



**Indiana University
Cognitive Science Program**
25th Anniversary

Indiana Memorial Union
Indiana University
900 E. 7th St Bloomington, IN 47405

April 16 - 17, 2015



**COGNITIVE SCIENCE
PROGRAM**

INDIANA UNIVERSITY
College of Arts and Sciences
Bloomington



Welcome! Thank you for joining us to celebrate the Cognitive Science Program's 25th anniversary — twenty-five years of linking units across Indiana University in a tradition of interdisciplinary excellence in research and teaching.

We are excited to gather our alumni, faculty, former faculty, staff, students, and other supporters to mark our accomplishments and look forward together. On this occasion, we are especially happy to honor Richard M. Shiffrin, the program's first director, with the launch of an endowed fund in his name dedicated to supporting cognitive science students.

In addition to the establishment of the Richard M. Shiffrin Cognitive Science Student Support Fund, we also celebrate recent faculty hires in embodied cognition and the philosophy of cognitive science, the inaugural meeting of the Cognitive Science Program Advisory Council, and additions to our website highlighting the interdisciplinary nature of cognitive science.

Finally, let me thank those of you who have traveled to Bloomington to be here today and to those of you who have given your time and efforts to making this a memorable event — alumni, students, staff, and faculty — your presence and contributions are very much appreciated!

Yours,



Colin Allen
Director

Cognitive Science Program Advisory Council

Please join us in recognizing the members of the Cognitive Science Program's new Advisory Council. The mission of this group is to steer the ongoing development of our Program through ongoing tasks such as curriculum review and long-term strategic planning. On Thursday, April 16, 2015 we held the inaugural meeting of this group. We thank them for their time and commitment to ensuring that our degree programs maintain their premier rank in the field, that our students have access to the most meaningful academic experience and the most valuable preparation for their careers.

Ravi Bhatt (B.A. 2003) Branchfire, Inc.
James Brink (B.A., B.S. 2001) Branchfire, Inc.
Amy Criss (Ph.D. 2004) Syracuse University
Susan Dumais (Ph.D. Psychology 1979) Microsoft Research
Tarun Gangwani (B.S. 2011, M.S. HCI 2013) IBM
Bruce LeMar (BSB 1968, J.D. University of Michigan 1970)
Senior executive in labor relations, human resources and law
Gary McGraw (Ph.D. 1995) Cigital, Inc.
Robert Port, Professor Emeritus, Indiana University
Mark Steyvers (Ph.D. 2000) University of California, Irvine
Peter Todd, ex officio, incoming Cognitive Science Program Director
Colin Allen, ex officio, outgoing Cognitive Science Program Director

KEYNOTE SPEAKERS

DOUGLAS HOFSTADTER



Douglas Hofstadter is Distinguished Professor of Cognitive Science and Comparative Literature at Indiana University, and for twenty-five years has directed its Center for Research on Concepts and Cognition (CRCC), an interdisciplinary center for research in cognitive science. CRCC research focuses mainly on computational models of creative analogical thinking and its sub-cognitive substrate, namely, fluid concepts. The group also conducts research in a number of other areas of cognitive science, including error-making, creative translation, scientific discovery, musical composition, philosophy of mind, and foundations of artificial intelligence. He received a bachelor's degree in Mathematics at Stanford University, and a Ph.D. in Physics from the University of Oregon. He is a member of the Royal Society of Sciences for Physics and Mathematics, and has been elected to the American Philosophical Society and American Academy of Arts and Sciences. He is also winner of the Pulitzer Prize and the Los Angeles Times Book Prize.

MARK STEYVERS



Mark Steyvers is Professor of Cognitive Science at the University of California, Irvine and is affiliated with its Computer Science department as well as the Center for Machine Learning and Intelligent Systems. He received his Ph.D. from Indiana University working with Dr. Richard Shiffrin and was a Postdoctoral Fellow at Stanford University. His recent work is on developing Bayesian models for aggregating human judgments, including probability estimates, rankings, and problem solving behavior. He also works on probabilistic topic modeling and text mining. In this research area, he has shown how to develop topic models to automatically extract high-level semantic representations from text documents. Until recently, Dr. Steyvers served as President of the Society of Mathematical Psychology. For his computational modeling work, Dr. Steyvers received the New Investigator Award from the American Psychological Association as well as the Society of Experimental Psychologists.

