AE" Symposium 2019
Architecture + Environment 2: New Environments

Symposium @ TU Vienna - 28 & 29 March 2019
Venue: Campus Getreidemarkt TUtheSky

The notion of environment (milieu) is becoming a universal and required way of capturing both the experience and the existence of living beings and we could almost speak of it being a category of contemporary thought.

> Georges Canguilhen. 1952. 'Le vivant et son milieu' In: *la Connaissance de la vie*. Paris: J Vrin, p. 129.

The ultimate problem for the profession is that of setting out the possibilities and choices in building an environment.

> Leslie Martin (1967) RIBA Journal May 1967 From: Peter Carolin and Trevor Dannat Eds. (1996) *Architecture, Education and Research - The Work of Leslie Martin: Papers and Selected Articles*. London: Academy Editions. 118.

The environment must be organized so that its own regeneration and reconstruction does not constantly disrupt its performance.

> Christopher Alexander. 1964. *Notes on the Synthesis of Form*. Cambridge Mass: Harvard University Press, p. 3.

The quest for saving the biosphere of Earth from accumulative and accelerating human impact in the so-called age of the Anthropocene brings with it significant efforts in research across many disciplines to meet complex and dynamic challenges. One key aspect in this quest is the advancement of the notion of 'environment' in terms of what is meant by it and how to support it accordingly. For architects, urban designers and landscape architects the question arises whether architecture could be in the service of the bio-physical environment.

This symposium collects together various disciplines, knowledge fields, approaches, expertise and methods that together can contribute to this effort. This includes human and environment relations, biology and ecology, urban metabolism, industrial ecology, architecture and environment interactions, the role of data, surveying and sensing, as well as technological advances that enable human-designed adaptive environments.

Second in a series of symposia that commenced in collaboration between the Technical University in Vienna and the Technical University in Munich, this event seeks to set the scene for advancing inter- and transdisciplinary efforts in rethinking Environment and the role of constructions and their interaction with the Environment.

Special effort is placed on inviting an audience of experts from various related disciplines that can be part of a new collaborative network in environment related inter- and transdisciplinary research.

Thursday 28 March 2019

08:00 – 18:00

08:00	Coffee
08:15	Welcome + Introduction Prof. Dr. Dipl. Ing. Michael U. Hensel
08:30	**Keynote 1:** Prof. John E. Fernández *Urban Metabolism and Planetary Thresholds*
09:30	Coffee break
09:45	Prof. Dipl. Ing. Thomas Auer *Lost in Transformation?*
10:20	Prof. Dr. Ing. Ulrich Knaack *Facade Roadmap*
10:55	Univ. Prof. DIpl. Ing. Dr. techn. Adeshir Mahdavi *Of sustainable architectures and other fairy-tales*
11:30	Prof. Dr. Ferdinand Ludwig *Regenerative Architecture:* *Exploring the synergies between productive landscapes and plant based architecture*
12:05	Lunch
13:00	**Keynote 2:** Prof. Dr. Claudia Binder *Conceptualizing the role of human-environment relations in urban sustainability*
14:00	Coffee Break
14:15	Prof. Dr. Ing. Stephan Pauleit *Green Infrastructure and Ecosystem Services for Climate Resilient Cities*
14:50	Adj. Prof. Dr. Katia Perini *Greening Cities – Nature-based Design Strategies for the Urban Environment*
15:25	Dr. Defne Sunguroğlu Hensel *Embedded Architectures and Ecological Prototypes*
16:15	**Keynote 3:** Hon. Prof. Dr. Julian Vincent *Architecture by Numbers*
17:15	Podium Discussion
18:00	End

Friday 29 March 2019

08:00 – 14:00

08:00	Coffee
08:20	Introduction Prof. Dr. Dipl. Ing. Michael U. Hensel
08:30	**Keynote 4:** Billie Faircloth *A Method Amongst Many Methods*
09:30	Coffee break
09:45	Dipl. Ing. Dr. techn. Markus Hollaus *Multi-scale and multi-sensor remote sensing data for landscape mapping*
10:20	Prof. Grazia Tucci *The role of geoinformation for the cultural heritage: from landscape to artworks*
11:00	Coffee break
11:15	Daniele Santucci Climate*walks* and *flows*
11:50	Prof. Dr. Ing. Henriette Bier *Adaptive Environments based on Design-to-Robotic Operation Principles*
12:20	Podium Discussion
13: 00	Final Comments + End

Thursday 28 March 2019

08:30

Keynote 1: Prof. John E. Fernández

Urban Metabolism and Planetary Thresholds

Abstract:

Today's cities contain half of humanity and are responsible for most of our energy and materials consumption, waste production and greenhouse gas emissions. The resource intensity of our urban world has already had a dramatic effect on altering the future of the planet and its biogeochemical systems. Fernandez will describe the work of the MIT Urban Metabolism Group, a research effort he founded in 2006 to account for the resource requirements of urban economies. Past results include a global typology of urban resource consumption while a current focus is the connection between urbanization and biodiversity.

