

2018

John M. Carroll-Distinguished Professor of Information Sciences and Technology

Carroll, who was awarded the Faculty Scholar Medal in Social and Behavioral Sciences, was one of the founders of human-computer interaction (HCI), an interdisciplinary research area, combining social and cognitive science with information technology and design. He was originally trained as a cognitive psychologist and linguist. His early work in HCI explored cognitive mechanisms in the software design process, design rationale, user interface metaphors, computer games and command languages.

His development of the minimalist information and instructional design model, and of scenario-based design, earned him three lifetime achievement awards from the Association for Computing Machinery and the Institute of Electrical and Electronics Engineers. He was also elected fellow or honorary fellow of seven scholarly societies.

Carroll consolidated his research on community-information infrastructures, including the Blacksburg Electronic Village, into his book “The Neighborhood in the Internet: Design Research Projects in Community Informatics.” The Blacksburg Electronic Village was the first web-based community network. Carroll investigated how information technology can be applied to facilitate civic engagement, community attachment and sociotechnical innovation in residential communities.

Contemporary Sociology called the book “a landmark for community informatics and for the study of the internet in, by and for local communities” and “an outstanding contribution to community informatics and to the overall study and understanding of the emerging and evolving relationship of the internet and information technology with physical communities.”

“The fact that Carroll has sustained in this kind of work for more than two decades is not only a testament to his enormous stamina but to his commitment to the value — both intellectually and socially — of such work,” a nominator said.

Other areas where Carroll has had a research impact include peer-to-peer exchange, online privacy and safety for families with teenage children, smart-camera prosthetics for visually impaired people, activity awareness for computer-mediated collaborative information analysis

work, computer support for critical thinking in collaborative learning, and the coproduction of health and well-being by active older adults.

“Carroll continues to demonstrate extraordinary leadership in the research area of community informatics with his work with local organizations and citizens,” a nominator said. “In his prolific and high-quality publications, he has demonstrated not only innovative thinking in this area, but also great breadth of research. For example, his distinct combination of disciplinary expertise in social psychology and computer science, especially HCI, has produced the range of ideas and empirical studies that are not only seminal and interdisciplinary, but also has provided major contributions to research.”

Neil Christensen - Professor of Pathology Microbiology and Immunology

Christensen, who was awarded the Faculty Scholar Medal in Entrepreneurship, Technology Transfer and Economic Development, has spent three decades studying the immunity and pathogenesis of papillomavirus infection to better understand how the virus can lead to genital malignancies.

His research involves the construction of a large and diverse set of monoclonal antibodies to various viral and host proteins with particular strength and probes that recognize HPV capsids and that have virus neutralizing activities. Christensen’s antibodies were foundational for the development of commercially available HPV vaccines and vaccine candidates.

Christensen maintains a library of more than 500 monoclonal antibodies which he has distributed worldwide to more than 50 academic and industry research labs. As of 2018, there are more than 80 Penn State agreements in place for the acquisition of his antibodies.

“The interest in Christensen’s antibodies supports his mastery for antibody creation,” a nominator said. “His expertise is not limited to the generation of antibodies against HPV. Christensen and his team have experience in antibody purification, Fab production, immunoassays and the construction of single-chain variable fragment reagents,” a nominator said. “Because of this experience, Christensen is currently collaborating with more than 15 Penn State colleagues, creating antibodies for various clinical targets and applications.”

In an effort to create low-cost antibodies for he and his colleagues, Christensen is currently embarking on a new pursuit. He is launching a monoclonal antibody core facility at Penn State. The facility will provide a multitude of services including generation of mouse monoclonal antibodies, rabbit monoclonal and polyclonal antibodies and antibody purification. The facility in the near future aims to offer humanized monoclonal antibodies, nanobodies and biomedical products.

“Christensen’s research and intellectual property embodies translational science, contributing to vaccine development, positive impact to human health worldwide and has generated one of the largest licensing income streams of any faculty member at Penn State,” a nominator said.

