Dean's Roundup
28 May 2021

THE UNIVERSITY OF HONG KONG
faculty of architecture
HKURBAN labs

Roundup: Ceiling function, the mathematical operation of rounding a number up to the next higher integer
Roundup: a term in American English referring to the process of gathering animals into an area, known as a "Muster" in Australia
Rounding up: when a helmsman cannot control a boat and it heads into the wind
Roundup: the plan for an invasion of northern France by Allied forces during World War II (Wikipedia)
Dean's Roundup: part blog, part bulletin; part honour roll, part curatorial [cu ra·to ri·al]

FoA's Exceptional Standard of Scholarship

I always finish this blog by thanking or praising those mentioned in the following pages for their research and other contributions to the Faculty and University. This time I will praise FoA's scholars not for specific achievements but for being judged to be among the best in the world. Not just a few of our scholars, but most.

Some of those reading this outside HK may not be aware of the quinquennial research evaluation that HK universities are subjected to. The RAE follows an approach first pioneered by the UK in the late 1980s, that systematically applies international peer review to a sample of research outputs from subject-specific units of assessment (which typically correspond to a department or a close group of departments). Love it or hate it, the RAE (now called REF in the UK) has an impact on the behaviour of academics, departments, faculties and whole universities. Funding and reputations are affected by the results. The maturity of the process in the UK is such that student recruitment is measurably impacted too. Savvy high school students, teachers and parents keenly look at the RAE ranking of departments when choosing which university to apply to. Some of the good things about the system, after operating in the UK for almost the length of a whole academic career, are that it provides more granular information to students about the best place to study a specific subject; it de-elitises the system, allowing less well-known universities to attain prominence and drawing power in specific subjects; and it allows government to put research funds where they are most likely to be used best. While the more elitist systems of the USA and France have merits, a more egalitarian and merit-based system is arguably more efficient and fair. But that is to digress (and invite argument).

There are pros and cons of a centrally-organised peer-review research quality control system like the RAE. My personal view is that its overall effect on the entire university system is probably good, as is the external accountability and discipline it imposes on academics and departments. Colleagues from the North American system tend not to understand or appreciate the RAE as easily as Europeans and this is partly due to the differences in private-public university cultures. The RAE emerged in the UK in the 1980s to hold universities to account for large amounts of tax-payers' funds channelled into individual research agenda of mixed quality, social and scientific benefit and degrees of whimsicality. And so it is with the publicly-funded university system of HK.

So, how did we do in the 2020 HK RAE, results of which have just been published?

I will avoid pages of detailed self-praising prose. All I think I would like to say is that the RAE results once again caused me to be hugely grateful for the privilege of working with such an exceptional group of fellow academics, including the PhD students, RAs and PDFs who work with us on our research agenda – and of course our amazing, supportive administrative colleagues. FoA conducted two mock RAE exercises in preparation, and it was noted by some external reviewers at the time that the process was at least as thorough, if not more so, than the real thing. Our mock RAE panels peer reviewed a sample of research outputs from all FoA's professorial-track teachers. There were 20 panel members – the vast majority of whom were senior professors with experience on a national UK RAE panel or similar – and each output was read and evaluated by two panel members, with moderation by the panel chair. Given the rigour, it was not surprising then, that the mock RAE results were pretty similar to the real RAE results. I mention the mock exercise to make the point that in my view, based on 3 decades of this kind of national research evaluation, the RAE results can be taken as having a high degree of measurement validity. None of the 20 mock RAE panel members were on HK's 2020 real RAE. But the percentage of research outputs rated as world-leading was roughly 40% in the two independent exercises. When scientifically testing a measurement instrument, the instrument's reliability (ability to reproduce the same measurement in repeated applications) is crucial.

We can therefore say with some certainty, that HKU's Faculty of Architecture, is one of the best in the world. Adding the headline RAE results to another metric we tend to take notice of:

- For the last 6 years of QS World University Rankings, FoA has hovered between 14th and 10th in a ranking of the world's best Built Environment schools.
- Now the RAE tells us that 40% of research outputs from our Department of Architecture and Department of Landscape Architecture (evaluated together) published between 2014 and 2019 were judged by the RAE panel to be world leading (4*).
- For the same two departments, 65% of research outputs were judged to be either world leading (4*) or internationally excellent (3*).
- For our Department of Real Estate and Construction and Department of Urban Planning and Urban Design, 38% of research outputs published between 2014 and 2019 were judged as world leading (4*).
- For these two departments, an amazing 93% were judged as either world leading (4*) or internationally excellent (3*).

The RAE data can be taken to validate the QS ranking. Indeed, in computing the QS ranking, one quality criterion objectively measured by the ranking agency is citations (a citation is when someone publishes a paper, book, government report etc which cites your published work). When standardised for subject (dividing citation counts by some average for the subject), Faculty of Architecture's citation metrics are the best for any subject group across the whole of HKU.

As always, thanks to those mentioned below. You are part of a truly brilliant and exceptional community of built environment researchers.

