dents. "They are able to take my ideas and suggestions, some of dubious merit, that I lob like so many juggling pins and convert them into the body of work on which this award rests," he says. "I am very proud of the scientists that my coworkers have become."—SUSAN AINSWORTH

"A giant in the field of experimental physical-organic chemistry," "a world leader in the chemistry of reactive intermediates," "a world-class researcher and scholar." These are but a few of the accolades colleagues use in describing **Robert A. Moss,** the Louis P. Hammett Professor of Chemistry Emeritus at Rutgers University, in New Jersey.

NICK ROMANENKO

Moss

In a career spanning more than five decades, Moss delved into several major areas of chemistry but is probably best known for advancing the understanding of reactive intermediates, especially of carbenes. Among his pioneering contributions is the first use, together with Nicholas J. Turro of Columbia University, of laser flash photolysis to study singlet carbene reactions. With this tool, Moss says, "rather than look at the footprints of intermediates, we can see the beasts themselves."

"The Moss laboratory provided the experimental and theoretical framework for the understanding of the structure-reactivity dependence of singlet carbenes, affording a unified spectrum of reactivity that melds fast absolute kinetics and relative rate measurements, as well as frontier molecular orbital theory and ab initio calculations," Matthew S. Platz of Ohio State University says.

Moss "opened the field of carbene chemistry in a way that could not have been imagined when he started," Ronald Breslow of Columbia University says.

"From meticulously conceived experiments probing the kinetics and isotope effects of carbenes, he went on to their detection. This body of work is a landmark achievement," Roald Hoffmann of Cornell University adds.

Two other major areas of research are chemistry in aggregated systems and the destruction of nerve agents. Chemical methods Moss developed to study site-specific reactions in liposomes led to the first systematic correlation between lipid molecular structure and intraliposomal dynamics. His discovery of the nucleophilic properties of iodosylbenzoate led to reagents that can destroy the chemical warfare agents sarin and soman. More recently, he discovered lanthanide, actinide, and transition-metal catalysts that can help remediate nerve-agent contamination.

"Moss has some of the very best catalysts for the decomposition of nerve gases," Breslow says. Recognizing Moss with the Cope Scholar Award will "help remind the public that chemists play a major role in developing defenses against weapons of mass destruction," he adds.

Moss says he's proudest of the "breadth of what we have accomplished." These accomplishments have earned him numerous awards, including a National Science Foundation Creativity Award in 2007. Moss is also author or coauthor of more than 400 publications and editor or coeditor of seven books, including "Reactive Intermediate Chemistry," published in 2004. It "is the principal reference work in the field" of reactive intermediates and carbenes, Breslow says.

Moss, 69, received a B.S. degree from Brooklyn College in 1960 and M.S. and Ph.D. degrees from the University of Chicago in 1962 and 1963, respectively. After a postdoc with Breslow, Moss joined Rutgers in 1964 as an assistant professor and rose through the ranks. He retired in 2006, but with funding from NSF and the Petroleum Research Fund, he continues doing research at Rutgers as a research professor.—MAUREEN ROUHI

Eiichi Nakamura started a career based on synthetic methodology and total synthesis and has taken it far beyond the boundaries of traditional chemistry. His accomplishments are vast, beginning in the 1980s with development of homoenolate chemistry and trimethylenemethane biradical chemistry, total synthesis of steroids, and mechanistic analysis of copper-catalyzed conjugate additions, among many others. The last area "has been characterized by controversy, misunderstanding, and myopic analysis over 20 years," says Scott E. Denmark of the University of Illinois, Urbana-Champaign. "Nakamura's theoretical studies provided the first unifying picture of mechanisms of organocopper reactions."

MASAKATSU SHIBATA

Nakamura

By the 2000s, according to Iwao Ojima of the State University of New York, Stony Brook, Nakamura "started focusing on the boundaries of chemistry." Here are just some of Nakamura's contributions to biology, materials science, and single-molecule imaging: a new positron emission tomography probe based on oxygen-15 for glucose metabolism; fullerenes for DNA delivery; vesicles from fullerene anions, the only vesicles based on molecules unrelated to lipids; self-assembling nanoshuttlecock molecules; and direct observation of single molecules in motion.

Nakamura's "picturesque representations of chemistry," Ojima says, have contributed enormously "to the promotion of organic chemistry to researchers outside of chemistry."

His "groundbreaking studies and applications of organometallic reactions and his imaginative excursions into the frontiers of materials" make him richly deserving of the Cope Scholar Award, Denmark says.

