From the editor ...

Welcome to the Newsletter for the third quarter 2019, which introduces two editions, the first 62.4 Dynamics in Architectural Science and the second 62.5 Special Edition Means, Methods, Machines and Making in Architecture.

The guest editors Mike Christenson, University of Minnesota, Dr. David Jason Gerber, USC, Dr. Wassim Jabi, Cardiff University, Mara Marcu, University of Cincinnati and Andrew John Wit, Temple University. This team has brought to ASR new cutting edge research in the field of design computing, the contribution is welcome.

The former edition has a number of papers, which have explored the dynamics of architectural science. The two papers of interest that contribute to this topic illustrate the importance of this issue. First up is A learning Automated 3D Architecture Synthesis Model: demonstrating a Computer Governed Design of minimal apartment units based on human perceptual and physical needs, author Dafna Fisher-Gewirtzman and developed with Research Assistant Architect Nir Polak.

The next Physical and Perceptual Gap in Indoor Environmental Quality: A Mixed Method Study of Space and Users at an Aged Care Facility in Victoria contact author Masa Noguchi. Not represented here but worth noting is the paper Responsive Kinetic Façade, the Elderly, Customized Services, Daylighting with contact author Hyunsoo Lee. Interest is growing in the use of dynamic facades and this paper examines how this technology can be harnessed to improve the quality of lighting for elderly people.

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Computer Governed Design

Paper title: A learning Automated 3D Architecture Synthesis Model: demonstrating a Computer Governed Design of minimal apartment units based on human perceptual and physical needs

Author: Dafna Fisher-Gewirtzman and developed with Research Assistant Architect Nir Polak

This paper presents a learning model for the automated generation of built environments, demonstrated by the creation of minimal apartments situated in dense urban settings. The research utilizes the techniques of parametric modelling, multi-criteria optimization and supervised machine learning to provide 3D configurations of minimal apartments with improved visibility from significant viewpoints, and with a functional layout defined by ‘the wisdom of the crowd’. The model seeks to maximize the measured 3D visibility in generated units – an attribute associated with low perceived density, recognized as having a positive effect on the well-being of dwellers. Simultaneously, the model engages a learning process, through which the classification of the suitability of each apartment is refined through ‘the wisdom of the crowd’, collected through an open web-simulation. This automated design model, regarding both perceptual and physical needs, demonstrates its potential for future use in the development of larger-scale densified urban environments.

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*ASR and Journal Metrics

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Taylor & Francis ASR website (http://www.tandfonline.com/tasr) also gives the number of reads and citations for each paper, as well as information on ‘most read’ and ‘most cited papers’.

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Computer Governed Design

Biography of the principal author

Dafna Fisher-Gewirtzman is an Assistant Professor (PhD) at the Faculty of Architecture and Town Planning at the Technion-Israel Institute of Technology, and a visiting scholar at CUSP-NYU. She serves as Vice Dean for students and the Academic Director of the VisLab, the visualization laboratory at the Faculty of Architecture. She will be the Chair of the Architecture program, starting October 2019.

Dafna’s academic life is driven by her belief in a sustainable, vibrant and healthy environment, and therefore strives to combine the areas of academic activities in order to generate synergy among them while engaging in significant doing that will ultimately heighten quality of life. She achieved international recognition for her research in visual analysis and simulation of urban and architectural space related to human perception and behaviour. These studies centered on sustainable built environments in dense cities, and the development of novel, automated architecture design tools based on potential residents’ perception of space. She is currently expanding these studies, integrating body and brain measurements to extend the understanding of how architecture impacts human emotions and well-being.

Top: 3D Line Of Sight (LOS) Visibility analysis for variant computer-generated minimal apartment units. Above: Comparative 3D Visibility Analysis for minimal apartments (EPB, 2016)

Her quantitative models can describe, analyse, evaluate and simulate a person’s perceptions within various elements of the built environment, ranging from a basic dwelling unit and its specific layout to the urban scale as a pedestrian experience while in motion. The theoretical foundation of these models is the link between the geometry of the built space, on the one hand, and human perception and behaviour on the other. Discovering scientific ratiifications for design, can then serve as guidelines to improve existing urban settings and the foundations for generative design models. Such studies can have a vast impact on planning and design processes and, consequently, on the urban quality of life.

Her work has been published in many leading refereed professional journals, among them: Architectural Science Review (ASR), Computer Environment and Urban Systems (CEUS), Journal of Urban Design (JUD), Environment and Planning B (EPB), Urban Design International (UDI) and the Journal of Architectural and Planning Research (JAPR). Refereed book chapters appear in books of the Springer International Publishing Switzerland 2014/2017. Her research has been presented in many international conferences and several invited or plenary talks at international Universities, among them ETH, UCL, NYU, NUS. This rich and challenging area of her research has been supported financially since 2011 by the Israel Science Foundation (ISF) and Joy Ventures (since 2017).