Schedule

Friday, April 17

Thursday, April 16

Cognitive Science Awards Reception	
5:30 - 6:00 p.m. IMU - Presidents Room	Appetizers
6:00 - 7:30 p.m. IMU - Presidents Room	Remarks on the 25th Anniversary celebration Presentation of the Distinguished Alumni Award Graduate and undergraduate awards Special recognitions

Friday, April 17

Mini-Conference - Morning Session	
9:00 - 10:30 a.m. IMU - State Room East	Opening remarks by Larry Singell, Executive Dean of the College of Arts and Sciences Remarks by Colin Allen, Director of the Cognitive Science Program Keynote by Douglas Hofstadter, Distinguished Professor of Cognitive Science and Comparative Literature, and Director of the Center for Research on Concepts and Cognition at Indiana University
10:30 - 11 a.m. IMU - State Room West	Break Anniversary event T-shirts will be available for sale
11 a.m. - noon IMU - State Room East	"Director's Choice" Panel: Looking back and looking forward

Mini-Conference - Afternoon Session

Noon - 1 p.m. On your own	Nearby lunch options, including The Tudor Room at the IMU
1:00 - 2:00 p.m. IMU - State Room East	"Alumni+" Panel: Experiences with Cognitive Science
2:00 - 2:30 p.m. IMU - State Room West	Break Anniversary event T-shirts will be available for sale
2:30 - 3:00 p.m. IMU - State Room East	Keynote by Mark Steyvers, Professor of Cognitive Science, affiliate of the Computer Science Department, and affiliate of the Center for Machine Learning and Intelligent Systems at the University of California, Irvine

Intelligent Interactive Systems Open House

3:15 - 5:00 p.m. Informatics East, Woodlawn Avenue and 10th Street, Room 150 Co-organizers: Selma Sabanovic and David Crandall	<p>This event will showcase current research and education efforts in Cognitive Science, Informatics, and Computer Science at IUB through posters, live demonstrations, computer simulations and visualizations, and more. Confirmed presentations include cloud-based drone navigation, an interactive algebra system, various socially interactive robots, 3d visualizations of brain anatomy and pathways, hand tracking in egocentric video, machine learning in health informatics, an educational robotic system, probabilistic programming, and optical music recognition, among others.</p> <p>Come see what members of our community have been working on. This event is open to IU faculty, staff and students, anniversary attendees, as well as the broader Bloomington community.</p>
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Poster Session and Banquet

5:30 - 6:30 p.m. IMU - State Room West	Poster Session Cash bar, T-Shirts on sale
6:30 - 8:30 p.m. IMU - State Room East	Closing Banquet Remarks by Director Colin Allen

"Director's Choice" Panel

Looking back and looking forward: our Cognitive Science Program

Moderator: Colin Allen

Linda Smith, Distinguished Professor and Chancellor's Professor of Psychological and Brain Sciences, chaired the Department of Psychological and Brain Science from 2007 to 2012. She directs the Cognitive Development Lab and, in recognition of her research accomplishments, has been elected a Fellow of the American Psychological Society, the American Academy of Arts and Sciences, and of the Cognitive Science Society. In 2013 she received the prestigious David E. Rumelhart Prize in Cognitive Science.

Robert Goldstone, Chancellor's Professor of Psychological and Brain Sciences and Cognitive Science, was director of the Cognitive Science Program 2006-2011, and previous to that was editor-in-chief of the journal *Cognitive Science*. He is director of the Percepts and Concepts Lab, and for his research accomplishments he has been elected Fellow of the Association for Psychological Science, of the Cognitive Science Society, and of the Society of Experimental Psychologists.