Short Biography:

John E. Fernández is a professor of building technology in the Department of Architecture at MIT and a practicing architect. Fernández founded and directs the MIT Urban Metabolism Group, a highly multidisciplinary research group investigating the resource intensity of cities and creating design and technology pathways for sustainable urbanization. Fernández serves as the second Director of the MIT Environmental Solutions Initiative; a major MIT effort to enable the capacity of the MIT community in the transition to a low-carbon and humane future. He is author of two books, numerous articles in scientific and design journals including Science, the *Journal of Industrial Ecology, Building and Environment, Energy Policy* and others, and author of nine book chapters. He is Chair of Sustainable Urban Systems for the International Society of Industrial Ecology and Associate Editor of the journal Sustainable Cities and Society. Fernández served as Director of the Building Technology Program in the Department of Architecture from 2010 to 2015 and as the Director of the International Design Center at MIT from 2012 to 2015. He was also the Head of the Architecture and Sustainable Design program of the Singapore University of Technology and Design from 2010 to 2016. He previously served as the Director of Research for Sustainable Energy Systems of the MIT Portugal Program.

Fernández has served on several National Science Foundation Review Panels, as a member of the Department of Energy Roadmap 2020 Advisory Committee, and as a member of the Board of Directors of the Building Envelope Technology and Environmental Council of the National Institute of Building Science. He also served as a member of the Research Committee of the United States Green Building Council. Fernández has participated in the launch of two startup companies in the past 5 years. Fernández has been lead architect of more than 2.5 million square feet of new construction. As senior designer in two major New York City architecture firms Fernández led the design and construction of major commercial, institutional, and residential buildings in Washington D.C., New York City, Philadelphia, Los Angeles, Honolulu, Jakarta, Tokyo, Shanghai, and other locations. Today he is principal and founder of the Metabolic Design Office and continues to practice as an architect with dozens of buildings and several low-carbon designs in his portfolio.

Fernández is a member of the Board for New Ecology Inc., and a member of the Board of Advisors for the Center for Sustainable Energy of the Fraunhofer Institute. At MIT, Fernández has served on the Committee on the Innovation Initiative, the Faculty Policy Committee, and the Institute Planning Committee, as well as the Campus Sustainability Task Force, the MIT Materials and Waste Management Working Group, and the Metropolitan Warehouse Advisory Group. Fernández is Head of Baker House on the MIT campus.

Thursday 28 March 2019
09:45

Prof. Dipl. Ing. Thomas Auer

Lost in Transformation?

Abstract:

In order to get to a carbon neutral building stock – which is e.g. required by the EU Carbon roadmap by 2050 – our efforts need to be smart and holistic on all scales of design. At the same time it is essential that a transformation process lead to healthy, comfortable and inspirational environments – indoors as well as outdoors. It is necessary to re-think the approach towards environmental quality. Over the past decades a steady state, homogeneous environment was considered comfortable. However, more and more one recognizes that this approach doesn't provide user satisfaction nor excitement. It is essential that scientist and designers better understand human well-being and design accordingly. This provides environments, which rely on human sensory perception and potentially highly energy efficient buildings.
A transformation requires mitigation and adaptation strategies, which can only be accomplished by transforming the design process: "Form Follows Process" (Chris Bangle, chief of design at BMW between 1992 and 2009). Integrated design strategies and a performance driven design process is the basis to find answers on the question how the challenges of our time will transform and change our built environment - a transformation, which needs to be radical in order to achieve a full de-carbonization of our building stock and to provide a highly comfortable environment.
However, to be convincing as a profession our work needs to be aspirational and inspirational. Academic and practice-based research must determine the level of aspiration, with exemplary lighthouse projects, which inspire the industry as well as the public.

Short Biography:

After studying process engineering in Stuttgart, Thomas Auer worked for Transsolar. With offices in Stuttgart, Munich, Paris and New York, the Transsolar office develops and simulates innovative energy and climate concepts for buildings and neighbourhoods with the goal of energy efficiency and high quality of stay. Thomas Auer taught at the Yale University in New Haven, CT (USA), the École Spéciale d'Architecture (ESA) in Paris (France), the University of Sassari in Sardinia (Italy) and the Ryerson University in Toronto (Canada). In 2014 Prof. Thomas Auer, Managing Director of Transsolar, was appointed chair of building technology and climate-friendly building at TUM. The focus of research and teaching is climate-friendly and energy-efficient construction. Here, Thomas Auer focuses on balancing energy efficiency, quality of stay and ecology, and this at the interlinking levels city / city district, building / building technology and form / materiality.

