

Precision Convergence Webinar Series

Understanding Complex Systems for Real-World Transformation: Multiscale Coordination Dynamics

By Dr. Scott Kelso

With High-Level Panel of Leaders in Science, Technology, On-the-Ground Action, and Policy

Tuesday, December 14, 2021 | 11 AM to 1 PM EST (2 hours in duration)

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ABSTRACT: Key concepts of complexity science, such as nonlinearity, emergence and self-organization all follow from the old adage that the whole is greater than (or different from) the sum of the parts. The fact that we use the word ‘parts’ (and like words such as components, elements, and even ‘agents’) implies that nature may be broken into separate pieces, basic ‘building blocks’ that somehow are brought together to produce coordinated behavior. The different forms that coordination takes and how it emerges and changes are of great interest to many disciplines, particularly the social and behavioral sciences, neuroscience, biology and physics. The science of coordination (Coordination Dynamics) seeks to understand how coordinated patterns of behavior form and change at many scales and for multiple functions in living things. This talk will review some of the main concepts, methods and tools of Coordination Dynamics along with recent developments of the theory that point to future research targets. A panel of scientists and action leaders will discuss insights that can inform real-world transformation in moving toward a better future.



PRESENTER: Scott Kelso’s research aims to understand how human beings (and human brains)—individually and together—control and coordinate their behavior on multiple levels, from cells to cognition to (most recently) social settings. Kelso’s approach is to look for commonalities and differences in the way such complex systems are coordinated across scales with the goal of identifying common principles and mechanisms—an empirical, theoretical and computational modeling framework called Coordination Dynamics. From 1978 to 1985 Kelso was Senior Research Scientist at Yale University’s Haskins Laboratories in New Haven, Connecticut. Since then, he has held the Glenwood and Martha Creech Eminent Scholar Chair in Science at Florida Atlantic University (FAU) in Boca Raton, Florida where he founded The Center for Complex Systems and Brain Sciences, obtaining the first NIH National Training Grant in this new interdisciplinary field. Kelso is also a Professor at The University of Ulster’s Intelligent Systems Research Centre in his hometown of Derry where he continues to collaborate with colleagues and students. In 2016, Kelso was elected an Honorary Member of The Royal Irish Academy (Hon.MRIA). Trained in a specifically interdisciplinary setting, Kelso’s PhD students and Postdoctoral fellows have gone on to careers in some of the top academic and research institutions in the world.

About the series: The [precision convergence series](#) is launched to catalyze unique synergy between, on the one hand, novel partnerships across sciences, sectors and jurisdictions around targeted domains of real-world solutions, and on the other hand, a next generation convergence of AI with advanced research computing and other data and digital architectures such as [PSC’s Bridges-2](#), and supporting data sharing frameworks such as [HuRMAP](#), informing in a real time as possible the design, deployment and monitoring of solutions for adaptive real-world behavior and context.

The McGill Centre for the Convergence of Health and Economics (MCCHE) is a virtual world network of scientist, action and policy leaders promoting the weaving of digital-powered interdisciplinary science into person-centered domain-specific solutions at scale to global challenges faced by traditional and modern economy and society worldwide. The MCCHE stimulates lasting collaborations that bridge the many divides in the market, economy, and society that are at the root of these most pressing modern challenges through collaborative of modular convergence innovation platforms.

The Pittsburgh Supercomputing Center is a joint computational research center between Carnegie Mellon University and the University of Pittsburgh. Established in 1986, PSC is supported by several federal agencies, the Commonwealth of Pennsylvania and private industry. PSC provides university, government, and industrial researchers with access to several of the most powerful systems for high-performance computing, communications, and data-handling available to scientists and engineers nationwide for unclassified research. PSC advances the state-of-the-art in high-performance computing, communications and informatics and offers a flexible environment for solving the largest and most challenging problems in computational science.

Co-Chairs:



Laurette Dubé, PhD is the founding Chair and Scientific Director of the McGill Centre for the Convergence of Health Economics. She holds the James McGill Chair of Consumer and Lifestyle Psychology and Marketing. Her work has been published in top disciplinary journals in Psychology, Management and Medicine as well as in multidisciplinary journals. She holds an MBA in finance, and a PhD in behavioural decision making and consumer psychology. During her 2020-2021 sabbatical, she is a visiting scholar at the National Research Council of Canada and at the Pittsburgh Supercomputing Center, Carnegie Mellon, USA. <https://thefutureeconomy.ca/interviews/laurette-dube>



Shawn Brown, PhD is Vice Chancellor for Research Computing at the University of Pittsburgh and the Director of Pittsburgh Supercomputing Center at the Carnegie Mellon University/University of Pittsburgh and. Prior to his appointment, Dr. Brown served as the Associate Director of Research Software Development at the McGill Centre of Integrative Neuroscience at the McGill Neurological Institute. Dr. Brown is an expert on high - performance computing and computational simulation. He has over 25 years of experience in developing software to support the use of high-performance computing for research in areas such as chemistry, bioinformatics, and public health. his research interests are ALSO in how agent-based modeling and other computational techniques can be used to provide decision support in public health and chronic disease.