Robert Port, Professor Emeritus of Linguistics and Computer Science, was one of the founding committee members of the Cognitive Science Program and served in several leadership roles. His important contributions to phonology include concern for detailed understanding of timing in speech. This concern for precise timing led to an important early volume on dynamical systems theory, which he co-edited with Timothy van Gelder, a former faculty member in the Philosophy Department at IU, and helped establish IU as a leading center for dynamical approaches to cognition.

Richard Shiffrin, Distinguished Professor and Luther Dana Waterman Professor in the Department of Psychological and Brain Sciences, the Cognitive Science Program, and the Department of Statistics. He was the founding director of the program, serving initially until 2002 and for a second term from 2004-2005. He has been widely recognized for his pioneering work on memory and is the only faculty member at IU to be elected Fellow at all three of the National Academy of Science, the American Academy of Arts and Sciences, and the American Philosophical Society. He is also an elected Fellow of the American Psychological Society and a winner of the David E. Rumelhart Prize in Cognitive Science.

Peter Todd, Provost Professor of Cognitive Science, Informatics, and Psychological and Brain Sciences, is director of the Adaptive Behavior and Cognition Lab and will be Director of the Cognitive Science Program starting in the summer of 2015. He spent 10 years at the Max Planck Institute for Human Development in Berlin before coming to IU in 2005, and his work continues to bridge between Bloomington and Berlin. He studies cognition "in the wild" in contexts ranging from speed-dating venues, to German supermarkets, to Bloomington's own farmer's market. He is also the founding director of IU's brand new Food Institute.

"Alumni+" Panel

Experiences with Cognitive Science

Moderator: Mike Jones

Nicole Beckage (B.S. 2010) is working on a Ph.D. in Cognitive Science and Computer Science focused on computational modeling of child language acquisition at the University of Colorado, Boulder. At IUB, she won a 2010 Provost Award for Undergraduate Research for her collaboration with Professors Linda Smith and Peter Todd.

Ravi Bhatt (B.A. 2003) is co-recipient of the 2015 Distinguished Alumni Award which he shares with the co-founders of Branchfire, Inc., creators of mobile productivity software with over one million users worldwide. His career encompasses years of innovation in software, communication and business development. He holds a J.D. from Washington University in St. Louis (admitted to the Illinois Bar) and a B.A. from IU in Cognitive Science with a minor in Computer Science.

Amy Criss (Ph.D. 2004) is Associate Professor of Psychology at Syracuse University and Adjunct Assistant Professor in Psychiatry at State University New York Upstate Medical University. Her research involves a multidisciplinary approach to modeling memory spanning experimental psychology, gerontology, computation science, and cognitive Neuroscience. She holds a B.A. in Psychology and Neuroscience from Miami University, as well as a joint Ph.D. in Cognitive Psychology and Cognitive Science from IU.

Tarun Gangwani (B.S. 2011, M.S. 2013) is currently a Design Lead for IBM's cloud platform, Bluemix. He describes himself as an interaction designer focused on mobile, web and service design from a cognitive science and business strategy perspective. He received an M.S. in Human-Computer Interaction and Design and a B.S. in Cognitive Science from IU.

Gary McGraw (Ph.D. 1995) is Chief Technology Officer at Cigital, Inc., the world's largest software security firm. He is a globally recognized authority on software security, serving as strategic counselor for top business and IT executives. He holds a Ph.D. in Cognitive Science and Computer Science from IU where he studied with Douglas Hofstadter. He serves on the Dean's Advisory Council for the IU School of Informatics and was awarded the IU School of Informatics Career Achievement Award in 2013.

Mike Sellers is Professor of Practice and Game Design in the IU Media School. Designer of award-winning games, his AI research focuses on "social artificial intelligence," creating agents that behave plausibly in social situations. He has published groundbreaking work on enabling artificially intelligent agents to learn, form social relationships, and have and express emotions based on a unifying psychological architecture. Sellers has a B.S. in Cognitive Science from Lewis & Clark College.