Thursday 28 March 2019

10:20 **Prof. Dr. Ing. Ulrich Knaack**
TU Delft - Professor of Design of Construction, Chairman of Department of Architectural Engineering + Technology
TU Darmstadt - Professor for Facade Structures

Facade Roadmap

Abstract:

Facades separate the interior and exterior - but they are also the instrument for conditioning the interior against the climate outside. The facade roadmap provides an overview of the development lines of various facade solutions and their triggers, technologies and potentials. The second part of the lecture deals with current research from the environment at the TU Delft and the TU Darmstadt as well as an overview of European activities in teaching and research.

Short Biography:

Ulrich Knaack focuses his chair on the fundamentals of construction, the use of construction materials and elements and the joints between elements and materials themselves. The chair analyses construction principles and their relationship to the production process and deals with special structures and specific components, such as façades. Important research topics are glass, façade structures, system construction and the structure and organization of the field. This involves research into the feasibility and implementation of new or innovative construction techniques and materials.

Among other things, Knaack is researching economic double-skin façades, façades in which building systems are integrated and façade systems which are suitable for a free-form, ICT-driven architecture. The chair is also characterized by a deep integration of research and education. This is achieved through the supervision of the Bachelor's and Master's students' final projects and by integrating teaching groups in different parts of the course. Students are given the opportunity to test their research results in models, so that they will become familiarized with the problems of construction on a large scale through practical application.

Thursday 28 March 2019

10:55 **Univ. Prof. DIpl. Ing. Dr. techn. Adeshir Mahdavi**
Technical University Vienna - Chair Institute of Architecture and Science,
Director Department of Building Physics and Building Ecology

Of sustainable architectures and other fairy-tales

Abstract:

This contribution critically examines frequently stated assertions in the professional community concerning the importance of buildings' designs in the global context of energy use and environmental impact. Toward this end, buildings' environmentally relevant implications are compared to those of other anthropogenic phenomena and activities. Thereby, the objective is not to question the significance of sustainability considerations as such. Rather, the treatment targets a more realistic assessment of the potential of sustainable building design strategies, suggesting that ultimately it would better serve the interests of both building design professionals and the community at large.

Short Biography:

Professor Ardeshir Mahdavi is the Director of the Department of Building Physics and Building Ecology as well as the Head of the Institute of Architectural Sciences at TU Wien, Austria. Professor Mahdavi has conducted internationally acclaimed research in the fields of Building Physics, Building Performance Simulation, Building Controls, Building Ecology, and Human Ecology. Professor Mahdavi has authored over 700 scientific publications and supervised 70 doctoral students. He is a fellow of IBPSA (International Building Performance Simulation Association) and the recipient of the IBPSA Distinguished Achievements Awards.

Thursday 28 March 2019

11:30 **Prof. Dr. Ferdinand Ludwig**
Technical University Munich - Professor for Green Technologies in Landscape Architecture

Regenerative Architecture:
Exploring the synergies between productive landscapes and plant based architecture

Abstract:

The lecture is divided into three parts: The first part uses historical examples to show how trees can be manipulated in their growth in such a way that they provide multiple benefits for humans and at the same time have a positive effect on their ecosystem. Examples are the living root bridges of the Khasi People in India, which simultaneously serve as living supporting structures of a transport infrastructure, are used to stabilize riverbanks and for the production of latex. Secondly, there are the techniques of coppicing and hedge laying that were widespread in large parts of Europe. Simple architectural tasks such as fencing are provided by living structures, which also serve the production of cattle feed and building materials. The second part shows how important framework conditions have changed over the past decades and why the approaches mentioned above have largely disappeared today. In particular, the standardisation and increase in efficiency associated with industrialisation through new materials and techniques, which stands in contrast to the labour-intensive and highly site-specific historical technology genes, should be mentioned here. In the third part, our current social and ecological requirements and current and future technological possibilities are outlined and the new potentials for a regenerative architecture and a synergetic architecture-environment-relationship based on the growth and adaptation processes of plants are shown.

Short Biography:

Professor Ludwig's research is focused on architectural concepts in which plants play a central role. Integrating plants – both functionally and creatively – into construction designs not only provides answers to some of today's most pressing ecological issues, such as the adaptation to climate change. It also presents a methodological challenge, encouraging exploration into ways of dealing with aspects of growth and decay, chance and probability in architecture and landscape design. Ferdinand Ludwig studied architecture and completed his doctorate studies at the University of Stuttgart with a dissertation entitled "The Botanical Fundamentals of Baubotanik and their Application in Design". In 2007, he founded the research group "Baubotanik" at the University of Stuttgart's Institute of Architectural Theory and Design (IGMA), and he headed this group as a research associate until 2017. Professor Ludwig applies the botanical-constructive approach to architecture, urban planning and landscape design in the office collaboration "ludwig.schönle: Baubotanik – Architecture – Urbanism", which he founded with Daniel Schönle in 2010.

