

Complexity Insights:
Future Healthcare, Global Governance under Environmental Uncertainty
& Identities

Raffles City Convention Centre, Singapore
Hullet (Level 4)

Thursday, 20 July 2017	
8.30am	Registration
Future Healthcare	
9.00am	Overview <i>Cheong Siew Ann</i> <i>Associate Professor, Complexity Institute, Nanyang Technological University (NTU)</i>
9.15am	Understanding the Complexity of Urban Health Dynamics <i>Peter M. A. Sloot</i> <i>Co-Director, Complexity Institute, NTU</i>
10.15am	Coffee/Tea Break *
10.45am	Next Generation Simulation for Future Healthcare <i>Peter Klimek</i> <i>Assistant Professor, Medical University of Vienna</i>
11.45am	Panel Discussion (30mins)
12.15pm	Networking Buffet Lunch <i>Jointly with Foresight Conference participants</i>
Global Governance under Environmental Uncertainties	
1.30pm	Optimizing Infrastructure In The Asia-Pacific Region <i>William F. Laurance</i> <i>Professor, James Cook University in Cairns</i>
2.30pm	The Complexity of Cascades and Interaction Relationships for Managing Large Scale Natural Hazards and Environmental Disasters <i>Adam Switzer</i> <i>Associate Professor, Asian School of Environment, NTU</i>
3.30pm	Coffee/Tea Break *
4.00pm	Will Climate Related Global Assistance Offer an Unique Opportunity for Development in Asia? <i>Wu Fengshi</i> <i>Associate Professor, S. Rajaratnam School of International Studies, NTU</i>
5.00pm	Panel Discussion (30mins)
5.30pm	End
7.00pm	Welcome Dinner hosted by Strategy Group * <i>Venue: National Gallery L6 Aura Sky Lounge</i>

* No Pork & No Lard

Friday, 21 July 2017

8.30am	Registration
	Identities
9.00am	How Languages Affect Self-Perception of Social Identity <i>Helena Hong Gao</i> <i>Senior Lecturer, School of Humanities, NTU</i>
10.00am	Complex Narratives and Identity <i>Cheong Siew Ann</i> <i>Associate Professor, Complexity Institute, NTU</i>
1100am	Coffee/Tea Break
11.20am	Cultural Mixing, Cultural Attachment and Architecture <i>George Georgios Christopoulos</i> <i>Assistant Professor, Nanyang Business School, NTU</i>
12.20pm	Panel Discussion (30 mins)
12.50pm	Closing Remarks <i>Peter M. A. Slood</i> <i>Co-Director, Complexity Institute, NTU</i>
1.00pm	Networking Buffet Lunch <i>Jointly with Foresight Conference participants</i>
2.00pm	End

* No Pork & No Lard

Speakers & Abstracts



Peter M. A. Slood
Co-Director, Complexity Institute
Nanyang Technological University, Singapore

Peter M. A. Slood is a professor of Complexity Systems Science, Co-Director of NTU Complexity Institute, Professor of Computational Science, University of Amsterdam (UvA), and Co-Director, of Institute of Advance Study, UvA and Professor of Advanced Computing, ITMO of St. Petersburg.

He is a laureate of the Russian Leading Scientist President's programme and was the principal investigator of 5 large EU research projects and 9 National Research Foundation projects (www.nwo.nl). The most recent ones:

- ViroLab: 2007 – 2011: 'A virtual Laboratory to understand the spreading of HIV: From Molecule to Man'. 6 MEuro,
- DynaNets: 2009 – 2013: 'Dynamics on and off Complex Networks, applied to Crime and Contagion'. 4.5 MEuro,
- Urgent Computing: 3.6 MEuro: Modelling and Simulation on the edge of human interactions and their urban roles.
- SimCITY: An infrastructure to detect and act on critical transitions in complex urban systems using a City Simulator

On top of these, he is the editors-in-chief of two highly ranked Elsevier Science journals: Future Generation Computer Systems and Journal of Computational Science. He has published over 400 research papers and his work is covered in international media such as newspapers, interviews and documentaries.

Small wonder his research interest lies in understanding how natural and man-made systems processes information in complex systems by computational modelling and simulation. His work is applied to a wide variety of disciplines. Recent work has been on the virology and epidemiology of infectious diseases, notably HIV, through Complex Networks, Cellular Automata and Agent Based Models

Abstract: [Understanding the Complexity of Urban Health Dynamics](#)

Pending.