Chris Webster
Dean, FoA

Department of Architecture

1. 'Public Home / Hong Kong' Exhibition

   A team of faculty and recent graduates from the Department concluded a consultation on public open space with an exhibition at PMQ – 'Public Home / Hong Kong' – that presents **design prototypes for the public realm.**
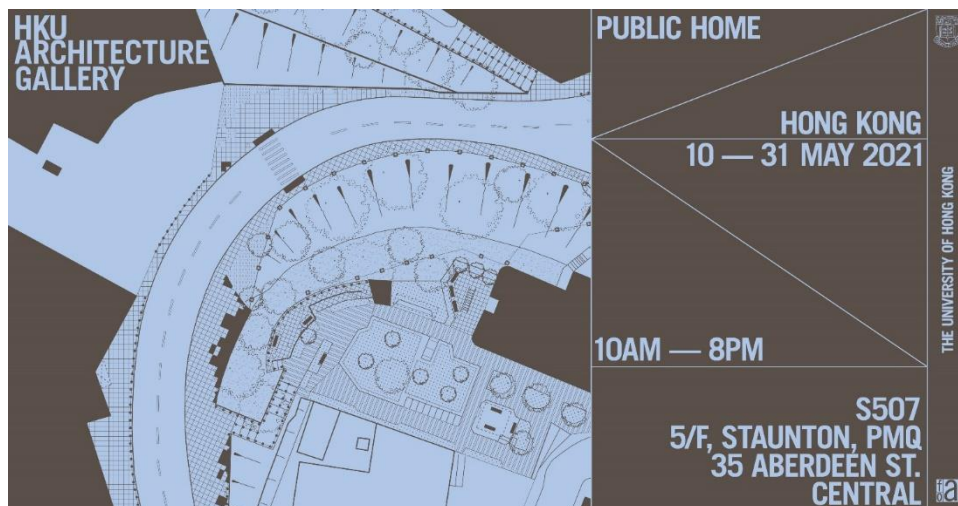
   The six-month research considered often neglected spaces in Hong Kong – cemetery edges, highway underpasses, terraces and waterfronts. Bringing together maps, drawings, photographs, texts and diagrams, the exhibition comprises a rich documentation of Hong Kong's public realm and propositions for its design.

   Project Team: Chan Yu Kiu Rain, Wallace Chang, Sony Devabhaktuni, Dong Jingyi Zoey, Natalia Echeverri, Hung Wai Yin Louis, Jiang Canran Daisy, Lai Chui Ting Minnie, Anderson Lee, Ngan Yuk Ying Wendy, Guillaume Othenin-Girard, Shum Siu Kei David, Soo Kwan Yau April, Tse Yat Chi Eugene, Ivan Valin, Wang Siqi Betsy, Wang Weijen and Xu Zhu Andrew

   For enquiries, please contact Isabel Wong of the Department, at Tel: 3917 2136, Email: isabel.wong@hku.hk.

   For more information, please visit the HKU Architecture Gallery webpage: https://www.arch.hku.hk/events_index/exhibitions/?cat=hku-architecture-gallery

Date:	10 May 2021 (Monday) – 31 May 2021 (Monday)
Time:	10:00am – 8:00pm
Venue:	S507, 5/F, Staunton (Block A), PMQ, 35 Aberdeen Street, Central, Hong Kong

Curator's Talk: Public Home Hong Kong / Uncovering Public Space

What does the public realm mean for Hong Kong and how can we design it? Sony Devabhaktuni, Assistant Professor of the Department and curator of the 'Public Home / Hong Kong' exhibition, led 30-minute exhibition tours on 16 and 23 May 2021 to delve into these questions, as well as a discussion with the audience about what public space means for us in Hong Kong today.

Division of Landscape Architecture

1. Conference proceedings and presentations by Dr Bin Jiang and PhD candidates Lan Luo, Yuwen Yang and Wenyan Xu

   (i) Lan Luo

   - **Luo, L.**, Yu, P., and **Jiang, B.** (2021). Blue matters: Using EEG technology to measure impacts of various bluescapes on human's psycho-physiological restoration. In *2021 Annual Conference of the Council of Educators in Landscape Architecture* (CELA, USA). Online, March 17–20, 2021.

   - Yu, P., and **Luo, L.** (2021). A national survey of LGBTQ students' experience and behaviour in queer spaces of Chinese colleges and universities. In *2021 Annual Conference of the Council of Educators in Landscape Architecture (CELA, USA)*. Online, March 17–20, 2021.

   - **Luo, L.**, Liu, X., and **Jiang, B.** (2020). *A new pathway model to interpret the impacts of the streetscape on citizens' mental stress in the high-density city* [Conference presentation]. In 14th International Association for China Planning (IACP) Virtual Conference. Shenzhen, China, 2020.

     This presentation has also received the 2020 IACP Excellent Presentation Award:

(ii) Yuwen Yang

- **Yang, Y.**, Dong, Y., Liu, X., and **Jiang, B.** (2021). *Investigate the impacts of landscape characteristics on the disparity of children and the elderly' presence and behaviour in urban central waterfront using the mixed method* [Conference presentation]. In 2021 Annual Conference of the Council of Educators in Landscape Architecture (CELA, USA). Online, March 17–20, 2021.

(iii) Wenyan Xu

- **Xu, W.**, and **Jiang, B.** (2020). *Effect of seasonality on visual aesthetic preference of urban landscapes* [Conference presentation]. In 14th International Association for China Planning (IACP) Virtual Conference. Shenzhen, China, 2020.

(iv) Dr Bin Jiang

- **Jiang, B.** and **Luo, L.** (2021). Significance of oppressiveness: A pathways model to interpret impacts of streetscapes on mental stress in the high-density city. In *2021 Annual Conference of the Council of Educators in Landscape Architecture (CELA, USA)*. Online, March 17–20, 2021.

- **Jiang, B.**, Shen, K., Sullivan, W.C., Yang, Y., Liu, X., **Lu, Y.** (2021). Significant impacts of built environment on public housing residents' suicide rates: A 13-year natural experiment. In *2021 Annual Conference of the Council of Educators in Landscape Architecture (CELA, USA)*. Online, March 17–20, 2021.