Thursday 28 March 2019

13:00 **Keynote 2: Prof. Dr. Claudia Binder**
EPFL - Director of the Laboratory for Human-Environment Relations in Urban Systems (HERUS), Swiss Mobiliar Chair in Urban Ecology and Sustainable Living

Conceptualizing the role of human-environment relations in urban sustainability

Abstract:

Already, about 50% of the population lives in cities and this share is expected to keep increasing. Although cities only cover 3% of earth surface, they account for 75% of the CO_2 emissions, consume about 75% of the resources and produce 50% of the waste worldwide. However, cities also provide income (80% of GDP) and education, and are hotspots for innovation. This ambiguous role of cities poses large sustainability challenges and poses the following questions: What does sustainability mean in the context of living in a city? How can the relation between humans and the environment be shaped to contribute to urban sustainability?
To address these questions an interdisciplinary, integrative perspective is required. In this keynote lecture we look at the utility of (i) perspectives on social-ecological relations; and (ii) four metaphors of cities (machine, organism, network, and melting pot) to contribute to conceptualizing human-environment relations with regard to urban sustainability. The *machine* metaphor views cities as complicated systems, whose challenges can be solved through rational planning and engineering. The *organism* metaphor imagines cities as evolving living beings rooted in their surroundings. The *network* metaphor views cities as complex agglomerations of social, economic and infrastructural connections and flows, virtually indistinguishable from other networks operating across the globe. Finally, the metaphor of cities as *melting pots* refers to them as sites of intermingling and sometimes conflicting cultures and social groups. The different metaphors suggest divergent images of cities, thereby leading to different conceptual framings of the urban systems and the human-environmental relations therein. The power of the metaphors lies especially in their ability to create normative expectations about what is important in the urban system. Thus, they enable us to reflect on human- environment relations from different viewpoints and derive insights for more sustainable urban systems.

Short Biography:

Prof. Dr. Claudia R. Binder holds the chair Swiss Mobiliar Chair for Urban Ecology at ENAC, EPFL and is the head of the laboratory for Human-Environment Relations in Urban Systems at EPFL. She holds a PhD in environmental sciences and a venia legendi in Human-Environment Systems, both from ETHZ. From 2006-2009 she was assistant professor for Social and Industrial Ecology, University of Zurich; from 2009-2011 full professor for Systems Sciences, University of Graz, Austria; from 2011-2016 full professor for Human Environment Relations at the Department of Geography, University of Munich. Since 2016 she is full professor at EPFL. Furthermore, she is the academic director of the interdisciplinary teaching program “design together” and member of the directorate of the Energy Centre. Claudia Binder is a founding Member of the “European Group for the Study of Socio-Ecological and Socio-Technical Systems”. Since 2016 she is member of the research council of the Swiss National Science Foundation / Division IV. Her research interests lie in analysing, modelling and assessing transitions or urban systems towards sustainability. In doing so, she develops inter-and transdisciplinary methods which are able to depict the key aspects of the ecological and the social systems and moreover the relations, feedbacks, and regulatory mechanisms between them. Her application areas are in energy, phosphorous, and food in the context of urban and peri-urban areas in Europe and Latin America. She has published over 50 peer-reviewed publications in renowned journals such as *Ecology and Society*, *Ecological Economics*, *Environment Science and Technology* and *Industrial Ecology*. With her team she has organized and co-organized more than 18 conferences and guided over 20 stakeholder work-shops ranging from scenario development, eliciting and consolidating system knowledge, and result dissemination.

Thursday 28 March 2019

14:15 **Prof. Dr. Ing. Stephan Pauleit**
Technical University of Munich - Chair for Strategic Landscape Planning and Management

Green infrastructure and ecosystem services for climate resilient cities

Abstract:

The development of urban green infrastructure as multifunctional networks of green and blue areas is considered as a promising approach to urban climate change adaptation and for improving quality of life in densely built urban environments. However, mainstreaming of urban green infrastructure into urban planning and its implementation on the ground requires a sound evidence base on its capacity to provide regulating ecosystem services such as heat mitigation and stormwater retention. Moreover, such information needs to be translated into guidance for urban planning. Therefore, in three interrelated strands of research we have aimed to (i) consolidate the theoretical foundations and empirical knowledge base for urban green infrastructure as a strategic planning approach; (ii) assess the potential of urban green infrastructure as a tool for urban climate change adaptation via the provision of regulating ecosystem services such as mitigation of urban heat and stromwater runoff; (iii) develop a process-based understanding of the growth dynamics and ecosystem services of urban trees as a key element of urban green infrastructure under different environmental conditions and climate change.
Extensive studies on urban green infrastructure planning in Europe and Germany, microclimate and hydrological modelling of ecosystem services provided by different types and quantities of UGI in distinct urban settlement types, and measurements of urban tree growth and modelling in Bavarian urban areas were undertaken.
The presentation will provide an overview of key results and outcomes from these researches. Conclusions will be drawn for our further research and how this may link into a wider urban research agenda for sustainable and climate resilient urban development.