Peter Klimek
Associate Professor, Section for Science of Complex Systems,
Complexity Science Hub Vienna.
Medical University of Vienna

His research focus is to explore and exploit the possibilities that big data and complexity science offer for the future of medicine. His work uses methods from network analysis, statistical mechanics, complex data analysis, and various simulation and modelling approaches to understand how we can improve, both, patient health and the health care system itself. His results include novel methods to quantify and predict the future health state of multi-morbid patients, statistical models for the influence of epigenetic factors on disease risks, as well as network characterizations of health care processes. His research interests also include complexity economics and socio-economic modelling. He developed a statistical test for electoral fraud, novel methods to measure systemic risk, as well as modelling techniques for emerging risks and for socio-economic impact analyses of new technologies.

He obtained his PhD in theoretical physics in 2010 and master in 2007 in quantum information. His work attracted broad media interest and was featured on various BBC programs (Radio 5, Scotland, World Service), Austrian Radios OE1 and FM4, magazines like Nature News, Science News, Scientific American, New Scientist and other newspapers including Sunday Times, NY Times, Daily Telegraph, Berliner Morgenpost and Moscow Times.

Abstract: Next Generation Simulation for Future Healthcare

Healthcare costs are currently growing unsustainably around the world. The root cause for this unsustainable growth is a dramatic increase in the prevalence of chronic disorders, such as diabetes, cancer, or cardiovascular diseases, that represents one of the most pressing challenges in health and medicine today. However, the integration of large-scale computational models and mathematical know-how allows us to better understand personalized health risks and how their quantification can be used to prevent disease. These developments lead to personalized models for the spreading of diseases and the data-driven identification of risk factors for chronic illnesses. With the availability of complete data on population health, such as medical claims or electronic health records, it becomes now possible to objectively quantify costs, efficiencies, and bottlenecks in our health care system in a systemic way. We will discuss how these findings allow for the first time to build a predictive full-scale model for the health state of an entire country's population based on large-scale observational health care data. These developments will provide policy-makers with novel tools to assess the effectiveness of health interventions in order to make those systems more effective and sustainable.



William F. Laurance, PhD, FAA, FAAAS, FRSQ
Director of the Centre for Tropical Environmental and Sustainability Science
Distinguished Research Professor & Australian Laureate
Prince Bernhard Chair in International Nature Conservation
Director, Alliance of Leading Environmental Researchers & Thinkers (ALERT)
James Cook University, Cairns, Australia

William Laurance is a Distinguished Research Professor and Australian Laureate at James Cook University in Cairns, Australia. A tropical environmental scientist, he has written eight books and over 600 scientific and popular articles. He is a fellow of the Australian Academy of Science and has received many professional honors, including the Heineken Environment Prize, BBVA Frontiers in Conservation Biology Award, the Society for Conservation Biology's Distinguished Service Award, and the Zoological Society of London's Outstanding Conservation Achievement Award. He is director of the Centre for Tropical Environmental and Sustainability Science at James Cook University, and founded and directs ALERT—the Alliance of Leading Environmental Researchers & Thinkers—a science-advocacy group that reaches up to 500,000 readers weekly. He is a four-time winner of Australia's Best Science Writing Prize.

Abstract: Optimizing Infrastructure in the Asia-Pacific Region

Developing nations need better roads and transportation infrastructure to create economic opportunities and social development. However, if inadequately planned and constructed, roads can create an array of economic, social, environmental and political problems. Effectively designing and prioritizing roads is essential because at least 25 million kilometers of new roads are expected by 2050—enough to encircle the Earth more than 600 times. About 90% of these new roads will be constructed in developing nations that sustain exceptional biodiversity and ecosystem services. I will highlight multidisciplinary efforts to maximize the social and economic benefits of new roads and transportation infrastructure while minimizing their environmental costs and socio-political and economic risks, focusing particularly on the Asia-Pacific region.