Bernhard Luscher- Professor of Biology, and Biochemistry and Molecular Luscher, who was awarded the Faculty Scholar Medal in Life Sciences, was Penn State’s first neurobiologist to be promoted to professor and has been instrumental in building a sizeable and internationally recognized group of neurobiology faculty members.

He has served as co-director of the neuroscience graduation program, as interim co-director of the Penn State Neuroscience Institute and as director of the Center for Molecular Investigation of Neurological Disorder.

Luscher researches the role of the principal inhibitory neurotransmitter gamma-aminobutyric acid (GABA) and its major receptors in brain function. These receptors serve as the principal mediators of neural inhibition in the brain and also as targets for some of the most frequently prescribed psychoactive drugs such as those used to treat anxiety.

Luscher’s research also provides insights into the role these receptors play in emotion-related behavior. Based on initial findings by his laboratory, he proposed that comparatively small defects in the function of GAMA receptors could serve as culprits of Major Depressive Disorder (MDD). Luscher found that antidepressant drug therapies were reversing the consequences of GABA receptor defects, despite being designed to increase the function of two other neurotransmitters (serotonin or norepinephrine).

MDD is the leading cause of total disability and, through suicide, a primary cause of death among young people,” a nominator said. “Currently available therapies for MDD are

ineffective in almost half of patients, indicating that Luscher's studies address one of the foremost health concerns of modern society.”

Luscher's two key findings bettered our understanding of MDD and ways to treat it.

First, Luscher demonstrated that GABA receptor mutant mice, which exhibit signs of depression, suffer from a compensating downregulation of the function of the second major neurotransmitter in the brain, glutamate.

“Most remarkably, treatment of these mice with an experimental antidepressant drug (ketamine) reversed both the glutamate and GABA defects of the mutant mice and also normalized their behavior,” a nominator said.

Second, Luscher's group asked whether enhancing the function of GABA can end depression. This treatment is currently used, although ineffectively, at treating depression. Luscher explained one reason these drugs might be ineffective is that they enhance GABA function indiscriminately and independent of the level of brain activity. To enhance the function of GABA in a brain-activity-dependent manner, Luscher designed an innovative strategy to genetically increase the activity of GABA-producing cells in mice and then showed that these animals behaved as if they had been treated with antidepressant drugs.

“Luscher's work represents a seminal contribution to the detailed understanding of MDD and antidepressant drug action,” a nominator said. “He has provided a rigorous intellectual framework for his work and gone on to experimentally prove that his predictions were correct.”

Sandra Spanier-Professor of English

Spanier, who was awarded the Faculty Scholar Medal in the Arts and Humanities, is one of the world's leading experts on the iconic American writer Ernest Hemingway. Through publications based on Hemingway's letters, she has provided a resource for scholars around the world.

Although Hemingway is known for his rugged, one-dimensional persona, Spanier says his thousands of written letters tell a different story.

Of all the projects now in progress that concern American literature of the 20th century, none is so significant — nor so detailed and complicated — as the Hemingway letters,” said a nominator. “This importance is highlighted by the nearly continuous support the National Endowment for the Humanities (NEH) has provided to Spanier and the ‘Letters of Ernest Hemingway’ project since 2005. Indeed, NEH designated the work as a We the People project, a special recognition for projects that advance our understanding of American history and culture.”

Spanier directs “The Letters of Ernest Hemingway” project — compiling a massive trove of more than 6,000 letters by the prolific author by locating and collecting copies of letters from far flung sources including museums, libraries, archives and individuals around the world. Spanier has organized these letters chronologically, writing footnotes and commentary to provide context such as informing the reader about the individuals, places, events and context referenced in the letters. Four volumes have now been published by Cambridge University Press in the projected 17-volume series.

Spanier also met with and recorded oral histories from primary source contacts including Hemingway's surviving son, his Cuban caretaker and other acquaintances throughout his life.

Dozens of media outlets have featured the publications, including online venues such as The Daily Beast and BuzzFeed, a lengthy piece in Vanity Fair, and rave reviews in The New York Times and Wall Street Journal. The reviewer for the London Times Literary Supplement called the work "an astonishing scholarly achievement." Historian Ken Burns has invited Spanier to assist on his forthcoming documentary film project, Ernest Hemingway, slated for PBS in 2020.