2. Dr Cecilia Chu

- was invited to speak at a webinar titled 'Infrastructure Imagination: Charting Hong Kong's Futures through Construction Photography', organised by UBC Hong Kong Studies Initiative on 21 May 2021. More information: https://hksi.ubc.ca/events/event/webinar-infrastructure-imagination/

Webinar

Infrastructure Imagination:
Charting Hong Kong's Futures through Construction Photography

Friday, 21 May 2021, 19:00–20:30 PDT
Cecilia L. Chu (HKU) and Dorothy Tang (MIT)
via Zoom
Details: hksi.ubc.ca

Department of Real Estate and Construction

1. Dr Llewellyn Tang

   - received his Silver Medal at the 2021 International Exhibition of Inventions of Geneva (IEIG) award ceremony on 17 May 2021.

   - shared with HKEJ on his start-up and the development of Building Information Modelling (BIM) in Hong Kong. See full coverage at:
     http://startupbeat.hkej.com/?p=103410
     http://startupbeat.hkej.com/?p=103427

Department of Urban Planning and Design

1. Professor Rebecca L.H. Chiu

   - was invited to be a member of the Peer Review Panel of the National Housing Research Program 2022 Funding Round of Australian Housing and Urban Research Institute, July–August 2021.

2. 2021 Esri Young Scholars Award

   - Maosu Li, PhD student supervised by Professor Anthony Yeh and Dr Frank Xue at the Department of Urban Planning and Design and stationed at iLab, won the Champion of 2021 Esri Young Scholars Award on 14 May 2021.

Online Story Map: https://bit.ly/32yz8xL

Title: Save people from the concrete barriers: integrated assessment of visual and physical accessibility to nature in 3D cities

Abstract: *A good window view of nature has been proven a huge influence on human mental and physical health and personal performance. However, the dense population, increasing demand for housing and infrastructure, and crowded cityscapes in high-rise high-density areas like Hong Kong have made people access nature unequally. Although people can physically access nature via active measures such as go hiking, which used to be a common practice to travel beyond the concrete barriers, one has to rely more on their windows especially during the Covid time. This study presents (1) a nature view index (NVI) from automatic assessment of the windows in 3D cities and (2) a nature accessibility index (NAI) by integrating the visual NVI with physical accessibility network to nature, aiming to (1) provide quantified shreds of evidence of the nature visibility and accessibility in a 3D city; (2) reveal new means for urban optimisation; (3) highlight inconvenient buildings and town blocks for planners, architects, dwellers, property developers, and other decision-makers, and (4) promote urban greenery management and self-greenery management in Hong Kong. Utilising 314 buildings in Wan Chai as a case, a pilot experimental result has indicated that three types of buildings tend to have better NVIs. Furthermore, three clusters of the lowest NAIs are pinpointed in Wan Chai. Finally, the nature accessibility issues in 5 aged zones can be recommended to Town Planning Board and Urban Renewal Authority's consideration.*

- The following two DUPAD students have also received the Award:

    1st Runner Up: **Cheng Chi Chiu, David** (MUP Year 2 student)
    2nd Runner Up: **Lui Wing Hin, Daniel** (BAUS Year 3 student)

    Winners will have the opportunity to attend the Virtual Esri User Conference, and will be awarded a summer internship place at the Urban Renewal Authority.

    Details of their submissions are as follows:

    http://esrichina.hk/ysa/Result_Announcement.aspx

    Background of the Award: The Esri Young Scholars Award (YSA) programme was launched in 2012 to recognise the exemplary work in geospatial sciences of undergraduate and graduate students in universities around the world. Esri (Environmental Systems Research Institute), the world leader of GIS software, organises the YSA, and, Esri China (HK) gives full support to engage tertiary educators and university students in Hong Kong to participate in this programme. The goal of the competition is to encourage and recognise university students who can create more innovative GIS applications that lead to a better society and meet the diversified needs of the metropolis of Hong Kong.

Centre of Urban Studies and Urban Planning

1. Dr Derrick Ho

   - has published the following articles:

     (i) Cao, Z., Wen, Y., Song, S., **Ho, H. C.**, & Sun, H. (2021). Spatiotemporal variations and controls on anthropogenic heat fluxes in 12 selected cites in the Eastern China. *China Geographical Science, 31*(3), 444-458. DOI: https://doi.org/10.1007/s11769-021-1203-y

     Abstract: *Spatiotemporal variations of anthropogenic heat flux (AHF) is reported to be associated with global warming. However, confined to the low spatial resolution of energy consumption statistical data, details of AHF was not well descripted. To obtain high spatial resolution data of AHF, Defense Meteorological Satellite Program/Operational Linescan System (DMSP/OLS) nighttime light time-series product and Moderate Resolution Imaging Spectroradiometer (MODIS) satellite monthly normalised difference vegetation index (NDVI) product were applied to construct the human settlement index. Based on the spatial regression relationship between human settlement index and energy consumption data, a 1-km resolution dataset of AHF of 12 selected cities in the eastern China was obtained. Ordinary least-squares (OLS) model was applied to detect the mechanism of spatial patterns of AHF. Results showed that industrial emission in selected cities of the eastern China was accountable for 63% of the total emission. AHF emission in megacities, such as Tianjin, Jinan, Qingdao, and Hangzhou, was most significant. AHF increasing speed in most areas in the chosen cities was quite low. High growth or extremely high growth of AHF were located in central downtown areas. In Beijing, Shanghai, Guangzhou, Jinan, Hangzhou, Changzhou, Zhaoqing, and Jiangmen, a single kernel of AHF was observed. Potential influencing factors showed that precipitation, temperature, elevation, normalised difference vegetation index, gross domestic product, and urbanisation level were positively associated with AHF. Overall, this investigation implied that urbanisation level and economic development level might dominate the increasing of AHF and the spatial heterogeneousness of AHF. Higher urbanisation level or economic development level resulted in high increasing speeds of AHF. These findings provide a novel way to reconstruct AHF and scientific supports for energy management strategy development.*