Short Biography:

Stephan Pauleit graduated as M.Sc. in Landscape Architecture and Landscape Planning at the Technical University of Munich (TUM) where he also obtained his PhD. He held positions as Research and Teaching Associate at TUM, as lecturer at Wye College Kent and the University of Manchester before he was appointed professor at the Royal Veterinary and Agricultural University, Denmark (University of Copenhagen). He is Chair for Strategic Landscape Planning and Management at the Technical University of Munich since 2009.
He is an expert in landscape planning and urban ecology with special interests in green infrastructure planning, strategies to climate change adaptation in the urban environment, and urban forestry. Stephan Pauleit has participated in several European Union funded research projects and he has worked in urban planning and urban greening projects in China and Africa. At present, he is director of the “Centre for Urban Ecology and Climate Change Adaptation” awarded by the Bavarian Ministry of the Environment and Consumer Protection.

Thursday 28 March 2019

14:50 **Dr. Katia Perini**
Adjunct Professor and postdoctoral researcher at the Architecture and Design Department, Polytechnic School of the University of Genoa

Greening Cities – Nature-based Design Strategies for the Urban Environment

Abstract:

Over 50% of the global population currently lives in urban areas. Cities are particularly exposed to climate change and environmental problems due to the impact of anthropic activities. Flooding, heat and drought, in particular, are hazards which are increasingly characterising the urban areas. Climate change and anthropogenic pressures have altered the functions of ecological systems and have consequently modified the flow of ecosystem services in terms of their scale, timing and location. In urban environments, additionally, the negative effects of climate change are amplified by settlement features (impervious surface, buildings, transport infrastructure, socio-economic activities).
Greening systems can improve environmental conditions in cities, and thus quality of life of citizens by providing multiple ecosystem services. Nature based strategies, such as urban forestry and greening systems for the building envelope, can be implemented to curb a wider urban heat island phenomenon having regional scale impact on energy demand, air quality and public health. Green infrastructure (GI) can contribute to curb the negative effects of climate-related hazards, including storm surges, extreme precipitation, and floods. Planning, developing, and maintaining GI can integrate urban development, nature conservation, and public health promotion.
The lecture presents case studies, including monitored pilot projects, of greening systems and green infrastructure. Research results show their multi-functionality and performances, in terms of microclimate regulation (outdoor comfort), air quality improvement, water management, providing at the same time cultural and social services for resilient cities.

Short Biography:

Katia Perini is adjunct professor and postdoctoral researcher at the Architecture and Design Department, Polytechnic School of the University of Genoa (Italy). Katia Perini graduates with honours at the Faculty of Architecture of Genoa in March 2008. During the last year of university studies and after graduation Katia collaborates with several architects such as the Company AIACE srl.
From 2009 to 2012 Katia she undertook her PhD in Architecture at the Università degli Studi di Genova, focusing on environmental sustainability and the integration of innovative systems and technologies in architecture. In 2012 Katia Perini defended with success in April 2012 her dissertation “The integration of vegetation in architecture. Innovative methods and tools” and is given the European Ph.D Label.
Results of the research activities have been published on Building and Environment and Energy and Buildings and on other journals, and presented at international conferences. Katia Perini published also monographs and edited books.
Katia spends some period abroad including a period at the Delft University of Technology (CITG, Department of Materials & Environment) as guest researcher. In 2013 Katia Perini was selected as a Fulbright grantee, under the Fulbright-Schuman Program, with a research project regarding the sustainability of urban areas with New York City as case study; the research was conducted at the Urban Design Lab of Columbia University (NY, USA). In 2016 Katia Perini spends a two months period at the Technische Universität München (TUM) Chair of Building Technology and Climate Responsive Design as visiting scholar thanks to a DAAD (German Academic Exchange Service) Personal award.
In 2017 Katia Perini obtains the National Academic Qualification as Associate Professor, released by the Ministry of Education, Universities and Research (Italy).

Thursday 28 March 2019

15:25 **Dr. Defne Sunguroğlu Hensel**
TUM / TU Wien

Embedded Architectures and Ecological Prototypes

Abstract:

Urbanization is a major driver of environmental change. For architecture, the consequent land-use and resource-induced conflicts as well as degradation is one of its greatest challenges, which in parts is self-generated. Nature-based architecture by adaptation and integration has the potential to provide a path to success through solutions that enable the protection, restoration and enhancement of ecosystems and sustainable use of natural resources. This necessitates a materials-focus on the capacity of architecture to adapt to its environment, while at the same time adapting its environment to changing and multiple requirements and targets, thus bringing an ecological-focus. This lecture will examine some of the key references that provide useful information for design, including studies based on historical structures developed for horticulture and as an integral part of traditional agricultural systems. Together with a number of select research projects, they will demonstrate a way forward towards embedded architectures that are locally-specific and ecological prototypes for architecture.

