Baylands are poised at an inflection point: with sufficient sediment, wetlands can replace defunct salt ponds, softening the Bay's edge and encouraging a lively gradient of interchange between bay and uplands; without sediment, the Bay Area will likely begin to resemble New Orleans, lined by levees and seawalls. Public Sediment organized around addressing these futures through design research. We asked: what practices are necessary to address sediment shortage? How can we make sediment public? What does it look like to design with mud? Synthetic mapping, fieldwork, physical modeling of sediment flows, collaboration with a stakeholders, and iterative design development produced a set of three proposals addressing four geographies. "Plan and Pilot for a Future Bay" suggests implementable short-term pilot projects crucial for adaptation to Bay scale challenges. "Unlock Alameda Creek" redesigns the Bay's largest local tributary to bring sediment to the Baylands, connect migratory fish to spawning grounds, and reclaim the creek as a place for people. "Rethink the Sedimentshed" examines the potential of the upland watershed of Alameda Creek to supply more sediment to the Bay. The result of this work brings specificity to general design principles for coping with sediment starvation, including the development of typologies for hybrid (constructed and dynamic) infrastructures, the reconsideration of tributaries as multifunctional infrastructural landscapes, and a substantiated argument that designing for and investing in the Baylands needs to begin upland in the medium-term, a critical juncture between the present's deadlock and a future where intensive responses to climate change become undeniably necessary. These results

address the local urgent issues of the Bay and designers' interest in softer, multifunctional forms of coastal infrastructure that support settlement within dynamic landscapes.

Rosalea Monacella, 367, *Diagram for the Thickened Ground: Production of alternative urban morphologies for the post-capitalist landscape*

A diagram for the Thickened Ground proposes an assemblage of various states of multiplicity, material processes, rhizomatic connections and states of becoming that act as an agent for how we might perceive the morphological possibilities for a post-capitalist landscape. The intention of this paper is to reflect on the agency of the diagram through a suite of research case studies. This will be discussed through the diagram's varied role, including its 'perceived' indifference to aesthetics, through to one that is concerned with matter through the idea of the 'thickened ground', having the ability to mediate multiple datums, forms of exchange, and connectivity. A 'thickened ground' questions the Capitalist nature of the city and constructs alternatives through the notion of a post consumptive urban landscape, a landscape that is driven not only by its infrastructure of supply but an alternative that provides an interplay between spatial variables and individual liberty of both human and non-human centric agendas. Questions for the investigation of the diagram will include; What is the diagram? From where does the diagram emerge? What is its material agency? How does the diagram emerge and operate as a projected set of relationships between matter and the landscape, where 'landscape' is explored through the vertical strata of varying material processes and connections that extend from the depths of the earth to the depths of the sky, and what alternative morphologies does the post-capitalist landscape generate?. The research and teaching examples will be utilised as a reference through which a universal understanding of conventional measures, scale, and time are rendered irrelevant tools to apply within this context. What is required is an alternative set of tools in the discourse of Landscape Urbanism in which scale, time and projection are inherent expressions of matter. In this model top-down and bottom-up operations coexist while maintaining self-governance and a multitude of counterbalanced interdepencies that produce the thickened ground. The research aimed to question and bring to bear the different discourses on 'the diagram' in various schools of thought that operate within the larger discourse of Landscape through comparative case studies and design research explorations. The intention is to describe how the diagram shifts to being considered as a relational figure which emerges as a horizontal phenomenon imbued with the materiality of the complex systems it projects from, and to, and is enabled to order, and re-order, territorial conditions of the landscape.