     (ii) Li, C., Tang, W., **Ho, H. C.**, Ong, J., Zheng, X., Sun, X., Li, X., Liu, L., Wang, Y., Zhao, P., Xiong, M., Zheng, H., Wang, C., & Yang, B. (2021). Prevalence of chlamydia among pregnant women, gynecology clinic attendees, and subfertile women in Guangdong, China: A cross-sectional survey. *Open Forum Infectious Diseases*. DOI: https://doi.org/10.1093/ofid/ofab206

     Background: *Chlamydia trachomatis (CT) is a major cause of infertility and adverse birth outcome, but its epidemiology among childbearing-age women remains unclear in China. This study investigated the prevalence of CT and associated factors among Chinese women aged 16-44 years who were either 1) pregnant; 2) attending gynaecology clinics; or 3) subfertile.*

Methods: *We conducted a cross-sectional survey and recruited participants from obstetrics, gynaecology, and infertility clinics in Guangdong, between March and December, 2019. We collected information on individuals' socio-demographic characteristics, previous medical conditions, and sexual behaviours. First-pass urine and cervical swabs were tested using nucleic acid amplification testing. We calculated the prevalence in each population and subgroup by age, education, and age at first sex. Multivariable binomial regression models were used to identify factors associated with CT.*

Results: *We recruited 881 pregnant women, 595 gynaecology clinic attendees, and 254 subfertile women. The prevalence of CT was 6.7% (95% Confidence Interval (CI): 5.2%-8.5%), 8.2% (95%CI: 6.2%-10.7%), 5.9% (95%CI: 3.5%-9.3%) for the above three populations, respectively. The subgroup-specific prevalence was highest among those who had the first sex before 25 years and older pregnant women (>35 years). The proportion of asymptomatic CT was 84.8%, 40.0%, and 60.0% among pregnant women, gynaecology clinic attendees, and subfertile women, respectively. Age at first sex (<25 years), multipara, and ever having more than one partner increased the risk of CT.*

Conclusion: *Childbearing age women in China have a high prevalence of CT. As most women with CT were asymptomatic, more optimum prevention strategies are urgently needed in China.*

2. Dr Derrick Ho, Professor Rebecca Chiu and Dean Webster

- Their co-authored papers have been accepted for publication:

(i) Liu, Y., Lu, S., Guo, Y., **Ho, H. C.**, Song, Y., Cheng, W., Chui, C. H. K., Chan, O. F., **Chiu, R. L. H.**, **Webster, C.**, & Lum, T. Y. S. (2021). Longitudinal associations between neighbourhood physical environments and depressive symptoms of older adults in Hong Kong: The moderating effects of terrain slope and declining functional abilities. *Health & Place*, *70*, 102585. ISSN 1353-8292. DOI: https://doi.org/10.1016/j.healthplace.2021.102585

Abstract*: Little is known about the accumulative impacts of neighbourhood physical environments on older adults' depressive symptoms over time. Based on a cohort study of 2,081 older adults in Hong Kong, this study examined longitudinal relationships between neighbourhood physical environments and depressive symptoms among older adults, with a particular focus on the moderating effects of terrain slope and individual functional ability using latent growth curve modelling. Results indicated that the availability of community centres and passive leisure facilities reduced depressive symptoms over time. The protective effects of residential surrounding greenness on depressive symptoms among older adults differed by the terrain slope types. Longitudinal associations between neighbourhood physical environments and depressive symptoms varied between older adults with and without functional limitations. This study has implications for the Ecological Theory of Ageing by identifying the dynamic interplay of*

environment demands and individual functional ability. Planning policies for building age-friendly neighbourhoods are discussed.

(ii) Lu, S., Liu, Y., Guo, Y., **Ho, H. C.**, Song, Y., Cheng, W., Chui, C. H. K., Chan, O. F., **Chiu, R. L. H.**, **Webster, C.**, & Lum, T. Y. S. (2021). Neighbourhood physical environment, intrinsic capacity and 4-year late-life functional ability trajectories of low-income Chinese older population: A longitudinal study with the parallel process of latent growth curve modelling. *EClinicalMedicine*, in press.

Background*: Knowledge of how intrinsic capacity (IC) and neighbourhood physical environment shape functional ability (FA) trajectories in later life remains understudied. We investigated 4-year trajectories of IC and their impact on FA trajectories and the association between neighbourhood physical environment and FA trajectories over time among community-dwelling older adults in Hong Kong, China.*

Methods*: We conducted a four-wave longitudinal study from 2014-2017 in Hong Kong with 2,081 adults aged 65 and above. FA was assessed by The Chinese Lawton Instrumental Activities of Daily Living Scale. We used cognition, affect, locomotion, sensory capacity, and vitality to capture the multiple domains of IC. Neighbourhood physical environment attributes included green space, land use diversity, and availability of facilities, assessed within 200- and 500-metre buffers of respondents' homes. We used the parallel process of latent growth curve model.*

Findings*: IC (Unstandardised coefficient, β = -0·022, p<0·001) and FA (β = -0·196, p<0·001) each decreased significantly over time. Individuals with declines in IC experienced a faster decline in FA over time. Green space within a 200-metre buffer (β = 1·15, p = ·023), the number of leisure (β = 0·03, p = ·043) and public transport (β = ·08, p = ·003) facilities within a 500-metre buffer slowed the rate of FA decline.*