Panelists:



Takao K. Hensch, Ph.D., is joint professor of Neurology at Boston Children's Hospital (Harvard Medical School) and of Molecular and Cellular Biology at Harvard's Center for Brain Science. Hensch trained at Harvard, the University Tokyo, Max-Planck Institute for Brain Research (Fulbright Fellow) and University of California, San Francisco (Ph.D. Neuroscience) prior to helping launch the RIKEN Brain Science Institute (Japan) as lab head and group director before returning to the United States in 2006. Professor Hensch directs the NIMH Conte Center for Basic Mental Health Research at Harvard, the International Research Center for Neurointelligence and CIFAR Child Brain Development network. His research focuses on the biological basis of critical periods for brain maturation, offering insight into both cognitive development and recovery of function later in life. His work has been recognized (among others) by the Sackler Prize for Developmental Psychobiology, Society for Neuroscience Young Investigator Awards (Japan, US), NIH Director's Pioneer Award and as chief editor of Frontiers in Neural Circuits.



Dr. Randy McIntosh is a Professor in the Department of Psychology at University of Toronto. His research program is dedicated to understanding how different parts of the brain work together to bring about the wide range of human mental operations. The program combines modern functional neuroimaging with mathematical modeling to characterize the changes in brain network dynamics and show how these dynamics change in normal aging and different clinical conditions. He is a co-creator of TheVirtualBrain, a neuroinformatics platform used to create dynamical models of the human brain from empirical data.



Dr. Guillaume Dumas is a neuroscientist with a transdisciplinary back-ground in theoretical physics, systems engineering, and cognitive science. He investigates the neurobiology of social cognition through the lens of complex systems theory and computational methods. His scientific interests connect with biomedical research, specifically in psychiatry which requires to integrate biological, psychological, and social dimensions of the human mind.



Dr. Georg Northoff, MD, PhD, FRCP, is a philosopher, neuroscientist and psychiatrist, holding degrees in all three disciplines. Being originally from Germany, he is now working in Ottawa/Canada where he holds a Canada Research Chair for Mind, Brain Imaging, and Neuro-ethics. His research focuses on the relationship between brain and mind in its various facets, including neuroscience, psychiatry, and philosophy. He is interested in discovering the neuronal mechanisms related to consciousness and self in both healthy subjects and psychiatric disorders like depression and schizophrenia. "The question driving him is: why and how can our brain construct subjective phenomena like self, consciousness, emotions." He is one of the leading figures in linking philosophy and neuroscience as well as the founder of non-reductive neuro-philosophy. He authored more than 270 journal articles and 15 books which are translated into several languages, including "Neuro-philosophy and the Healthy Mind".



Roberto Morandotti, Professor at INRS-EMT since 2008, has a broad knowledge in the field of photonics, ranging from the fabrication of integrated devices to the use of state-of-the-art optical characterization techniques in the Infrared and Terahertz frequency domains. During the last years, he has established a novel and very successful line of research in nonlinear optics and integrated photonics. Despite his relatively short academic career, he is considered a leading figure in his field, having published well over 170 articles in high impact factor journals. The recognitions obtained during the last years testify the impact of his research on the scientific community. Among others, he has been awarded in 2011 a NSERC E.W.R. Steacie Memorial Fellowship. Furthermore, he is a recipient of the Royal Society of Canada Fellowship (one of the youngest in the Applied Physics Division). Today, he is Fellow of the Optical Society of America, SPIE, Institute of Nanotechnology, Institute of Physics (UK) and American Physical Society, Senior Member of the IEEE and full Member of Sigma Xi (i.e. the Scientific Research Society). He was the Program Chair and will be the General Chair of CLEO/QELS 2014 and 2016, respectively.



Andy Williams is the Executive Director of Nobeah Foundation. He has an undergraduate degree in physics from the University of Toronto and his graduate studies centered on quantum effects in nano-devices. He specializes in Technology strategy, delivery management, enterprise architecture, project management, and professional services proposals. The research of Andy Williams focuses on the emerging field of General Collective Intelligence (GCI), and the functional modeling required to create a universal model of information upon which collective reasoning can be based. His work explores how the collective general problem-solving ability of GCI can be applied to a wide variety of areas.