Frank Sleegers, 417, *Changing Parameters of the Urban Design Studio: Physical design models and the application of LIDAR mapping*

The education of Landscape Architecture has demonstrated a growing interest in research by design methods and outcomes. This trend coincides with the seemingly diametrical fact that our profession and teaching has become more complex as interdisciplinary and global issues are addressed while site-specific and local solutions are in high demand. A stronger emphasis on traditional design education such as searching for creative form or grading techniques may bridge this gap. This presentation showcases possibilities and opportunities for the integration of new technologies within the practice of a well-established urban design studio in Landscape Architecture. More specifically it presents and investigates outcomes of physical design models that were supported through LIDAR mapping data and new laser-cutting equipment in the program. The urban design studio in question has been taught by the same instructor for over ten years in both graduate and undergraduate programs. Over the years the studio has exclusively collaborated with one midsized, former manufacturing city in Massachusetts and built up a fruitful relationship with the City's citizens and their planning department. Geographical data for the diverse projects was retrieved through GIS and CAD files provided by the City. Typically for challenged cities, the CAD data was outdated and inaccurate. Maximum accuracy given were topographical contour intervals at ten feet. Given the two facts that LIDAR mapping data can provide a higher accuracy for topography and that new model-building equipment is available in the program, the teaching content and deliverables for the urban design studio was

modified. This paper compares and evaluates the outcomes of two recent graduate urban design studios taught in the same neighborhood. One design studio was supported through more accurate data and advanced equipment, the other design studio used older, less precise data. Criteria for the evaluation were: level of design detail, response to existing topography, clarity of final design submission. As expected, the comparison demonstrated substantial divergence in quality from one studio to the other. The study is a good example for critical and reflective design practice. The advanced design methods improved design related thinking and outcomes. It improved design research education through integration of digital technologies with physical models. The physical models have potential to include more tangible and descriptive outcomes such for engaged scholarship. The case is also a positive example to adapt an existing curriculum to new technologies in the discipline and thus could serve as guidance and inspiration for studio-teaching faculty.

13. FILM TRACK

Carter Crawford, 82, *Teaching Studio: Conversations with Landscape Architecture Professors Episode 12: What is the fundamental goal of studio education?*

The creator of Teaching Studio has built a research program around the study of the philosophy and history of western design education, which for centuries has been carried out in a studio setting. The results of the research so far have yielded a sense of the sequence and mix of underlying epistemological paradigms that have dominated the practice. Teaching Studio is an initial attempt to discern how, and to what extent, these undercurrents affect contemporary practice. In a typical semester, over three hundred studio courses are offered in landscape architecture in the United States at sixty-eight institutions in ninety-three programs (ASLA, 2017). The number of PhD programs in landscape architecture is increasing; these programs are presumably intended at least in part to produce new faculty. At the 2018 CELA conference, thirty-three presentations were accepted in the Design Education and Pedagogy track (CELA, 2018). Yet there is little explicitly shared understanding of the philosophy, the history, or the purpose of studio instruction or of design education more generally. In the summer of 2016, video-recorded interviews were conducted with thirteen highly- respected landscape architecture instructors. There is about an hour of raw footage per interview. The least experienced of the interviewed instructors were recently promoted associate professors. Several interviewees had considerably more experience; one had recently retired after teaching for roughly forty years. The interviews took place at institutions in Pennsylvania, Virginia, North Carolina, Kentucky, Illinois, Kansas, Utah, and California. The interviews were open-ended conversations that usually included these questions: • Do you have a project (or strategy) that you feel is particularly successful? • Have you done a studio project that was a complete disaster? • Did you have notable role models? • What is effective/ineffective about the studio model of teaching? • How has studio teaching changed during your career? • Has digital technology impacted the effectiveness of the studio? • Do students sometimes take projects in completely unexpected but interesting directions? • What is the goal of the studio method of instruction? • Can creativity be taught? • How does a person learn to teach studio? • What's the hardest lesson you've learned in your studio teaching career? Teaching Studio is intended to be a full-length documentary; its goal is to start a conversation about why we teach as we do and how to do it better. The movie presentation proposed here will include excerpts from the full work. Movie trailer: https://vimeo.com/290727763

