Welcome to the first Newsletter of 2019. We have started this year with a Special Edition ‘Urban Heat Island (UHI) and its Mitigation through Urban Planning, Design’ and Landscaping by Steve Kardinal Jusuf, Marcel Ignatius, Wong Nyuk Hien & Hasheem Akbari. The inception of the Special Edition started in back in 2016, the Fourth International Conference on Countermeasures to Urban Heat Island (ICUHI), held in the National University of Singapore on 30-31 May and 1 June 2016. It was growing attention of UHI and its impact on urban dwellers that inspired this conference and subsequent debate on the need for mitigation strategies, which came through the various fields of urban planning, design, and landscaping. The Edition set about providing research to support the work on mitigation of UHI.

This theme was of interest to a large number of researchers and some additional papers found their way into the second edition this year entitled, ‘Envisioning the architectural science research agenda’. From these editions three papers are worth noting for contribution to the research agenda for architectural science.

   This paper focuses on the design of buildings in subtropical high-density cities, examining the influence of environmental conditions on thermal sensation.

   This paper revisits the concept of radiant cooling, exploring new methods for condensation-free heat rejection.

   This paper explores the various aspects of urban planning, design, and landscaping in the context of mitigating UHI.

These projects mainly focused on urban heat island (UHI) mitigation, urban climatic mapping, microclimate simulation, thermal comfort, and remote sensing. Under supervision of Prof. Wong Nyuk Hien, he has worked also in several research projects with Singapore government agencies. His main research works deal with urban micro-climatic study and its relation with energy performance in urban areas. Under supervision of Prof. Wong Nyuk Hien, he has worked also in several research projects with Singapore government agencies. These projects mainly focused on urban heat island (UHI) mitigation, urban climatic mapping, microclimate simulation, thermal comfort, and remote sensing.

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WONG Nyuk Hien is currently the Vice Dean for research and Professor at the School of Design and Environment, National University of Singapore, is one of the most prominent and leading academics within the urban and built environment industry. His key area of expertise include urban heat island, urban greenerny and thermal comfort in the tropics. He has been extensively involved in a number of research projects related to Urban Heat Island, urban climatic mapping and greenery as the lead and principal investigator with the various government agencies such as Urban Redevelopment Authority (URA), National Parks Board (NParks), Housing Development Board (HDB), National Environmental Agency (NEA) and Building Construction Authority (BCA). With his vast experience, he has also been constantly invited to serve in various advisory committees both locally and globally. He is currently the chair of the Singapore Building and Construction Authority (BCA)'s Green Mark Sub-committee on ventilation simulation and has been the President of the International Building Performance Association (Singapore Chapter). Prof Wong has written 15 books/book chapters and published more than 500 international referred journal and conference papers in these related fields.

Hasem AKBARI is a Professor at Concordia University (Montreal, Canada). Prior to joining the Concordia University, he was the leader of the Heat Island Group, Senior Scientist, and principal investigator in the Environmental Energy Technologies Division at LBNL. He has obtained his Ph.D. in engineering from the University of California, Berkeley. As the leader of the Heat Island Group, he has been instrumental in the organization and initiation of the group at LBNL, funded by the U.S. Department of Energy, Environmental Protection Agency, California Energy Commission, and several other sources.

He has led LBNL’s efforts to investigate the energy conservation potential and environmental impacts of increased tree planting and modifications of surface albedo. His research has identified the attributes of these energy efficiency strategies to mitigating the urban heat island effect. Dr. Akbari is the author of more than 200 articles and coauthor of four books, and chief editor and editor of several scientific journals. He is the founding organizer of GCCA and CRRC and member of their Board of Directors; and an active member of ASHRAE, ASTM, and ASME. He is currently coordinating the “100 Cool Cities” initiative to cool urban heat islands and counter global warming.


Proceedings are also available in the ASA 2018 Conference website at https://www.asa2018conference.com/proceedings. A hardcopy of the proceedings will be posted to those who have requested a copy. You can also download the keynote speeches at: https://www.asa2018conference.com/ keynote-speaker

We had a focused session at the conference on Architectural Science Review with discussion on moving ASR forward. A number of agenda items emerged.

• Impact factor on the web site;
• Rethinking the promotion of Special Editions.
• Development of better ‘news feeds’ for papers, i.e. adding a ‘short statement,’ which can be used for the news feed.
• Improve authors researchers’ visibility/profile.
• Change web of science subject area from ‘arts and humanities’ to ‘science.’

The ASR team will be moving forward with this in 2019.

I would like to thank Associate Professor Priyadarsini Rajagopalan and her team for the hospitality at ASA and we are looking forward to working with them in 2019 on a Special Edition from that conference.

Also many thanks to Professor Susan Roaf for acting as an ASR Ambassador to the PLEA conference in Hong Kong and we look forward to working with the PLEA team a Special Edition from that conference this year. Final thanks to Diego Arroyo for inviting Alejandro Soffia to do the book review. Alejandro graduated as an architect in 2004 and received his Master in Architecture in 2011, Pontificia Universidad Católica de Chile. He has a personal interest in construction technologies and biomimetic design, in particular has done development and technological research in Chilean Schools of Architecture. His work is published though diverse international magazines including Arquitectura Viva, C3, Domus, Detail, Taschen.