Ronaldo Vigo (Ph.D. 2008) is Associate Professor of Mathematical & Computational Cognitive Science and director of the Center for the Advancement of Cognitive Science at Ohio University. He is also the author of the recently published scholarly book entitled "Mathematical Principles of Human Conceptual Behavior: The Structural Nature of Conceptual Representation and Processing." His research focuses on the formulation and development of mathematical and computational models of concept learning, categorization, and perception, and on how these inform other areas of cognitive research.

Poster Session

Friday, April 17, 2015, 5:30-6:30 p.m., State Room West

Please return to State Room West following the Interactive Intelligent Systems Open House for a poster session and informal cocktail hour to precede our closing banquet. Posters have been submitted by alumni in business and academia, as well as local Cognitive Scientists. A cash bar will be available and 25th anniversary T-shirts will be for sale. Cash only for the bar! ATMs conveniently located in the IMU.

Special thanks to Cognitive Science Program alumna, Nicole Beckage (B.S. '10), currently a doctoral student at the University of Colorado's Computer Science Department and Institute of Cognitive Science, for helping to coordinate this session.

Alumni

Nicole Beckage (B.S. 2010), University of Colorado, Boulder
Ravi Bhatt (B.A. 2003), Jim Brink (B.A., B.S. 2001), Steve Hockema (Ph.D. 2004), Branchfire, Inc.
Douglas Blank (Ph.D. 1997) Bryn Mawr College
Ronaldo Vigo (Ph.D. 2008) and Derek Zeigler, Ohio University

Current Students

Adrian Barr
Robert Bowers
Jaimie Murdock
Azede Nematzadeh
Matthew Setzler
Blake Steiner
Jack Zhang
IGERT students

IU Cognitive Science Research Labs

Bennett Bertenthal, Developmental Cognitive Neuroscience Lab
Douglas Hofstadter, Center for Research on Concepts and Cognition
Michael Jones, Cognitive Computing Lab
David Landy, Psychological and Brain Sciences
Kirk Ludwig, Department of Philosophy
Aina Puce, Social Neuroscience Lab
Peter Todd, Adaptive Behavior and Cognition Lab
Richard Shiffrin, Memory and Perception Lab
Selma Sabanovic, Social Robotics Lab
Luis Rocha, Center for Complex Networks and Systems Research
Chen Yu, Computational Cognition and Learning Lab
Institute for Communication Research of the Media School

Acknowledgements

The Program Director would like to thank all who contributed to the arrangements for this meeting, especially staff members Rose Vondrasek, Ruth Eberle, Susan Palmer, and Terri King, with additional help from Patrick Craig and website development by Shaoshing Li.

Distinguished Alumni Award

The Distinguished Alumni Award honors graduates who have carried forward the Cognitive Science Program's tradition of interdisciplinary excellence and brought credit to the Program by their personal accomplishment, professional achievement, or humanitarian service.

The Cognitive Science Program presents its 2015 (and first-ever) Distinguished Alumni Award to **Ravi K. Bhatt** (B.A. 2003), **James J. Brink** (B.A., B.S. 2001) and **Stephen A. Hockema** (Ph.D. 2004), in recognition of their outstanding and significant professional achievement.

In 2011, Bhatt, Brink and Hockema, with the participation of yet another IU Cognitive Science alumnus Jun Luo (Ph.D. 2004) founded Branchfire, Inc. The Chicago-based company has created award-winning mobile productivity software that is currently used by over one million people worldwide and is licensed for use by over 500 organizations in education, law, finance, and government.

Their first product, iAnnotate®, allows users to read, mark up and share documents and images via an iPad or Android tablet, enabling paperless document review and sharing. It is widely used in education. For example, the Stanford University Medical School used it to go paperless. A second product launched was Folia, a new word processor that enables users to link content across platforms and applications.

As entrepreneurs and developers, the Branchfire founders have leveraged an understanding of how emerging technology transforms the creative and collaborative process. We look forward to what the future brings from Bhatt, Brink, and Hockema.



Ravi Bhatt is CEO and co-founder of Branchfire. His passion for technology and communication has driven the development of the core ideas and opportunities for Branchfire. He received a B.A. in Cognitive Science with a minor in Computer Science from IU. He also holds a J.D. from Washington University in St. Louis and is a member of the Illinois Bar.