She is a UNESCO fellowship recipient and a laureate of the prestigious Yanai Prize for Excellence in Academic Education. Her PhD and MSc students are an integral part of the research group and publications. Some of them have an architecture background, but some are from interdisciplinary fields like industrial design, geoinformatics, and the humanities. Her goal is to promote outstanding students, encouraging them to become leading academics.

Since the establishment of the Visualization Laboratory at the Faculty, she has made 3D immersion (in Virtual Reality) an integral part of the design studio. This unique experience influences both the design processes and the quality of the students’ projects and provides an opportunity to investigate the impact of the lab as a working environment. The design studio was the research environment and the students the “participants” in this experiment. In the future she plans to broaden this study to determine how to integrate this working environment more precisely into the design process.

Main Research Interests:


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From the Editor

We have also put some thoughts together on ‘What makes a good ASR paper?’ Hopefully this provokes some more thinking to encourage cutting edge research in the ASR field. I would like to thank Dr Peter Smith for putting this together.

The book review again is of interest and relevance to the unfolding Climate Emergency. Thank you again to Diego Arroyo for organizing this. I am reminded of how fortunate we are to have editors from Argentina, welcome and thanks to Professor Romy Hecht, Pontificia Universidad Católica de Chile for the insight and demonstrating the interdisciplinary nature of the path to addressing this emergency.

Details of the book is as follows. ‘Overgrown practices between landscape architecture and gardening,’ by Julian Raxworthy and is reviewed by Professor Romy Hecht.

Finally, we publish abstracts of two HDR students who have completed their thesis and their degrees recently. Congratulations.
In Australia, the proportion of people aged 65 years and above are on the hike increasing from 15% in 2015 to 26% in 2051. This trend of the growing ageing population in Victoria and beyond is leading to increasing opportunities for the construction of new aged care facilities. It is important to understand the indoor environmental quality (IEQ) of these settings in consideration of not only measurable IEQ data but also senior occupants’ perceived comfort for their health and wellbeing. This study was carried out with the aim to analyse the senior users’ physical and perceptual gap by making use of IEQ data collected by means of IEQ monitoring and personal interviews accompanied by questionnaire distributions. The IEQ monitoring devices were deployed for continuous and instantaneous data collection to grasp the on-site physical conditions while the questionnaires and personal interviews were also conducted across three user groups (residents, staff and visitors) to establish an understanding of the users’ perceptions.

Biography of the principal author

Dr Masa Noguchi is an Associate Professor in Environmental Design at the Faculty of Architecture, Building and Planning, The University of Melbourne, specialising in ‘Environmental Experience Design (EXD)’ research that embraces value analysis and mass customisation techniques applicable to architectural design thinking process. In parallel to EXD studies, he also initiated global movement on zero energy mass custom home (ZEMCH) and vertical village/subdivision plug-in housing system research and development for future-proof city evolution. Dr Noguchi is a Chartered Engineer, Environmentalist, and Technological Product Designer registered respectively with the Engineering Council, Society for the Environment, and the Institution of Engineering Designers in the UK. In 2002, he also became a member of the Royal Architectural Institute of Canada and today, he serves as a Certified Passive House Designer registered with the Passive House Institute in Germany. Dr Noguchi is the founding coordinator of ZEMCH Network which consists of over 750 partners from nearly 45 countries and developed a series of industry-academia knowledge transfer events. ZEMCH international conferences (from 2012), ZEMCH sustainable design workshops (from 2014) and ZEMCH technical missions (from 2006) are amongst the projects being carried out by ZEMCH Network today in partnership with the regional experts groups based currently in Australia, Brazil, Italy, Korea, UAE and UK. At the Melbourne School of Design, he leads ZEMCH design units within the graduate program. Before coming to Melbourne, he was a Reader at the Mackintosh School of Architecture, The Glasgow School of Art affiliated with the University of Glasgow, where he established a ZEMCH research pathway within the Master of Architectural Studies program. His research is based on ZEMCH engineering design and socially, economically, environmentally and humanly sustainable housing community developments in global contexts. Inventing a ‘mass custom design’ system approach to quality affordable housing, he developed a digitalised interactive design communication tool, which was demonstrated in the US Department of Energy Solar Decathlon’s Canadian house 2005. In 2006, he designed Canada’s first net zero energy home - Alouette Homes’ EcoTerra house - built and commercialised through the federal government’s EQuilibrium sustainable housing initiative/competition in 2007. Later, he also contributed to Scottish and Brazilian ZEMCH construction projects. Dr Noguchi is frequently invited to deliver keynote lectures on ZEMCH R&D actions at national and international conferences stressing the need of EXD research and practice in the built environment for the occupants’ physical and mental health and wellbeing.
By changing the light distribution it is possible to double the apparent amount of light in a space without any increase in its overall luminance. If one simply assumes that the apparent amount of light in a space — its spatial brightness — is described by its mean luminance (or similar measures of the overall light level) then substantial errors may be made.

