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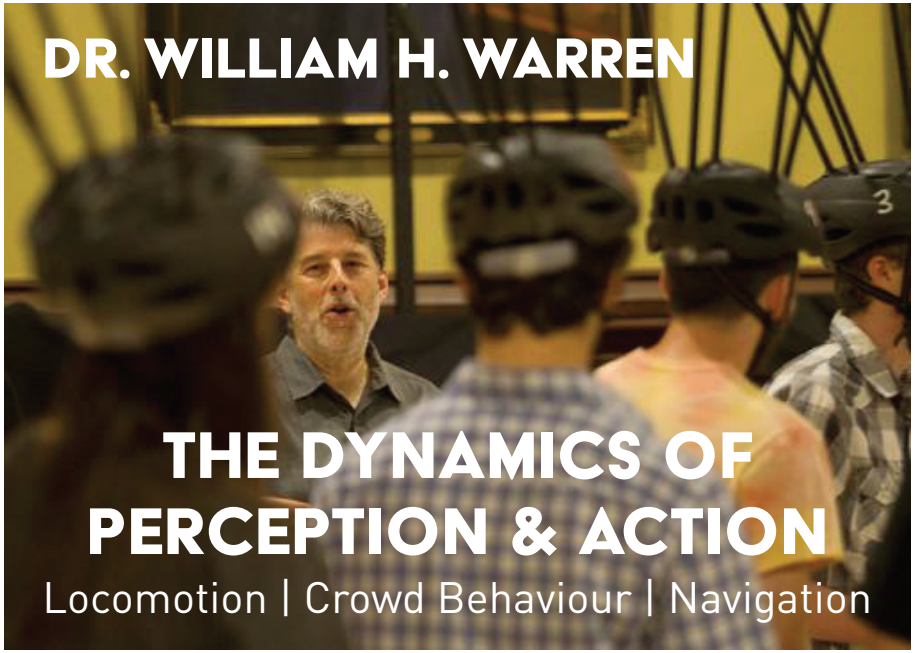
UNIVERSITY OF ALBERTA
DEPARTMENT OF PSYCHOLOGY

39TH ANNUAL DISTINGUISHED SCHOLAR LECTURE SERIES

January 11 - 13, 2017 | 3 - 4:30 PM



NOTES

For more information about the series, visit:
ualberta.ca/psychology/news-and-events/dsls

DR. WILLIAM H. WARREN

Chancellor's Professor,
Brown University

William H. Warren is Chancellor's Professor of Cognitive, Linguistic, and Psychological Science at Brown University and Director of the *Virtual Environment Navigation Lab (VENLab)*. He received his undergraduate degree from Hampshire College (1976), his Ph.D. in Experimental Psychology from the University of Connecticut (1982), did post-doctoral work at the University of Edinburgh (1983), and has been at Brown ever since.

He uses virtual reality techniques to investigate the visual control of human action, including optic flow, locomotion, crowd behavior, spatial navigation, and the dynamics of perceptual-motor coordination.

Warren is the recipient of a Fulbright Research Fellowship, an NIH Research Career Development Award, and Brown's Teaching Award for Excellence in the Life Sciences.

THE DYNAMICS OF PERCEPTION & ACTION

How do we account for the organization in behavior? Cognitive, neural, and evolutionary explanations are ultimately unsatisfying, because they seem to displace the problem without resolving it. In these lectures, I will develop the view that behavior is self-organized: it emerges from the dynamics of the organism-environment system, within physical and informational constraints, on several time scales. I will attempt to cash out this behavioral dynamics approach for three fundamental behaviors – visually-controlled locomotion, the collective behavior of crowds, and spatial navigation – and aim to link them in a common framework.

I. Locomotion
II. Crowd Behaviour
III. Navigation

1989 Robert Efron (UC Martinez) - "The Decline and Fall of Hemispheric Specialization."
1990 Phil Johnson-Laird (Princeton) - "Human and Machine Thinking."
1991 Timothy Salthouse (Georgia Institute of Technology) - "Mechanisms of Age-Cognition Relations in Adulthood."
1992 Scott Paris (Michigan) - "Authentic Assessment of Children's Literacy and Learning."
1993 Bryan Kolb (Lethbridge) - "Brain Development, Plasticity, and Behaviour."
1994 Max Coltheart (Macquarie) - "Our Mental Lexicon: Empirical Evidence of the Modularity of Mind."
1995 Norbert Schwarz (Michigan) - "Cognition and Communication: Judgmental Biases, Research Methods, and the Logic of Conversation."
1996 Gilbert Gottlieb (UNC Chapel Hill) - "Prenatal Roots of Instinctive Behavior: A Theoretical and Experimental Exposition of Probabilistic Epigenesis."
1997 C. Randy Gallistel (UCLA) "Basic Conditioning from an Interval Timing Perspective."
1998 Harold W. Stevenson (Michigan) - "Learning from other Cultures: Achievement and Society."
1999 Melvyn A. Goodale (Western Ontario) - "The Origins of Vision."
2000 K. Anders Ericsson (Florida State) – "The Complexity and Power of Deliberate Thought: From Protocol Analysis of Exceptional Memory to the In-vivo Dissection of Expert Performance."
2001/02 Mark Snyder (Minnesota) – "Personality, Motivation, and Social Behavior: Understanding Individuals and Their Social Worlds."
2003 Michael Tomasello (Max Planck Institute for Evolutionary Anthropology) – "Lectures on Children and Chimpanzees."
2004 Michael J. Ryan (UT Austin) – "Sexual Selection and Sensory Exploitation."
2005 Gary S. Dell (Illinois) – "Slips of the tongue: The Linguistic and Freudian Traditions; Aphasic speech Errors: Testing Freud's Continuity Thesis; and Implicit learning, Phonotactic Constraints, and Speech Errors."
2006 Michael A. Arbib (Southern California) – "Crusoe's Brain: Social Cognition and the Mirror System."
2007 Richard M. Lerner (Tufts) – "Applying Developmental Science to Promote Positive Youth Development and to Enhance Community Life."
2008 Denise C. Park (UT Dallas) – "Images of the Aging Mind; Developing a Cultural Neuroscience of Aging; and Following Doctors' Instructions: Medical Adherence."
2009 David C. Rubin (Duke) – "Autobiographical Memory."
2011 Tomáš Paus (The Rotman Research Institute) – "How Environment and Genes Shape the Adolescent Brain"
2012 Chi-Yue Chiu (Nanyang Business School) – "Socially Motivated Superstitions: Mutual Constitution of Society and the Mind."
2013 Arie Kruglanski (Maryland) – "Three Lectures on Motivation."
2014 Robert Cook (Tufts) "Comparative Visual Cognition: The bird's eye view"