We wish members of ASA and PLEA all the best for their conferences in 2019.

Richard

ASR 62.1 Guest editors

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Scientific Committee of the CATE 2019 – Comfort At The Extremes: Energy, Economy and Climate conference, 10th – 11th April 2019 Heriot Watt University, Dubai Website: https://comfortattheextremes.com/

Design for climate resilience: Influence of environmental conditions on thermal sensation

Authors’ Biographies

Dr Tanya Zheng Tan is currently an Associate Professor with the Mechanical and Civil Engineering Department at Hautes Études d’Ingénieur, Université Catholique de Lille. Her research interests focus on urban climate and thermal comfort, architectural spaces and human perception, and age-friendly city planning and design. Tanya received her Ph.D. in Architecture from The Chinese University of Hong Kong in 2016. She was a Postdoctoral Fellow in the School of Civil and Environmental Engineering, Nanyang Technological University and Institute of Future Cities, The Chinese University of Hong Kong.

Miss Sum Ching Chung is a research assistant at Institute of Future Cities, The Chinese University of Hong Kong. She is experienced in outdoor thermal comfort studies using questionnaire survey and field measurements. Her expertise also includes the applications of geographic information system and spatial analysis.

Dr Adam Roberts is a Senior Research Fellow, School of Mechanical and Aerospace Engineering, Nanyang Technological University. Dr Roberts is a Human Factors psychologist with specialisation in neuro-ergonomics. He has worked on projects relating to environmental effects on the brain and behaviour, speech and language perception, and brain-controlled adaptive automation. Dr Roberts has over 10 years of experience with psycho-physiological recording, including eyetracking, EEG brain responses, and cardiovascular measures.

Dr Kevin Ka-Lun Lau is a Research Assistant Professor at Institute of Future Cities, The Chinese University of Hong Kong. His expertise is in urban climatology and outdoor thermal comfort, and their application in urban planning and design. He is interested in investigating the impact of the built environment on the living quality of urban citizens, particularly at neighbourhood scale. Dr Lau has published over 40 articles in peer-reviewed journals and is the principal investigator of government-funded research projects. He has also established collaborations with international institutions from France, Sweden, Germany, Japan, Australia, and New Zealand.

Introduction

Our study investigated outdoor thermal comfort in a subtropical high-density city and the related environmental and psychological factors. With a sample of nearly 2,000 respondents on 13 urban sites in Hong Kong city, we found diverse patterns of PET-comfort ratings in different urban settings. It indicates that apart from the biometeorological index PET, there are other factors that affect outdoor thermal comfort in cities. The data showed that perception of environmental quality such as air quality, acoustic environment, and aesthetic quality significantly moderates the relationships between microclimate variables and subjective assessment on thermal environment.

Furthermore, we conclude that through influencing subjective assessment on wind, wind speed has a significant indirect effect on thermal comfort. In ultra-dense urban areas, small improvements on wind in highly developed urban areas can be detected by local people and hence their thermal levels can be enhanced during critical hot periods. Our study provides new perspectives on designing for climate resilience in high-density cities. Evidence on the complementary interaction between physical environmental and psychological effects in regards of outdoor thermal comfort can be found in the article.

Figure 1: Showing environmental quality such as air quality, acoustic environment, and aesthetic quality significantly moderates the relationships between microclimate variables and subjective assessment on thermal environment.
What shape should a city be to be most energy efficient? While our transport systems use non-renewable energy sources and our buildings are net energy consumers, there is a strong case for compact cities. Compact cities reduce travel distance and compact buildings reduce heat loss.

But what happens as we introduce disruptive technologies into the equation? Electric vehicles powered by solar energy gathered from our houses and distributed by virtual power plants. Our article “Energy and the form of cities: the counterintuitive impact of disruptive technologies” introduces a possible new direction for the relationship between urban form and energy.

We have compiled and reviewed research that begins to question the compact city as being energy efficient. For example, roof mounted PVs on houses have been shown to be able to power the transport needs of a city running on electric vehicles. Large areas of roof, relative to floor area of a building, provide electricity for both household use and electric vehicles. This allows minimal consumption of non-renewable fuels and reduces transport emissions. But it works best with a dispersed urban form.

Research on large samples of housing in various climates is indicating that high-rise compact building are consuming more energy than low-rise buildings because of the significant use of energy required to drive their infrastructure. As housing becomes more energy-efficient, its form becomes less important from the point of view of energy loss but the roof area becomes more important for energy gain. A dispersed city is more appropriate for houses to become net energy producers.

Disruptive technologies are just beginning to have an impact on cities. However, they will change far more quickly than urban form. What we are questioning is whether policies on urban form should consider the technologies of the future rather than those of the present. If energy is to become a more important issue in built form, then compact cities should be questioned.
The objective of the thesis is the development of socially, economically and environmentally viable proposals that will improve the thermal performance of the NSW Demountable Classroom and the thermal comfort of the people and communities who use them in any of the climates across the state.