Adam D Switzer

**Associate Professor & Associate Chair (Academic), Asian School of the Environment
Principal Investigator, Earth Observatory of Singapore
Nanyang Technological University, Singapore**

Adam is an Executive Council member of the Asia Oceania Geoscience Society and a member of the editorial board of peer review journals *Geoscience Letters* and *Journal of Coastal Research*. He has been PI or Co-I on 15 grants in Singapore (worth >\$5M) and has authorship on >60 peer-review publications, including lead academic publications in *J. Geophysical Research*, *Geophysical Research Letters*, *Bulletin of American Meteorological Association*, *Scientific Reports* and *Nature Communications*. His research includes storm surges, tsunamis and sea level along with multi-hazard interactions. Research subthemes include sedimentary geology, time series analyses, mathematical models, visualization, complexity, confronting models with data, and communications of science to user groups.

Abstract: The complexity of cascades and interaction relationships for managing large scale natural hazards and environmental disasters.

What is rarely discussed in future planning and disaster risk reduction and management is the potential of one natural hazard triggering or increasing the probability of another natural hazard occurring. For example, a volcanic eruption as a primary hazard can trigger many different secondary hazards, including earthquakes, tsunamis, landslides, floods, lightning and extreme temperatures, with each of these in turn triggering or increasing the probability of other hazards, thus resulting in multi-hazard cascades. Constraining hazard interactions is particularly relevant when considering countries which experience a high frequency and breadth of natural hazards. Here, I will present case examples of potential interaction relationships between natural hazards and people in southeast Asia including Singapore. I will draw on a wide-ranging synthesis of literature, to present a broad overview, characterization, and visualization of several interaction relationships between multiple natural hazards. I will summarise methodologies to identify and characterise the interaction relationships between these hazards (also termed ‘multi-hazards’), using visual formats particularly suited to end users. I will underscore the importance of providing a platform that allows those undertaking research into single hazards to place their work within the context of other hazards. Moving forward scenario based approaches also communicate important aspects of hazard interactions, thus facilitating an effective analysis by those working on reducing and managing disaster risk within the policy and practitioner communities. Knowledge of these potential interactions reinforces the need for holistic or multi-hazard approaches to natural hazard assessments regionally.



Wu Fengshi

**Associate Professor at the S. Rajaratnam School of International Studies (RSIS),
Nanyang Technological University, Singapore**

Fengshi Wu obtained her BA from Beijing University and PhD from University of Maryland. She specializes in Chinese politics, environmental politics, non-traditional security and global governance. Her recent publications have appeared in the *International Studies Quarterly*, *The China Journal*, *VOLUNTAS*, *Issues and Studies*, *Journal of Environmental Policy and Planning*, *China Perspectives*, *Journal of Contemporary China*, *Journal of Chinese Political Science* and the *Saint-Petersburg University Vestnik*. Her edited book *China's Global Quest for Resource: Energy, Food and Water* was published by Routledge (London) in 2016. Since 2013, she has joined the Editorial Boards of *Global Environmental Politics*, *China Review*, *Politics*, and *Voluntaristics Review*. She was among the inaugural class of the Graduate Fellows of the American Academy of Political and Social Sciences (2004), and a Visiting Scholar at the Harvard-Yenching Institute (2008-09).

Abstract: Will Climate Related Global Assistance Offer an Unique Opportunity for Development in Asia?

The Paris Agreement is now entering a new stage of negotiation, and the outcomes will shape how global climate governance will look like in the coming decades, which will affect many developing countries. Many of the ASEAN member states (esp. Philippines, Myanmar, Vietnam and Indonesia) and their neighboring countries (esp. Bangladesh) are now on the watch list by the international climate policy community as they are among the most vulnerable to any climate changes. Different from previous rounds of climate negotiations such as the Kyoto Protocol, the Paris Agreement is anticipated to offer more funds, reduce the binary division of developing versus developed countries, enhance technological transfer, and produce more effective international cooperation. Given these new developments, it is time to look at the overall potential impact of global-level climate governance building. Some experts have already argued that global climate governance can offer “flagship opportunity” for developing countries to re-steer domestic structures and economic models. My talk will examine climate vulnerabilities, domestic structures and pending international climate assistance related to ASEAN member states in order to shed light on such an argument, and also call for more attention to the global-local linkages in climate politics.