Phoebe Lickwar, 141, *Into the Woods: Video as a Tool for Critical Practice*

In March of 2018, the authors and a team of six collaborators traveled to the Loire Valley to build Into the Woods, a temporary garden for the International Garden Festival at Chaumont-sur-Loire. The concept for the garden, inspired by Jorge Luis Borges' story The Garden of Forking Paths, was to create a space where visitors could get lost in space and time within a lush forest. Multiple circulatory systems are overlaid to provide contrasting experiences. A winding gravel path takes visitors on a slow meditative journey while intersecting balance beams offer a series of elevated shortcuts. The forest is composed of juvenile trees, fast growing species typically used in short rotation forestry (SRF). Poplar, willow, birch, sycamore maple, and alder trees form a dense canopy over a carpet of ferns, sedges, wild strawberry, barrenwort, and hardy geranium. The process of designing and building the garden was also a process of developing and testing ideas about landscape architecture. Working in the tradition of the avant-garde, an aspect of the garden festival since its inception, the designers employed new materials in novel ways, preserving the walking surface of the wood beams with the Japanese shou sugi ban technique and planting SRF species in the density of typical biofuel plantations. Following the installation of the garden, the designers decided to use video to reflect upon the work. Footage captured during construction and at a

site visit six months later was used to prompt a collaborative dialogue about the ideas underpinning the garden as well as broader concepts about the making of designed landscapes that evolved out of the experience. Video was used as both a medium of inquiry and an avenue for storytelling. The process of reviewing footage, writing and recording narration, and editing the nonlinear sequence was a process of developing, expressing, and consolidating thoughts and ideas, a process of thinking through visual and auditory means. Video is an unparalleled medium for reflective practice in landscape architecture, offering the capacity to convey the sensorial and temporal qualities of landscape while requiring synthesis, sequencing, and expression of ideas through image and sound. Into the Woods, the video titled after the project that was its inspiration, demonstrates an approach rarely employed for the development of a critical practice, resulting in unexpected dialogues and discoveries. https://vimeo.com/266002236

David Eslahi, 236, *31 Park St.*

A day in the life of Cahokia, the largest prehistoric settlement in North America, agricultural fields and farms, a quiet subdivision, a state park, and a house. The blurry and overlapping envelopes of these landscapes unfold and refold unto and within each other. Through time and the transposition of material the histories of the site have been constructed and revealed. Where does the preservation of one begin and the other end? This video explores ideas of plural landscape histories and their relationship to competing preservation interests. Where does the preservation of one begin and the other end? https://youtu.be/caX7rZVznVA

Jody Rosenblatt Naderi, 450, *Atlas of Contemplative Walks*

"The medium is the message. There are no passengers on spaceship earth, we are all crew." Marshall McLuhan Fundamental to achieving basic equity is creating cities where everyone has walking access to a clinic, home, fresh food or a good school. It is the biophysical foundation of what makes cities humane. Then there are the pinnacle experiences of equity, where you have access to knowing your creative self, the part that is deeply connected with where you are walking. Why we walk, impacts where we walk. How we consider the design of walking places is a basic tool in a landscape architect's kit. Spatial preferences must be designed into high performing pedestrian realm or people won't walk there for nuanced purposes like walking: to school, for health, to discover, for social exchange, to get somewhere, to get nowhere, to show your beauty, for fitness, to take the dog out or to just think something through. The film presents The Atlas of Contemplative Walks and tells the story of an ancient form of walking using a print medium equally thick. The film is a single shot narrative about the use of printed ceramic porcelain to make The Atlas of Contemplative Walks. The viewer/reader reads the Atlas through circumambulating 15 porcelain stele (20" X 5" cone-like ceramic pieces) that constitute the "printed book". This content needs to be read while walking; the medium of film is the best way to disseminate / read the content. Taking a reflective and tactile relationship with pedestrian design, grounded theory, empirical research and case studies, the film talks about the use of clay to disseminate the twenty years of research findings in a slow walk for a rapidly urbanizing and volatile world. The hope is to embody knowledge of the need for contemplative places in the city to walk, transform and create. The hope is to ask CELA members to share their walk contributing another stele to the growing Atlas. Some famous, some personal, The Atlas presents guideposts into the unconscious landscape of the walking thinking person/community. As a theoretical and practical framework for pedestrian design, the film presents scales of our collaboration with nature when thinking outdoors, from pilgrimages that last for hours and go for thousands of miles, to a walk around the block. The trailer for the film can be found at: https://youtu.be/6JkTiUdCFYbc