James J. Brink is CTO and co-founder of Branchfire, leading their development of software and solutions. Brink studied in the Ph.D. program in Mathematics at the University of California, Berkeley. He was a Churchill Scholar and obtained a Certificate of Advanced Study in Mathematics from University of Cambridge. He holds a B.S. in Mathematics and a joint B.A. in Cognitive Science and Computer Science, 2001 from IU.



Stephen A. Hockema is Senior Engineer and co-founder of Branchfire. His career spans technology, academia, and telecommunications. Previous to that, he was professor at the University of Toronto's Faculty of Information where he conducted research on design, impact, and social shaping of information technologies. He holds a joint Ph.D. in Computer and Cognitive Science from IU, where he studied development and learning, as well as a BACEE and MSEE from Purdue University.

HISTORY

Cognitive science can trace its roots to the rise of computers as both tools and a source of metaphors for researchers trying to understand human and artificial intelligence. Although the ideas underlying cognitive science trace back to before the Second World War, it wasn't until the 1960s that the label "cognitive scientist" started to be worn proudly. By the late 1970s the field had professionalized with the Cognitive Science Society publishing a journal and organizing its first annual conference in 1979 in La Jolla, California. The 1980s saw a handful of universities begin to organize programs in cognitive science. The first academic department (UC San Diego) was formed in 1986. IU faculty knew that they had the makings of a world-class program that could rival the best anywhere, and in 1988 planning began in earnest for a cognitive science program at Indiana University.

Richard Shiffrin led a committee of faculty from across the university to design IU's Cognitive Science Program, with key administrative and intellectual support from Peggy Intons-Peterson (then chair of Psychology) and J. Michael Dunn (the philosopher and future founding dean of IU's School of Informatics, who at that time was Associate Dean for Planning in the College of Arts and Sciences). Although the committee wanted to establish from the outset undergraduate and graduate degrees, the program was initially started in the Fall of 1989 as a combined Ph.D., with Shiffrin as its director. The combined program offers the Cognitive Science Ph.D. as a second major to doctoral students from other departments and programs. It is still the case in 2015 that more than half of the Ph.D. students in cognitive science are in the combined program, having come to cognitive science from other disciplines. However, since 2004 the program has directly admitted doctoral students.

Over the years, the cognitive area of the Department of Psychological and Brain Sciences (PBS) has formed a strong core for IU's Cognitive Science Program. Many of our courses are taught by PBS faculty, and many of our students, graduate and undergraduate, pursue joint degrees between PBS and Cognitive Science. Faculty from Computer Science, Philosophy, History & Philosophy of Science, Informatics, Mathematics, and Linguistics regularly teach courses within the program, and students' double and triple majors speak to a very wide range of interests, from criminology to physics and Spanish literature to animal behavior.

From just one course and eight students in its inaugural year, to the 25 courses serving hundreds of undergraduate and graduate students during the current 2014-2015 academic year, the expansion of the program is evident. Today, 70 core faculty members and 78 associated faculty participate in the program. Representation is strong from the departments of Psychological and Brain Sciences, Philosophy, History & Philosophy of Science, Computer Science, Informatics, and Linguistics. Other participating departments include Biology, Anthropology, Education, Information and Library Science, Optometry, Speech and Hearing, and Mathematics. The program is highly integrated, encouraging interdisciplinary cooperation between all the participating disciplines. IU faculty and student collaborations are forged in the classrooms and cross multiple lines within the university. There are also many special groups, labs, and research centers affiliated with the program that enhance collaboration and provide opportunities for students to get direct training and experience in faculty research projects.

HISTORY

Our research and researchers are recognized internationally and nationally. Among our faculty are eleven fellows of the American Association for the Advancement of Science, eight fellows of the American Academy of Arts and Sciences, several members of the National Academy of Sciences, and fellows of the American Council of Learned Societies, as well as recipients of prestigious awards including the Barwise and Rumelhart prizes and Guggenheim fellowships. Many of our faculty members are also recognized by the university with titled, distinguished, chancellors, and provost professorships.