HISTORY OF THE LECTURE SERIES

With the support of the Faculties of Arts and Science, the Department of Psychology at the University of Alberta has organized the **Distinguished Scholar Lecture Series** since 1975. This annual event consists of three consecutive public lectures by a renowned psychologist on their cutting-edge research.

Past lecture series:

1975 Frank Geldard (Princeton) - "Sensory Saltation: Metastability in the Perceptual World."
1976 Benton Underwood (Northwestern) - "Temporal Codes for Memories: Issues and Problems."
1977 David Elkind (Rochester) - "The Child's Reality: Three Developmental Themes."
1978 Harold Kelley (UCLA) - "Personal Relationships: Their Structures and Processes."
1979 Robert Rescorla (Yale) - "Pavlovian Second-Order Conditioning: Studies in Associate Learning."
1980 Mortimer Mishkin (NIMH - Bethesda) - "Cognitive Circuits."
1981 James Greeno (Pittsburgh) - "Current Cognitive Theory in Problem Solving."
1982 William Uttal (Michigan) - "Visual Form Detection in 3-Dimensional Space."
1983 Jean Mandler (UC La Jolla) - "Stories, Scripts, and Scenes: Aspects of Schema Theory."
1984 George Collier (Rutgers) - "Learning and Motivation: Function and Mechanism."
1985 Alice Eagly (Purdue) - "Sex Differences in Social Behavior: A Social Role Interpretation."
1986 Karl Pribram (Stanford) - "Holonomic Brain Theory: Cooperative Processing in the Configural Aspects of Perception and Action."
1987 Abram Amsel (UT Austin) - "Behaviourism, Neobehaviourism and Cognitivism in Learning Theory."
1988 Robert Siegler (Carnegie-Mellon) - "How Children Discover New Strategies."

I. LOCOMOTION

Wednesday, January 11 | CCIS 1-140

How do humans and other animals locomote through a complex, changing environment? I will argue that paths of locomotion emerge in an on-line manner from the interaction between an agent and its local environment. Based on studies of visually-controlled human walking in virtual environments, we create simple dynamical models of steering to a goal, obstacle avoidance, interception, and moving-obstacle avoidance. By combining these elementary behaviors, our 'pedestrian model' can predict locomotor trajectories in more complex environments. Some strategies are strikingly similar to those observed in insect flight control, suggesting very general principles. The results demonstrate that locomotor behavior can emerge on-line as a stable solution of the system's dynamics, without appealing to an internal world model or explicit path planning.

II. CROWD BEHAVIOUR

Thursday, January 12 | CCIS 1-140

What accounts for patterns of collective motion, such as bird flocks, fish schools, and human crowds? Such collective behavior is thought to emerge from local interactions between individuals. The key to the problem is thus to understand the local 'rules' or visual coupling that govern these interactions. There are many such models of collective motion, but precious little empirical evidence. Based on human experiments with virtual crowds, we model 'following' and characterize the neighborhood of interaction in a crowd. We than use multi-agent simulations of the pedestrian model to predict crowd behavior, and compare the results with motion-capture data on real human crowds. Scenarios like Grand Central Station, Human Swarm, and Counterflow can be successfully simulated with a few components of the pedestrian model. The results support the view that crowd dynamics emerge from local interactions, consistent with principles of self-organization.

III. NAVIGATION

Friday, January 13 | CCIS L1-140

How do humans and other animals navigate to places beyond the sensory horizon, which are 'off-line'? It is often assumed that spatial navigation implicates a 'cognitive map,' an internal representation of the environment with a Euclidean geometric structure. Such spatial knowledge could be built up from path integration, as hypothesized for the grid and place cell system. Our experiments on navigation in virtual environments converge with previous research to show that humans
(i) have poor and discontinuous path integration,
(ii) rely heavily on visual landmarks, and (iii) take highly unreliable shortcuts that (iv) violate the metric postulates. The results imply that humans do not build a geometrically consistent map. I will suggest that spatial knowledge is better characterized as a labeled topological graph that incorporates rough local metric information from the path integration system. Graph knowledge could constrain the pedestrian model by specifying the approximate direction to unseen goals, while the locomotor path emerges on-line. Apparently Euclidean behavior may thus result from minimal spatial knowledge together with on-line control of locomotion.