Interpretation*: The level of FA decreased over time in later life. Changes in IC shaped FA trajectories. Increased residential green space and the number of leisure and public transport facilities in the neighbourhood may help slow FA decline over time.*

3. Professor Anthony Yeh

    - has published the following article:

    Mu, X., **Yeh, A. G. O.**, Zhang, X., Wang, J., & Lin, J. (2021). Moving down the urban hierarchy: Turning point of China's internal migration caused by age structure and *hukou* system. *Urban Studies*. DOI: https://doi.org/10.1177/00420980211007796

    Abstract: *Internal migration is critically important in China, where the fertility rate is declining and international immigration is under strict control. This study explores the massive population movement in China, examines the migration pattern of non-hukou migrants, 2010–2015 and 2014–2015 migration patterns through the urban hierarchy of the urban system using migration trajectories derived from the 2015 One Percent Population Sample Survey. Results reveal an emerging reversal from a predominantly upward pattern (e.g. most of the net flows move to high-level cities) to a downward one (e.g. from super-large/extra-large cities to large cities) in the recent migration trend. Regional disparities are significant. An upward and eastward tendency still dominates in the western, central and northeastern regions, whereas a downward and decentralised tendency has been initiated in the eastern region. The causes for the structural change include common factors found in developed countries, such as the influence of age and life courses. The age structure of China's population caused by the 'one-child' policy weakened the upward momentum and led to a strengthening downward trend in the current migration pattern. The contextual and institutional factor hukou also has a significant effect on people's migration directions. Hukou attracts people to move up or down the hierarchy to their registered place or where they can acquire registration. The characteristics of registered migrants reflect the different criteria of cities in granting hukou.*

Sustainable High Density Cities Lab

1. Dr Jianxiang Huang

   - has published the following papers:

(i) **Huang, J.***, Xu, Y., Jones, P., Li, X., Guo, M., Liu, G., & Ji, J. S. (2021). Building Energy and Thermo-Hydraulic Simulation (BETHS) for District Heat System in residential communities: A case of Shenyang, China, *Energy and Buildings*, 111114. ISSN 0378-7788, in press. DOI: https://doi.org/10.1016/j.enbuild.2021.111114

Abstract: District Heating Systems (DHS) received renewed attentions for its environmental, economic, and health benefits. Research literature on DHS tends to focus separately, either on the thermo-hydrological modelling or building energy demand. Rarely are there combined simulation approaches that consider the interactions between the district heating system and buildings. There is a practical need for a coupled simulation model to inform operation and energy retrofit strategies, such as, building insulation, water leakage prevention, and achieving comfortable indoor air temperatures. In this study, a novel simulation model, BETHS, is developed to predict the time-varying energy performance and occupant thermal comfort of a cluster of buildings served by a DHS in the urban context. The simulation results are compared with field measurement data collected for a secondary network consisting of 12 buildings and 2,788m of pipeline network over a 10-day period, in Shenyang, Liaoning, China. Predicted water temperature and indoor air temperature showed reasonable agreements with measured data. Simulation results suggested an energy saving of 35% for improved building insulation, 32% for switching from coal to gas, 18% for reduced indoor temperature, 14% for water leakage prevention, and 67% if all is combined. The BETHS model can be a valuable extension to building energy simulation framework and support retrofit strategies and operational decisions for existing DHS network.

(ii) **Huang, J.**, Jones, P.*, Zhang, A., Hou, S. S., Hang, J., & Spengler, J. D. (2021). Outdoor airborne transmission of coronavirus among apartments in high-density cities. *Frontiers in Built Environment, 7*(48). 666923. DOI: https://doi.org/10.3389/fbuil.2021.666923

Abstract: The coronaviruses have inflicted health and societal crises in recent decades. Both SARS CoV-1 and 2 are suspected to spread through outdoor routes in high-density cities, infecting residents in apartments on separate floors or in different buildings in many super-spreading events, often in the absence of close personal contact. The viability of such mode of transmission is disputed in the research literature, and there is little evidence on the dose-response relationship at the apartment level. This paper describes a study to examine the viability of outdoor airborne

transmission between neighbouring apartments in high-density cities. A first-principles model, Airborne Transmission via Outdoor Route (ATOR), was developed to simulate airborne pathogen generation, natural decay, outdoor dispersion, apartment entry, and inhalation exposure of susceptible persons in neighbouring apartments. The model was partially evaluated using a smoke tracer experiment in a mock-up high-density city site and cross-checking using the computational fluid dynamics (CFD) models. The ATOR model was used to retrospectively investigate the relationship between viral exposure and disease infection at an apartment level in two super-spreading events in Hong Kong: the SARS outbreak in Amoy Gardens and the COVID-19 outbreak in Luk Chuen House. Logistic regression results suggested that the predicted viral exposure was positively correlated with the probability of disease infection at apartment level for both events. Infection risks associated with the outdoor route transmission of SARS can be reduced to less than 10%, if the quanta emission rate from the primary patient is below 30 q/hr. Compared with the indoor route transmission, the outdoor route can better explain patterns of disease infection. A viral plume can spread upward and downward, driven by buoyancy forces, while also dispersing under natural wind. Fan-assistant natural ventilation in residential buildings may increase infection risks. Findings have implications for public health response to current and future pandemics and the ATOR model can serve as planning and design tool to identify the risk of airborne disease transmission in high-density cities.