Helena Hong Gao
Senior Lecturer of Linguistics
Faculty Fellow of the University Scholars Programme
Director the Bilingual Development Lab
Director of the Master of Arts in Translation and Interpretation Programme
School of Humanities, Nanyang Technological University, Singapore

Dr. Gao started her career as an Assistant Professor, a Lecturer, and then an Associate Professor in English, while working as a jointly appointed Senior Translator and Coordinator for the international collaboration programmes for the Sheyang Municipal Government in China. Through teaching applied linguistics and translation courses in her early career, she developed her research interest in psycholinguistics and became a Lecturer and Research Director of the Cognitive Development Lab in the Department of Psychology at the University of Toronto after she received her PhD degree from Lund University, Sweden. Since she joined NTU in 2006, she has developed more than 20 courses for the programmes in Chinese linguistics and translation and taught 18 of them to both undergraduate and graduate students. Her current research focuses on bilingual development in relation to cognitive development and social development in both children and adults in Singapore. Most of her recent publications can be found on the website of the Bilingual Development Lab (<http://web.hss.ntu.edu.sg/gaoresearchteam/>), which was established with the funding support of Tier 1 and Tier 2 grants from MOE, Singapore.

Abstract: How Languages Affect Self-Perception of Social Identity

Being a bilingual does not simply mean being able to speak two languages. The socio-cultural aspects of bilingual development often involve changes of bilingual speakers' perception of their social identities. In this talk I will present part of my current study on the perception of social identities of English-Chinese Singaporean bilinguals via online communication. The participants of the study were young Singaporean adults who speak English and Chinese on a daily basis and whose English was their dominant language. Thirty-six statements expressing their own opinions on different social roles in English and Chinese were collected via online communication from the participants. They were analysed within the frameworks of social identity theory and self categorization theory. Based on the preliminary analysis of the data, I will first discuss the cognitively and culturally based thinking patterns of English-Chinese Singaporean bilinguals and then illustrate how these patterns affect young adult bilingual Singaporeans' perception of their social identities, such as self, other, and gender roles. How bilingual competence can be assessed accordingly will also be discussed. The main goal of the research is to explore the process of reformation of active bilingual speakers' social identities and to identify which aspects of the reformation are related to their bilingual competence and the particular language they habitually use in a particular social context.



Cheong Siew Ann
Associate Professor
Division of Physics & Applied Physics, School of Physical & Mathematical Sciences
Deputy Director of the Complexity Institute,
Nanyang Technological University, Singapore

He is interested in understanding complex systems from both modeling and data perspectives, using a comparative approach on markets and economies, epidemics, earthquakes and tectonics, biological macromolecules, brain, society and language to distill more universal theoretical understanding of complex systems. Ultimately, his goal is to develop a computational theory of complex systems, by treating their dynamics as information processing, and discover the underlying logic. Using this theory, he would like to shed light on how evolutionary processes shape the complex network topologies and dynamics of complex systems.

Abstract: Complex Narratives and Identity

In *Hard Truths to Keep Singapore Going* (Straits Times Press, 2011), the late Lee Kuan Yew said that in spite of years of nation-building, Singapore is “not yet a nation”. This admission is surprisingly controversial, evoking reactions from Singaporeans young and old. We realized that this emotional push back is the result of Singaporeans misunderstanding the meaning of ‘nation’, which they think of equivalently as ‘country’. According to the Oxford English Dictionary, the word ‘nation’ is rooted in the Latin word *natio* (birth), and refers to “a large aggregate of people united by common descent, history, culture, or language, inhabiting a particular country or territory”. On the other hand, the word ‘country’ is linked to the Medieval Latin word *cuntrata* via the Old French word *cuntree*, and means “a nation with its own government, occupying a particular territory”. Thus, commonly speaking, we can have nations without a country (e.g. the Kurdish people), or countries without a nation, yet.

In a multi-racial, multi-religion, and multi-cultural society like Singapore, our differences are still too big for us to see ourselves as a nation. With their increasingly global outlook, there is thus no wonder our younger generations are asking themselves what it means to be a ‘Singaporean’. They also grow increasingly frustrated with the ‘official narrative’, and their own inability to articulate one they can identify with. More importantly, they do not know who they want to become, what they need to learn, and where to find the knowledge to achieve that goal.

How can Complexity Science help us better understand identity as a project for future citizenship at various levels?