Short Biography:

Defne Sunguroğlu Hensel [AA Dip RIBA II MSc AA EmTech PhD] is an architect. She directs OCEAN Architecture I Environment together with her partner Prof. Dr. Michael U. Hensel. The practice pursues multi-scalar and interdisciplinary work at the intersection of architecture, city and landscape. Dr. Sunguroğlu Hensel is member of the International Association for Shell and Spatial Structures and pursues research in architectures as ecological prototypes. This entails constructions that modulate the local microclimate to enable and support the growth of specific plant species and can also support ecosystems. In her research specific focus is placed on masonry structures.

In 2000, she received her bachelor degree in interior architecture from the Kent Institute of Art & Design [KIAD], Rochester, UK. In 2002, she received her bachelor degree in architecture and RIBA Part I from the Canterbury School of Architecture [UCA] in the UK. In 2006, she received the AA diploma and RIBA Part II from the Architectural Association [AA] in London. In the same year, she received a Buro Happold Scholarship for the MSc Program in the Emergent Technologies and Design Program of the AA, which she successfully completed in 2007. In 2017, she received her doctorate from the Oslo School of Architecture and Design. In 2018, she held the Postdoctoral Research Fellowship of the Faculty of Architecture at the Technical University of Munich.

In 2006, she received the Holloway Thrust Award for a significant contribution to the construction industry. In 2007, she received a stipend by Brick Development Association [BDA] and the Anthony Pott Memorial Award for detailed analysis and research of Eladio Dieste's work, as well as the PMI award in the industrial category oft he British Pottery Mechanics Institute of CERAM. In 2008, an AHO doctoral stipend for research-by-design. In 2013, she received the Tsuboi Award [Category A] of the International Association for Shell and Spatial Structures [IASS]. In 2016, she received the TUM Postdoc Mobility Travel Grant and in 2018 the TUM Post-Doctoral fellowship.

Thursday 28 March 2019

16:15 **Keynote 3: Hon. Prof. Dr. Julian Vincent** Heriot Watt University

Architecture by Numbers

Abstract:

The 'numbers' are twofold - agents and algorithms. The plan, hatched some 5 or 6 years ago, is to mine biological literature for the development of an ontology. The ontology thus contains, in a series of logical statements and proposals (axioms) a coded implementation of biology that can be used as a resource by agents (i.e. robots or machines). When the agents have a problem or want information, they can interrogate the ontology and get an answer. Since each agent will have its own 'idea' of what it should be doing, the agents have to come to an agreement about the next activity to continue with their job - in this case the production of a building. Sound familiar?
It's based on the observations of Scott Turner (biologist) and Rupert Soar (engineer), who studied termite nests for over 10 years, measuring, counting and experimenting to understand how such small insects (most termites are only a few millimetres long) could make such a large integrated structure when there was no possibility that they could realise or conceptualise what they were doing. It's also based on the production of an ontology, driven by the many futile attempts to generate an objective system for interpreting biological phenomena so that engineers and designers could access that knowledge without needing to search for it in unfamiliar territory.
In practical terms the biology is abstracted in terms of trade-offs and their solutions by organisms, which is the way evolution works. This both gives biology a more objective structure and presents it in a way that engineers can understand. In the process it compresses biological complexity since there are many fewer trade-offs than species of organism, and they work in similar ways that can be translated into techno-speak using a limited range of design changes.

Short Biography:

In 2008 Julian Vincent retired from the Chair of Biomimetics in the Department of Mechanical Engineering, University of Bath. His MA (zoology) was from the University of Cambridge; his PhD (insect hormones) and DSc (insect cuticle) were from the University of Sheffield. He spent most of his research career in the Zoology Department at the University of Reading, studying the mechanical design of organisms and working out ways in which aspects of the design can be used in technology. During this time, he ran the Centre for Biomimetics, which he had started with Professor George Jeronimidis from the Department of Engineering in Reading. His remit in the University of Bath was to introduce concepts from biology into engineering and design, thus making the adaptive design of organisms available to advanced engineering design and control.

His interests cover aspects of mechanical design of plants and animals, complex fracture mechanics, texture of food, design of composite materials, use of natural materials in technology, advanced textiles, deployable structures in architecture and robotics, smart systems and structures. He is a professional Member of the Institute of Materials, a Chartered Engineer and a Fellow of the Institute of Mechanical Engineers. He is the Founding President of the International Society of Bionic Engineering.

He is currently developing an ontology loosely based on the Russian system for inventive problem solving (TRIZ). Ultimately this will interface with autonomous agents in a design environment, solving problems using biomimetics where appropriate.

Friday 29 March 2019

08:30 **Keynote 4: Billie Faircloth** Kieran Timberlake

A Method Amongst Many Methods

Abstract:

We can better understand the behavior of our materials, buildings, and landscapes when we take up the agency to characterize—to purposefully organize the necessary steps to describe what a thing is and how it behaves. The process of *characterization* has the very real chance of manifesting as a bold design philosophy and a foundation for interdisciplinary design practice and culture. Billie Faircloth will unpack these statements by examining the daily actions and diverse field experiments of her firm KieranTimberlake, a transdisciplinary practice over 30 years in the making that is committed to empowering its designers and clients through a process of design inquiry.