The problem is significant because around 6000, or 12%, of all government classrooms in the state are Demountable Classrooms. The NSW Demountable Classroom was designed 50 years ago and was intended to, and continues to, provide the NSW government with a system of physical infrastructure that allows schools to expand and contract in response to population fluctuation as well as providing emergency accommodation at times of need in any of the diverse climates across NSW. However, they are commonly regarded as offering inferior “temporary” teaching spaces due, in particular, to the perception of their internal environmental quality.

The thesis understands buildings, including the NSW Demountable Classroom, as intrinsically complex systems that exist within other complex environmental, social and economic systems. Therefore there can be no single optimal solution to the challenges raised by function, climate or social context and therefore no simple route to find ‘the solution’. This thesis adopts a research methodology that is integrative; which accepts implicitly that there is no single optimal answer or solution for a problem consisting of so many indeterminate and interrelated variables. The methodology understands the value of, and permits the integration of, sociological and scientific paradigms of thought, and what they can contribute to the search for solutions to complex problems.

The thesis has methodologically intersecting parts. By analysing existing documentary evidence, interviews and physical surveys, the first part of the thesis determines that central to the poor perception of these economically, socially and potentially environmentally efficient buildings is their poor thermal performance.

The thesis develops an overall strategy, and specific “Solution Sets”, for improving the thermal performance of the NSW Demountable Classrooms and the thermal comfort of those who use them. A computer simulation model is used to understand the performance of the existing classroom buildings in five climates representative of the diverse climates in NSW. The same model is used to evaluate the performance of the “Solution Sets”.

The thesis concludes that the NSW Government, in collaboration with local communities, can employ simple strategies, identified in this thesis, to create high performance, adaptable and low carbon classroom buildings at a low cost. The analysis also suggests that by integrating the process of refurbishment into a constructivist pedagogy the entire school community can be engaged in, and learn, from the refurbishment process and continue to learn from the refurbished classrooms.
**Cultivated Building Materials:**
Authors: Hebel, Dirk E. / Heisel, Felix
Publisher: Birkhäuser

Review by: Alejandro Soffia,
Universidad Nacional Andres Bello,
Santiago, Chile

ISBN 978-3-0356-1106-9

“Cultivated Building Materials” (CBM) has taken the opportunity to build an interesting manifesto on how biological processes can be used to create materials and can offer architectural design a sustainable alternative for developing new building systems.

The first industrial revolution, after the creation of the steam machine, led to an architecture materialised mainly from mining and industrial resources such as iron, glass and concrete.

The book describes two further stages of the industrial revolution: the introduction of standards and measurements for individual items; and the complete prefabrication of interchangeable parts to be assembled into a complex whole such as a motor vehicle.

Then it presages a fourth revolution, in which uniformity is replaced by an adaptability as is found in biological systems.

As a result of these developments, traditional cultivated building materials such as wood, bamboo and rope are not much considered in the current development of our cities.

This new project by prestigious partnership, Birkhäuser and Detail, can be understood as the second part of a new material series following the book “Building from waste” (BFW) (2014). Indeed, many of the topics covered in CBM can be found in BFW, which raises the question of the deepening in the content was expected for this new book, edited by the same authors, Dirk E. Hebel and Felix Heisel, along with Marta H. Wisniewska.

“Cultivated Building Materials” is a very precise and timely name for a book that presents and explains an avant-garde architectural material research within the knowledge of Biology. Nowadays problems related to the lack of consideration of human production in relation with our natural environment, has found promising solutions of the impact of the building industry by including in it natural process, behaviors, materials and the like.

In this context, in the third of three parts of the book, quite innovative materials are presented which have been developed due to interdisciplinary entrepreneurships between biologists, engineers, designers, and others. Bacteria, Fungus, Algae and other organisms have been raised up, bred or “cultivated” to become new materials and building systems that can even develop form in their own life cycle.

Therefore when talking about “cultivating” we open our minds to other biological organisms, beyond trees and/or plants. We can expect by now in the natural environment there may be as many new materials and technologies as living species.

It means an incredible opportunity to change the way we design and build architecture. Despite the good articles of many material topics to be found in the book, I felt the structure and contents could have conveyed a clearer organization when discovering the potential of cultivating as a source for materializing architecture. For example, there is not a clear reason why the second of three parts of the book is dedicated exclusively to Bamboo, while wood and timber products feature less prominently throughout the other sections. Even more, other ways of cultivating have not been presented in the same hierarchy, as the state of the arts suggest.

In my opinion, more pages in this book could have been devoted to Biofabrication. Articles as Phil Ross’s “Fungal Mycelium Biomaterials” opens a wide field of cultivating possibilities for design. In the same way, it could be desirable that different ways of cultivating or different groups of organisms could have had equivalent coverage as others in other point of view, there are also a few topics that relate design and biology that seems to be out of step with the main topic, like Biomimicry cases, that have built its own discipline in the last thirty years. All in all, the book is interesting in terms of each paper that it is presented, although it might have had a clearer structure to develop a topic which is quite diverse in itself.