In this talk, we will use a complexity approach to investigate the highly controversial relationship between factual events and their narratives. We will begin by pointing out the fallacy of over-simplification (i.e., that one set of factual events ‘leads’ to only one narrative) on a historical method basis. In fact, the same set of factual events can support multiple coherent (non-self-contradictory) narratives constructed out of different subsets of events. Without degenerating into New Historicism, we concentrate on the working interpretation that in telling a story we impose a causal structure on top of the narratives. Different coherent narratives assign different causes to the same effect, and sometimes an event recognized by one coherent narrative as an effect can be identified as a cause in another coherent narrative.

In stories that form the bases of identities, we can also detect wholly fictional events (events that are too fantastic to be true, or for which corroborating evidence do not exist). We understand that in creating a 'historical' sequence of facts, gaps are inevitable. This problem of gaps is exacerbated by the filtration process needed to form coherent narratives. It is difficult to expect narratives with different fictional elements to be compatible with each other.

From the Complexity Science point of view, the different coherent narratives arise from the needs of different human communities to process the *same* information. These information pathways are different because of the different cultural backgrounds (logic) of the human communities. Different information pathways leading to more or less the same set of decisions are mutually compatible. Otherwise, they are mutually incompatible. In both cases, it is possible to re-engineer the narratives, to make them more compatible with each other. The fictional elements are key in this process. The stories can be retold to make them more similar, either by streamlining the plots, or by incorporating the plot from one story into another. Nations have emerged in the past from such exercises.

Today, this narrative re-engineering can be done in a more compelling way and be able to test existing theories and act as cultural labs. Instead of working with culturally-biased fictional elements, we can employ agent-based modeling and simulation (ABMS) to generate culturally-neutral fictional elements. With ABMS, we will be able to measure how robust or fragile a narrative is. A robust narrative is one that emerges time and again, in very similar forms, from the ABMS. A fragile narrative is one that emerges rarely from the ABMS. Either can be used for the re-engineering.



George Christopoulos, PhD, University of Cambridge
Assistant Professor
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Decision, Environmental and Organizational Neuroscience (DEON) Lab
Fellow, Asian Consumers Insights Institute
Principal Investigator, Future Resilient Systems, ETH Zurich
Affiliated Scholar, Virginia Tech Carilion Research Institute, VT, USA

I am a Decision Neuroscientist (University of Cambridge; postdoc at Cambridge, Baylor College of Medicine and Virginia Tech) with extensive research experience in neurobehavioral accounts of human behavior. In a series of studies, we identified the neural correlates underlying risk attitudes (*PNAS*, 2009; *Journal of Neuroscience*, 2009, 2010). Recent studies have explored the social aspects of human behaviour, such as cooperation, trust and social influence, employing novel neuro-computational approaches (*Nature Neuroscience*, 2015, *Neuroimage* 2015). Part of my current research examines the, rather unexplored, effects of Culture on human decision making. A new research stream in my lab explores the effects of the development of Mega-Cities and urbanicity on human behaviour, mental health and performance.

My lab has received well over \$1.1M in external funding from both governmental and private institutions. This research has been showcased in various media, including the French TV and Channel News Asia; finally, I have been occasionally consulting major companies in Singapore and overseas.

Abstract: Cultural mixing, cultural attachment and Architecture

I will offer evidence and data examining these two quotes. Our research shows that culture does affect our stress-related body and brain responses - thus the idea that culture resides in our hearts is not just a metaphorical poetic concept. Culture can act as a parental figure that offers security in the face of threat – mimicking the caring function that family offers to children. However, this protective mechanism carries a dark side as well. In human history, the mixing of cultures has been proven to be a beneficial but as well difficult exercise – with the major obstacle being mostly psychological and less of a pragmatic, financial nature. I will demonstrate the psychological mechanisms that underlie resistance to foreign cultures and influences and explain that, surprisingly, the major emotional reaction is neither fear nor anger.

On the second part, I will explain how architecture and culture build each other in an infinite loop. I will show how seemingly innocuous aspects of architecture could affect human preferences, behaviour, performance, emotions, social exchanges and health. Subsequently, humans rebuild their houses, workspaces and public spaces according to their preferences thus reshaping their culture’s architecture.

Policy makers that understand these mechanisms have the opportunity to shape identities and “nudge” citizen behaviour towards positive and creative choices, possibly without the need to take up the legal route that, many times, has the opposite effect.