An external evaluator said Spanier’s work reveals a new Hemingway.

Spanier’s scholarship already shows us a very different Hemingway than the common understanding of a certain mode of plain, natural, realistic, minimalistic, masculine prose,” the evaluator said. “Instead we see a more robust portrait of a mental anguish, anxious, insecure and fragile mid-century American male. His writings exhibit a great deal of complexity, doubt and nuance.”

Other evaluators called Spanier's work "urgent and enduring," "a monumental achievement befitting the most influential 20th-century American writer."

Qing Wang-Professor of Materials Science and Engineering

Wang, who was awarded the Faculty Scholar Medal in Engineering, was nominated based on his outstanding scholarly contributions to the development of novel functional polymers and polymer nanocomposites with dramatically enhanced electrical, dielectric and transport properties.

Wang has developed a completely new class of polymer dielectric materials for high-temperature applications. The materials are stable over a wide range of temperatures and frequencies and show remarkable energy storage capabilities at record temperatures of about 500 degrees Fahrenheit. This operating temperature allows for applications in modern electronics and electric vehicles.

“Wang’s work challenges the longstanding notion that thermal stability of polymers determines the operation temperatures of polymer dielectrics under the applied electric fields and discloses new design parameters for high performance, high temperature polymer dielectric materials,” a nominator said. “Given the unique combination of scalability, weight, and record performance, his work may revolutionize the way compact power modules and power circuits targeted for harsh environment applications are built.”

Within the past five years, Wang has published about 70 peer-reviewed papers in high-profile journals such as Nature, Proceedings of the National Academy of Sciences and Energy & Environmental Science. In citations, five of his papers are among the top .1 percent, factoring field and age. He’s secured five national and two international patents.

Wang has also made advances in self-healing electronics and solid-state cooling. His work has drawn the attention of companies such as Murata, Samsung and Dow and has been featured on BBC News, Science Daily and Eureka.

“Wang is an internationally recognized world leader in dielectric and ferroelectric polymeric materials,” a nominator said. “He has pioneered the science and engineering of high

temperature, high-energy-density dielectric polymers, making seminal contributions that place him among the premier researchers in the world.”

Fuqing Zhang- Professor of Meteorology and Atmospheric Science

Zhang, who was awarded the Faculty Scholar Medal in Physical Sciences, was nominated for his innovating and pioneering research on data assimilation, which is the process of blending new observations into current estimate of the three-dimensional atmospheric state. This improves forecasting accuracy.

“Zhang has transformed the data assimilation field regarding the incorporation of radar and satellite observations into initial state of computer weather forecast models,” a nominator said. “One of his main focuses has been the improvement of hurricane prediction — most importantly — hurricane intensity forecasts.”

Zhang’s work is important because of its impact on public safety but also because research to improve hurricane intensity forecasting — until Zhang — has been largely at a stalemate.

Zhang helped the National Oceanic and Atmospheric Administration’s Hurricane Research Division develop a strategy to assimilate aircraft radar observations in real-time, leading to improved operational hurricane track and intensity forecasts.

“This direct, positive impact on society is one reason why Zhang’s visionary research is so outstanding,” a nominator said. “It has clear benefits to our nation and the world. But it is just as important to recognize that Zhang has revolutionized the data assimilation field through his research.”

Hurricanes are one of the most violent storms on Earth and can have devastating impact on society, causing widespread casualties and destruction of property. Recent hurricanes — Harvey, Irma and Maria — are testament to that. Zhang’s forecasting improvements contributed to advanced warning for these recent disasters and to early evacuations, saving countless lives.

“Zhang’s assimilation technique is based on using very large ensembles of previous forecasts to provide what amounts to a large set of prior information, which in combination with high-

resolution aircraft radar observations, allows accurate estimate of the initial state of the hurricanes,” a nominator said. “This represents the first real advance in intensity forecasting in decades and — given what is at stake — a very significant contribution to social welfare.”