Faculty members have received major research grants from the National Institutes of Health, the National Science Foundation, the National Endowment for the Humanities, the Department of Education, and the Department of Defense. Particularly noteworthy was the \$3.1 million Integrative Graduate Education and Research Training grant from the National Science Foundation for "The Dynamics of Brain-Body-Environment Systems in Behavior and Cognition" awarded to Professor Randall Beer as Principal Investigator, with Professors Linda Smith, Robert Goldstone and Olaf Sporns as Co-PIs. This 6-year grant from 2009-2015 funded 32 graduate students and supported research internships for 19 undergraduate interns.

The program has internationally recognized strengths in mathematical modeling of cognitive processes such as memory, decision-making, and concept learning, the application of dynamical systems theory to cognition and cognitive development, and the integrated study of brain-body-environment systems. Its tradition is strongly empirical, while simultaneously fostering broad thinking about topics as wide-ranging as human creativity, computational modeling of individual and group cognition, functional and structural mapping of the human brain's "connectome", the cognitive basis of moral behavior and empathy, and the philosophical foundations and implications of the cutting-edge contributions to cognitive science that the program had made and continues to make.

PROGRAM DIRECTORS

Richard M. Shiffrin	1989-2002, 2004-2005
Luther Dana Waterman Professor of Cognitive Science Department of Psychological and Brain Sciences	
Andy Clark	2002-2004
Professor of Philosophy and Chair in Logic and Metaphysics University of Edinburgh, Scotland	
Robert Goldstone	2006-2011
Chancellor's Professor of Psychological and Brain Sciences	
Colin Allen	2011-2015
Provost Professor Cognitive Science and of History & Philosophy of Science	
Peter Todd	2015-
Provost Professor Psychological and Brain Sciences & Informatics	

The Richard M. Shiffrin Cognitive Science Student Support Fund



In 1988, Richard Shiffrin first proposed the creation of an interdisciplinary Cognitive Science Program at Indiana University, in order to unite the many departments at Indiana University represented in the study of cognition. Dr. Shiffrin was its director from its inception in 1989 until 2002, and again from 2004 to 2005. In the 25 years that have followed since students first entered the program in 1989, 153 students have received cognitive science degrees from the program.

On the occasion of the Cognitive Science Program's 25th anniversary, the program honors its founding director Richard Shiffrin, distinguished Professor and Luther Dana Waterman Professor of Psychological and Brain Sciences, with the creation of an endowed fund in his name. Once endowed above the \$25,000 level, the fund will provide permanent support for the academic activities of undergraduate and graduate students in the program.

This special fund especially honors the research and mentorship excellence of Dr. Shiffrin. In addition to his significant contributions to the formal modeling of human cognition in the areas of perception, attention, learning and human memory, Dr. Shiffrin has been the mentor to a surprisingly large number of individuals who have developed noteworthy and fertile research programs. Many of Dr. Shiffrin's students have gone on to conduct research into modeling of human cognitive processes, formal analysis of language and other products of human cognitive activity, individually and together with their mentor. In 2015, *Cognitive Modeling in Perception and Memory: A Festschrift for Richard M. Shiffrin* will appear, featuring the work of many of his students and colleagues.

In October 2014, Dr. Shiffrin was awarded the Indiana University President's Medal for Excellence, which honors the most exceptional faculty, their commitment to excellence in education and research, and their devotion to students. It is a testament to Dr. Shiffrin's effectiveness as a mentor that his students have been able to apply the modeling tools that they learned to areas far removed from Dr. Shiffrin's own research. As one of his graduate students observed, "Rich creates an atmosphere that makes it easy for people to succeed." Here again, with this endowed fund for student support, Dr. Shiffrin will make it easier for our students to succeed.

Due to the generosity of faculty, staff, and alumni, we are already three-quarters of the way to reaching the funding level required for permanent status of the Richard M. Shiffrin Cognitive Science Student Support Fund. Your gift, no matter how small, will help us reach our target and support our future students. Donate at cogsci25.cogs.indiana.edu.