Virtual Reality Lab of Urban Environments & Human Health

1. Dr Bin Jiang

   - has co-authored the following papers:

   (i) **Jiang, B.***, He, J., Chen, J., Larsen, L., & Wang, H. (2021). Perceived green at speed: A simulated driving experiment raises new questions for attention restoration theory and stress reduction theory. *Environment and Behavior*, *53*(3), 296-335. DOI: https://doi.org/10.1177/0013916520947111. [SSCI. IF: 5.141(2019). Q1]

Perceived Green at Speed: A Simulated Driving Experiment Raises New Questions for Attention Restoration Theory and Stress Reduction Theory

Bin Jiang[1] (iD), Jibo He[2], Jielin Chen[1,3] (iD),
Linda Larsen[4], and Huaqing Wang[1,5]

Abstract: Few studies have investigated the impact of landscapes on humans' mental status while they are moving at high speeds, such as driving on the freeway. This study used a simulation system to measure drivers' mental responses to six different freeway landscapes. Each of the 33 participants completed six different 90-minute simulated driving tasks in a randomly assigned sequence. The six landscape conditions consisted of an identical freeway infrastructure, with different roadside landscapes. Results show significant differences between landscape conditions and drivers' mental responses. Landscape conditions with greater greenness, in general, had a greater positive impact on drivers' mental status. The barren and tree regular landscapes yielded the worst and best results, respectively. Further, higher complexity was associated with a higher level of negative mental status. We argue that

the speed of human's active movement should be considered as an essential factor in the Attention Restoration Theory and Stress Reduction Theory.
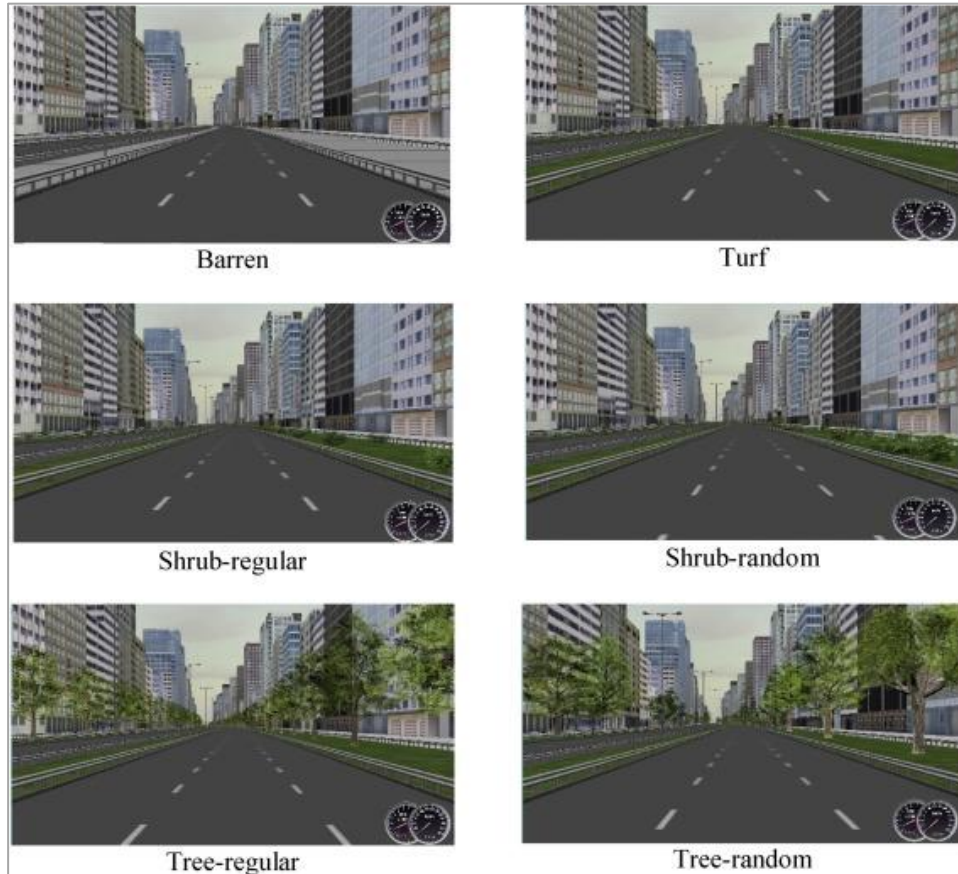
(ii) **Jiang, B.***, He, J., Chen, J., & Larsen, L. (2021). Moderate is optimal: A simulated driving experiment reveals freeway landscape matters for driving performance. *Urban Forestry & Urban Greening*, *58*, 126976. ISSN 1618-8667. DOI: https://doi.org/10.1016/j.ufug.2021.126976 [SSCI. IF: 4.021 (2019). Q1]

Moderate is optimal: A simulated driving experiment reveals freeway landscape matters for driving performance

Bin Jiang [a,b,*], Jibo He [c], Jielin Chen [a,d], Linda Larsen [e]

[a] Virtual Reality Lab of Urban Environments and Human Health, HKUrbanlabs, Faculty of Architecture, The University of Hong Kong, Hong Kong
[b] Division of Landscape Architecture, Department of Architecture, The University of Hong Kong, Hong Kong
[c] Department of Psychology, Tsinghua University, China
[d] Department of Architecture, National University of Singapore, Singapore
[e] Smart Energy Design Assistance Center, University of Illinois at Urbana-Champaign, USA