Short Biography:

Billie Faircloth is a practicing architect, educator, and Partner at KieranTimberlake, where she leads transdisciplinary research, design, and problem-solving processes across fields including environmental management, urban ecology, chemical physics, materials science, and architecture. She fosters collaboration between trades, academies, and industries in order to define a relevant problem-solving boundary for the built environment. Billie has published and lectured internationally on themes including research methods for a trans-disciplinary and trans-scalar design practices; the production of new knowledge on materials, climate, and thermodynamic phenomena through the design of novel methods, tools and workflows; and the history of plastics in architecture to demonstrate how architecture's 'posture' towards trans-disciplinary practices and new knowledge has changed over time.

Friday 29 March 2019

09:45 **Dipl. Ing. Dr. techn. Markus Hollaus** TU WIEN

Multi-scale and multi-sensor remote sensing data for landscape mapping

Abstract:

With the start of the Copernicus program, several satellite data (i.e. Sentinel-1, Sentinel-2) are freely available. These data sets have a high spatial resolution (~10 m) and a high temporal resolution (3-10 days). Additionally, to these satellite data, high quality EO data sets (i.e. aerial images, airborne laser scanning data) are available for Austria. For most of these data sets a regular acquisition interval is available (e.g. for aerial images every 3 years). Using novel algorithms that combines the advantages of the individual data sets different products for characterizing the Earth surface can be derived. In this contribution examples for (a) deriving high resolution topographic information from airborne laser-scanning data and aerial images (i.e. digital terrain and surface models, vegetation models, building models) and (b) for mapping and characterizing Natura 2000 areas based on satellite time series and 3D data from airborne laser scanning will be presented. The examples are part of research projects carried out at the department of Geodesy and Geoinformation at TU Wien.

Short Biography:

Markus Hollaus holds an MSc (2000) from the BOKU, Vienna and a phD degree (2006) from the TU Wien. From 2001 to 2003 he was a research scientist at the BOKU. He was involved into several remote sensing and GIS projects with the focus on land use/cover change. From 2004 to 2008 he was research scientist at the IPF at the TU. From 2009 to 2013 he was university assistant and since 2014 he is a senior scientist at the research group Photogrammetry, GEO, TU Wien. He is involved in several national and international research projects (e.g. NEWFOR for Alpine forestry monitoring; KYOTO for forest and biomass change; LISA for land cover change; Zuwachsschätzung Kanton Bern for biomass change, Adanced_SAR, 4D-ForMat, WebSnow, PleiAlps, HORA) focused on environmental studies using passive and active remote sensing data. Especially the derivation of forest parameters from ALS data and aerial photographs as well as the 3D reconstruction of forests were the main research areas in the last years. Hollaus is author or co-author of 53 papers in scientific journals, 10 book chapters, 91 full contributions in proceedings and numerous research reports. An overview of the publications can also be found in https://scholar.google.at/citations?user=WDIuIHcAAAAJ&hl=de.

Friday 29 March 2019

10:20 Prof. Grazia Tucci UNIFI

The role of geoinformation for the cultural heritage: from landscape to artworks

Abstract:

The term cultural heritage was restricted in the past to a few masterpieces, over time it has been gradually extended to include more and more broad witnesses of the human civilization. It is therefore natural to include among them the most significant aspects of man's interaction with the natural environment. A new recognition of the cultural value of the anthropic transformation of the agricultural landscape, came from the inclusion of many terraced landscapes of the world among UNESCO World Heritage Sites list, as well as in the newly established FAO Globally Important Agricultural Heritage Systems, including cases of Italian dry-stone wall terracing.

A common element in the identification of an asset as Cultural Heritage is the recognition of its fragility and therefore the awareness of the need to enable its transmission to posterity.
At the same time, the evolution in the philosophy of conservation is emphasizing prevention over intervention practices. In this field, geomatics, the science of computer-based spatial data management, gives an essential contribution to knowledge, seen as a prerequisite to any decision-making. Geomatics has many techniques to document the cultural heritage, with particular reference to the possibility of recording high-resolution data and integrating multi-sensor information.
Collected data can be used for providing discrete and continuous models, with different balances between accuracy and descriptive efficacy. The above mentioned issues will be illustrated with some case studies identifying some current research topics.

Short Biography:

Grazia Tucci is Associated Professor of Topography and Cartography at the Department of Civil and Environmental Engineering of the University of Florence. From 2008 she is the Director of the GeCo (Geomatics for the Environment and the Conservation of cultural heritage) Laboratory, which hosts research associates, research fellows, PhD students, visiting researchers, as well as Italian and foreign interns and trainees. The specific aim of her field of action has always been the need to stress the importance of “measurement” and its “quality”, both to describe the general conditions and to examine the risk factors to which our Cultural Heritage is exposed. She also is the Scientific Manager for the joined Laboratory SCHEMA (Survey, Cultural Heritage, Engineering, Monitoring and Analysis) for the knowledge of the Environment and the management of the risk. She is Scientific Manager of national and international research projects and she coordinates survey campaigns in Italy and abroad. She is author of more than 170 academic publications.