We carried out two experiments, measuring the brightness of 19 different model spaces. Our results demonstrate that making light distributions more non-uniform can make spaces appear both significantly brighter and significantly darker, depending on how the light distribution is changed. This challenges the majority of existing studies in the field that argue that non-uniformity of the luminance distribution simply makes spaces look darker. Indeed, the observed pattern in brightness between our conditions cannot be consistently explained by a simple measure of the uniformity of the luminance distribution. We can reject all existing models of light distribution and spatial brightness that have been proposed in the literature.

The best explanation of our results, and of the apparent disagreements in the literature over the effects of non-uniformity, appears to be that spatial brightness is affected by the qualitative appearance of the luminances in the space. Light sources and non-luminous surfaces have different effects. We propose a ‘duel’-process model of spatial brightness in which it is the sum of two opposed processes: the effects of the surfaces, and the effects of the light source(s). Non-uniform patterns of surface reflectance and illumination tend to make a space appear brighter. Non-uniformity as a result of a large difference between luminance of the light source(s) and the surfaces makes a space appear darker. If the light source is hidden from direct view it removes its darkening effect and so can make a space appear significantly brighter. Depending on the relative strength of these two processes, a non-uniform luminance distribution may thus appear either brighter or darker than a more uniform distribution.

Supervisor’s names: Michael Donn and Kit Cuttle
Design inspired by nature has been known as biomimicry or biomimetic design that is believed to transform human technologies into a sustainable status through translation of biological models, systems, and processes. Considering energy efficiency as one of the aspects of sustainability in the concept of bio-inspired building design, the problem was how to access the solutions best matched to the design problem. Various tools for finding existing knowledge from a different domain are described but as yet there appears to be no tool for allowing building designers to access the efficient ways found in nature of producing energy, using energy, and recycling resources.

What the research investigated was to find if it is possible to develop a generalised thermo-bio-architectural (ThBA) framework by use of which architects would be able to improve the energy performance of buildings in a wide range of climates, by following a systematic process that methodically connects design thermal challenges to thermal adaptation principles used in nature.

The ThBA was developed by studying biology to find how thermal regulation strategies used by living organisms can be classified and generalised. The proposed ThBA was confirmed and evaluated before it was used for the rest of the research. The biological part of the ThBA was assessed by biological experts within a focus group session. Having the ThBA confirmed, the research also investigated how the heat transfer principles in buildings can be articulated to be linked to the generalised thermal adaptation strategies in nature. For this, a series of case studies were selected and for each an energy simulation was run to analyse its thermal performance and identify its thermal challenges.

Then, the ThBA was used to introduce innovative solutions for improving the thermal performance of the case studies with big energy use to reveal unexpected techniques or technologies. This, however, necessitated its reconfiguration so as to be useful for architects.

Testing the ThBA for two extreme climates in New Zealand, highlighted the fact that the simple translation of the majority of biological thermal adaptation principles are being used by architects, although for some, the architectural equivalents did not function in exactly the same way as biological thermoregulation strategies. The differences were seen either in the central thermoregulatory principles or the broader properties within which the key principles fitted. However, despite the simple translation of the majority of these solutions being used in architectural design, the sophistication and internal hierarchical connections of almost all physiological strategies remained unexplored. The main barrier to their exploration is that the technology falls short when compared to the hierarchically organised, dynamic, and multiscale operational characteristics of living things (cells, tissue, organs). Naming these ‘obstacles’ could also outline the areas of future exploration. The ThBA, however, suggested a few strategies that might address opportunities for designing a new generation of buildings in the future. This implies that the ThBA is more useful for researchers than architects.
What makes a Good ASR Paper?

Preparing Your Paper

Structure: Your paper should be compiled in the following order: title page; abstract; keywords; main text introduction, materials and methods, results, discussion; acknowledgments; declaration of interest statement; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list).

The paper should be written in clear English, in the third person, and mostly the reporting should be in the past tense. Avoid colloquial or conversational language, and also avoid jargon except where subject-specific terms are necessary for precise communication. Please create a compelling argument about your research.