Abstract: *Driving on freeways is a daily activity across the world. Poor driving performance on freeways can cause severe injuries and deaths. However, few studies have examined whether and to what extent different types of freeway landscapes influence driving performance. A simulated driving task was designed to measure the impacts of six types of freeway landscape on 33 participants' driving performance. Each participant completed a driving experiment with six blocks of 90-minute driving sessions in a random sequence. During the experiment, participants' driving performance was measured through eight parameters. A set of repeated-measure one-way ANOVA analyses show that landscapes with three-dimensional branch and foliage (shrub & tree) were generally more beneficial for driving performance than barren (concrete-paved ground) or low green landscape conditions (turf). Furthermore, a repeated-measure two-way ANOVA analysis of four conditions with vertical green foliage (two shrub and two tree conditions) shows moderate levels of greenness and complexity were optimal for driving performance.*
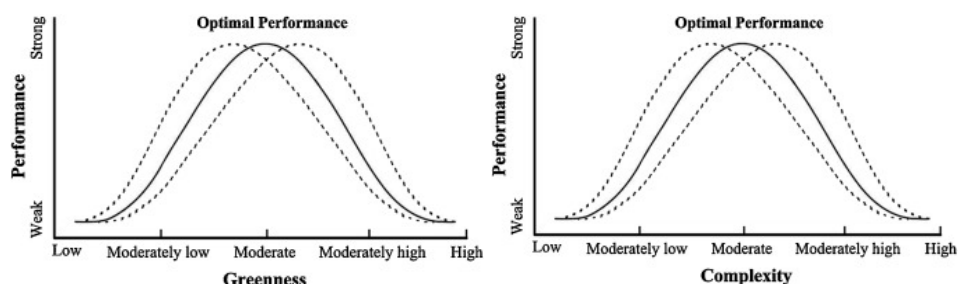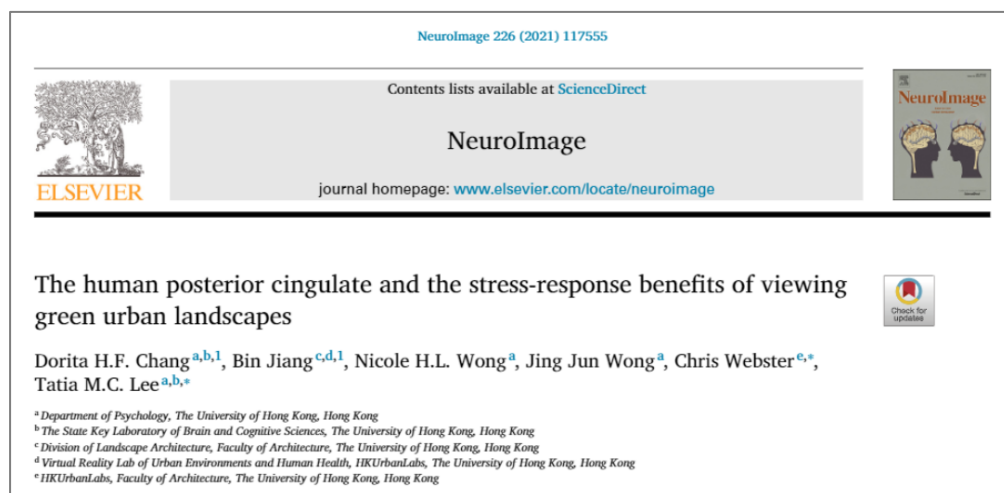
2. Dr Bin Jiang and Dean Webster, with colleagues from HKU Psychology Department and The State Key Laboratory of Brain and Cognitive Sciences

-   have co-authored the following paper:

Chang, D. H. F.[#], **Jiang, B.[#]**, Wong, N. H. L., Wong, J. J., **Webster, C.***, & Lee, T. M. C.* (2021). The human posterior cingulate and the stress-response benefits of viewing green urban landscapes. *NeuroImage, 226*, 117555. DOI: https://doi.org/10.1016/j.neuroimage.2020.117555. [SCIE. IF:5.902 (2019). Q1]

[#]represents the equal contribution to this study

The human posterior cingulate and the stress-response benefits of viewing green urban landscapes