Friday 29 March 2019

11:15 **Daniele Santucci**
Technical University of Munich - Member of the Architecture Research Incubator

Climate*walks* and *flows*

Abstract:

Microclimate has among further key factors a fundamental influence on how people occupy and use public spaces in dense urban environments. Comfort evaluation of outdoor spaces is essential since they accommodate daily pedestrian traffic and various outdoor activities, also they contribute largely to urban liveability and vitality. Studies on microclimate of cities have already proved that pedestrian thermal comfort is function of built environment and it is fundamental to understand these phenomena both with numerical techniques and field measurements to achieve comfortable, healthier and more liveable urban spaces. There has been wide variety of methods to approach the question how people react or behave in transient outdoor condition since most of the thermal comfort studies perceive pedestrian thermal comfort as a “static” phenomenon. The geo-referenced technique for outdoor comfort mapping is an innovative approach to monitor environmental parameters as well as human respond to varying outdoor conditions. I present methods, tools, and applications to enhance urban resilience at a micro scale looking for correlations between environmental factors and human behaviour in terms of outdoor comfort.

Short Biography:

Daniele Santucci is a practicing architect, building scientist, and educator. His research expertise is in environmental engineering and sustainable design focusing on energy modelling, passive climate control strategies and performance driven design workflows in both urban and architectural scale. The focus of his past professional and research activity has been on sustainable buildings. In his teaching activity at TUM, which he started in 2012, he has given lectures and courses both in the Bachelor, Master and in the postgraduate Mastercourse ClimaDesign. His principal research line is focusing on urban microclimate and outdoor comfort in urban space. Daniele is member of the Architecture Research Incubator of the Faculty of Architecture of TUM and is Doctoral Candidate at the TUM Graduate School. Daniele has been appointed visiting research fellow at the Senseable City Lab at MIT. Besides his academic activity, he consults architecture firms on environmental aspects ranging from operational energy performance to indoor and outdoor comfort levels.

11:50 **Prof. Dr. Ing. Henriette Bier**
Associate Professor Robotic Building, Architectural Engineering, Faculty of Architecture and the Built Environment, TU Delft
Visiting Professor Robotics in Architecture, Dessau Institute of Architecture, Anhalt University of Applied Science

Adaptive Environments based on Design-to-Robotic- Operation Principles

Abstract:

The development of robotic and computational mechanisms aimed at augmenting architectural environments has been the focus of academic education and research implemented at the Faculty of Architecture and the Built Environment, Delft University of Technology (TUD) for more than a decade. Current developments involve responsive physically reconfigurable environments and distributed climate control systems embedded into adaptive environments based on Design-to-Robotic-Production and –Operation (D2RP&O) principles. By connecting robotic production and operation with computational design, D2RP&O contribute to improving both manufacturing processes and performance of buildings. While, D2RO relies on sensor-actuator networks that are establishing cyber-physical mechanisms aimed at introducing responsiveness in the built environment, D2RP facilitates designing and building such environments. Together D2RP&O establish unprecedented feedback loop based on human-nonhuman interactions, which have properties that are not reducible to neither human nor nonhuman aspects; instead, they result from the relationships and dependencies they form.

In this context, Adaptive Environments are presented and discussed with focus on D2RO as means to imbue architectural environments with capabilities to identify and respond to requirements for physical and environmental adaptation. This is achieved through the use of architecture-embedded and/or wearable sensors and actuators. These sensors collect data from the environment and users, which is then processed in computational nodes that activate/deactivate the distributed responsive devices. They instantiate behaviours that are increasingly imbued with computational intelligence allowing the system to not only respond but anticipate, learn, and actively propose environmental adaptation by monitoring physical, climatic, and physiological changes.

Short Biography:

After graduating in architecture (1998) from the University of Karlsruhe in Germany, Henriette Bier has worked with Morphosis (1999-2001) on internationally relevant projects in the US and Europe. She has taught computational design (2002-2003) at various universities in EU and since 2004 she mainly teaches and researches at Technical University Delft (TUD) with focus on robotics in architecture. She initiated and coordinated (2005-06) the workshop and lecture series on Digital Design and Fabrication with invited guests from MIT and ETHZ and finalized (2008) her PhD on System-embedded Intelligence in Architecture. She coordinated EU funded projects (2007-10) and led 4TU funded projects Scalable Porosity (2015-16) and Adaptive Stiffness (2017-18). 2017, she has been appointed professor at Dessau Institute of Architecture. Results of her research are internationally published in books, journals and conference proceedings. She is editor-in-chief of the Springer Series Adaptive Environments and editor of Archidoct and Spool [CpA] journals.