The journal has an international focus. Although the research may be based on conditions or case studies in a particular region, it is important to show how the work is relevant more broadly. It is important to have a conversation with the research community.

Avoid descriptive narratives, which are mainly qualitative, and describe of the existing research.

If experiments or simulations are carried out to compare a range of solutions, it is more helpful if the differences can be described parametrically as well as in the specific situations studied. This usually makes the work more widely applicable.

The Literature Review is important and crucial to the argument. It should not only list relevant published material on the topic, but also critically discuss the literature in order to set the current state of knowledge, recognise differences of opinion, and establish why there is a need for the research being reported in the paper to fill in gaps or extend the state of knowledge.

The paper should then explain simply what the objective is; align the methods and procedures proposed with the objective; more details of the actual study or research; the results; and a discussion or explanation of what the results reveal that is relevant to the original objective. Emphasise in the argument the innovation in the research… objective… literature… methodology… results .

Happy ASRing… and walk tall

Conference Index

ANZAScA Conference:
Revisiting the Role of Architecture for ‘Surviving’ Development
28th - 30th November 2019
Indian Institute of Technology,
Roorkee, India
www.asa2019.com

Windsor 2020:
Resilient Comfort in a Heating World
16th – 19th April 2020
Windsor Great Park, UK
https://windsorconference.com/

Plea 2020
September 2020
A Coruña, Spain

CSTR Berlin - International Conference on Science and Technology Research,
14-15 May 2020
Berlin, Germany

The Creativity Workshop in Barcelona -
18 - 22 July, 2020 Barcelona, Spain
I am writing this review while the Amazon rainforest is burning. And for the city where I live, Santiago, this August is somehow equally unpromising: for the first time in 79 years, Chile’s capital city has not received a drop of rain, even though we are in the middle of winter, our traditional rainy season. It is a hard task then to think in forests, parks and coppices, or similar large areas covered with plants, which is what landscape architect Julian Raxworthy’s title seems to announce.

But Overgrown is more than that, it is a tale challenging landscape architects to embrace the potential that lies behind the knowledge embedded in gardening practices: the lifecycle of plants. By going back to their roots, landscape architects do not need to discard forms and forfeit designs to the network of greenery, or soften landscape structures with nature. On the contrary, the call here is to explicitly incorporate plants growth and their bona fide aliveness in the design of landscapes. The author even offers a new term for this way of approaching practice, “the viridic,” derived from the Latin word for green, viridis, and coined to emulate the art of construction in architecture, the tectonic. Thus, more than an act of will to shape an imagined future condition, landscape architecture is exposed here as the art of creatively managing plant growth to bring the material into presence. Raxworthy warns us, however, that this is not an easy change; fixing planting knowledge in landscape practices requires a transition from the creation of representations simulating abstract ideas of the dynamic performance of plants to ‘the real deal’: plowing, sowing, nurturing, pruning and caring, all necessary operations to sustain growth.

Raxworthy breeds the interconnectedness between design foresight and gardening techniques along six chapters, organized in two parts, progressing from “formal” to “informal” cases, and ranging from a sixteenth-century French Renaissance water garden to a Scottish poet and scientist’s “marginal” garden. Accordingly, in the first half he uses “landscape-architectural approaches” and in the second, “gardening-led approaches.” To expose how these gardens exhibit a designed synchronization of the rhythms of plant life, the book does not rely on conventional case-study analyses or evidence, but on reports of the works developed in the gardens, interviews with managers and staff in charge of those tasks, some of the owners’ memoirs and the author’s own observations in situ.

The most important conclusion offered here is that as stewardships of living matter, landscape architects should not diminish their role as gardeners, a humility lesson for a profession that still fights for visibility. Otherwise, how do we confront landscape making, a practice that for centuries has satisfied our collective desire to domesticate plants? How do landscape makers overcome their sometimes reductive appreciation of plants and their forms as merely useful resources and/or aesthetic pieces? Offering the viridic as an answer, Raxworthy helps us to face the uncertainty of the Anthropocene: if landscape architects intermingle, merge and coordinate plant growing with human affairs, then they not only will make relevant the essence of planting, they will also unveil that gardening still is the underlying force that enables and safeguards the existence of landscape.

Romy Hecht is Professor of History and Theory of Landscape Architecture at the School of Architecture, Pontificia Universidad Católica de Chile. Her research focuses and inquiries into the nature of Chilean landscapes, examining them as entities in which human expectations, design propositions and socio-cultural processes intersect, giving form to an arboreal culture that has transformed Chilean cities as a result.