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Abstract: The mechanistic and neural bases of why green environments drive positive mental health outcomes remain poorly understood. We show that viewing green urban landscapes that vary in terms of green-space density elicits corresponding changes in the activity of the human ventral posterior cingulate cortex that is correlated to behavioural stress-related responses. We further show that cingulate responses are engaged early in the processing cascade, influencing attentional and executive regions in a predominantly feedforward manner. Our data suggest a key role for this region in regulating (nature) dose-dependent changes in stress responses, potentially through its extensive connections to the prefrontal and hippocampal regions which in turn project towards the neuroendocrine system. As the posterior cingulate cortex is implicated in a variety of neurological diseases and disorders, these findings raise a therapeutic potential for natural environmental exposure, highlighting green-cover as a modifiable element that links to changes in limbic responses, and has health consequences for practitioners and city-planners alike.
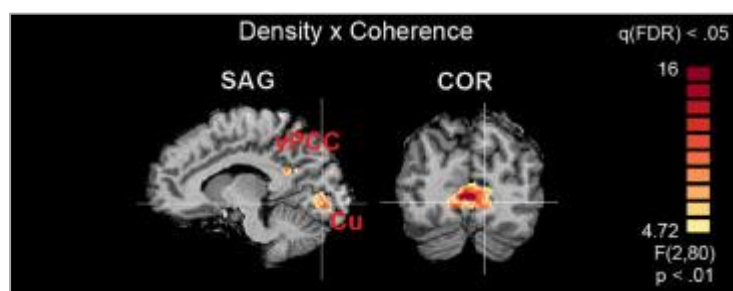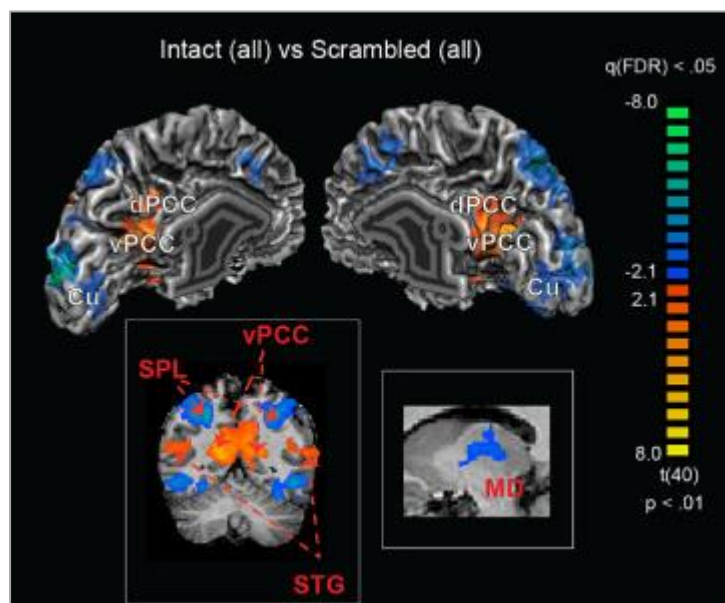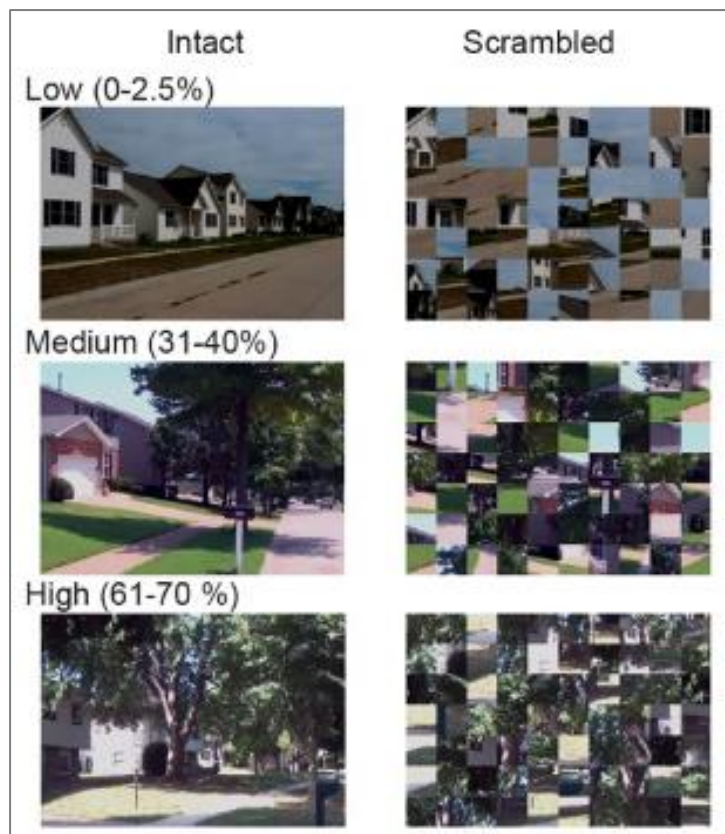
- The above paper on the study of the mechanistic and neural bases of why green environments drive positive mental health has been reported in the *HKU Bulletin* (May 2021 Volume 22 No.2):

https://www4.hku.hk/pubunit/Bulletin/ebook_2021May(22.2)/20-21/

HOW GREEN IS SEEN

A collaborative research study spanning architecture, psychology and neuroscience answers the question: what happens in the brain when people view urban green landscapes?

Numerous studies have reported the mental health benefits of contact with green landscapes. However, the mechanistic and neural bases of why such landscapes drive positive mental health outcomes have remained poorly understood until now.

"This study uses functional magnetic resonance imaging (fMRI) to enable us to understand the mechanisms and effects in a more accurate and theoretically valid way," said Dr Bin Jiang, Associate Professor in Landscape Architecture. "By scanning the brain, we can observe that different brain parts make different levels of neural responses to the green landscapes. This study is opening a 'black box' that cannot be opened before."

In 2016, Dean of the Faculty of Architecture and Chair Professor Chris Webster set up a strategic research cooperation with the Head of Department of Psychology and Chair Professor Tatia MC Lee, May Professor in Neuropsychology, and her State Key Laboratory of Brain and Cognitive Sciences. With their support and guidance, Dr Jiang had the opportunity to work with Dr Dorita Chang from the Department of Psychology to investigate the problem.

First, the research team developed the plan together based on visual materials collected by Dr Jiang in the US. Then Dr Chang designed and ran a random assignment fMRI experiment, asking participants to view one of three types of 3D image inside the fMRI device. Each type of image contains similar single-house community streets with a low (0–2.5 per cent), medium (31–40 per cent), or high (61–70 per cent) level of tree canopy density measured at eye-level. Brain activities were measured while the participant was viewing the images. In addition, the investigators conducted a photograph survey study of images in the laboratory as a supportive portion of the study.
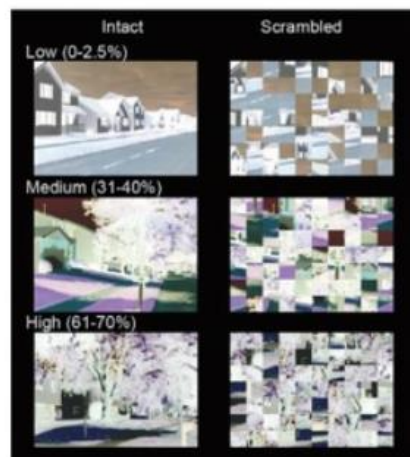
Sample stimuli from the three density levels tested in the fMRI. Stimuli were stereoscopic, and presented in the magnet using a prism setup.

Images of streetscapes with low (top, average tree cover density is 1.7 per cent), moderate (middle), and high (bottom) tree cover density within single-house communities.