Nakamura, 58, is a professor of chemistry at the University of Tokyo and the research director of the Erato Nakamura Functional Carbon Clusters Project at the Japan Science & Technology Agency. He "distinguishes himself with his rare breadth in chemical sciences and his contributions to the expansion of new territories in organic chemistry," Ojima says. He is "the single most influential scientist in his generation of Japanese organic chemists," Denmark adds.

After receiving a Ph.D. from Tokyo Institute of Technology in 1978, Nakamura spent two years as a postdoctoral associate working with Gilbert Stork at Columbia University. He joined the institute in 1980 as an assistant professor and became professor in 1993. In 1995, he moved to the University of Tokyo.

His many honors include the "Shiju Hosho" or Medal of Honor with Purple Rib-

bon from the government of Japan in 2009. When he was inducted into the American Academy of Arts & Sciences as an honorary foreign member in chemistry in 2007, he became only the second Japanese to join the elite group of 32 foreign chemists, the first being Nobel Laureate Ryoji Noyori. In 2003, he became one of the youngest recipients of the Chemical Society of Japan Award, the highest award from the society. He is an elected fellow of the American Association for the Advancement of Science and of the Royal Society of Chemistry.

Nakamura's service to the community includes stints as associate editor for *Organic Letters, Accounts of Chemical Research,* and other journals. Since April 2009, he has been serving as the first Asian associate editor of the *Journal of the American Chemical Society.* He is a member of the international organizing committee for Pacifichem 2010.—MAUREEN ROUHI

Matthew S. Sigman, a chemistry professor at the University of Utah, was nominated for developing "a superb collection of catalysts for aerobic oxidations of organic molecules," as well as for his efforts "to discern complex mechanistic relationships that are critical for rationally designing new catalysts."

DEBORAH SIGMAN

Sigman

About his interest in reaction mechanisms, Sigman says simply, "I just really want to know how things work."

Much of his research focuses on using palladium as a catalyst. In particular, he is known for developing a system to enantioselectively oxidize alcohols using a Pd(II) complex with (–)-sparteine as a ligand. Mechanistic studies showed that the (–)-sparteine serves a dual role in the catalytic system: both as a ligand on Pd and as an exogenous chiral base.

Understanding the role of the ligand led Sigman to develop additional Pd-based catalytic systems with other ligands for general aerobic alcohol oxidation. He has also worked on Pd-catalyzed olefin functionalization reactions.

Away from palladium, Sigman has also explored the use of chiral modular oxazolines for asymmetric catalytic reactions in which substrates are activated by hydrogen bonding. Exploring the mechanism of the reactions and the effect of catalyst acidity, he determined that the pK_a of the catalysts was correlated to the enantiomeric ratio of the reactions through a free energy relationship.

"While most researchers would be satisfied to publish yields and enantioselectivities from these reactions, Sigman has contributed much more to the general understanding of this type of catalysis," a colleague says. "Sigman's strong desire to add long-lasting pedagogical value to his work is both differential and deserving of esteem."

Recent work on Pd-catalyzed cross-coupling of styrenes and organostannanes has produced compounds with activity against breast cancer, so Sigman is now taking six months to work with Bryan Welm, a professor of oncological sciences at the University of Utah School of Medicine, on cancer cell biology. "I'll be learning how to take a small molecule and see what it's doing in an organism and in cells," Sigman says. "I'm excited—I haven't been in the lab too much in the last few years."

Sigman, 39, received a B.S. from Sonoma State University, in California, in 1992 and a Ph.D. in 1996 from Washington State University, where he worked with chemistry professor Bruce E. Eaton on iron-catalyzed cycloaddition reactions. He then did postdoctoral work at Harvard University, where he focused on developing catalysts for the Strecker reaction in the lab of chemistry professor Eric N. Jacobsen. Sigman joined the faculty at Utah in 1999.—JYLLIAN KEMSLEY

At age 34, **Alice Y. Ting,** Pfizer Laubach Career Development Associate Professor of Chemistry at Massachusetts Institute of Technology, has carved out a niche for herself with her groundbreaking contributions to the development of fluorescent probes to image protein interactions inside of cells.

"Since starting her independent career at MIT, Alice has quickly made her own mark in the field by developing totally different ways of specifically labeling proteins," says Sunney Xie, a professor of chemistry and chemical biology at Harvard University.

COURTESY OF ALICE TING

Ting

Specifically, Ting was cited for her development of lipoic acid ligase to site-specifically incorporate fluorescent and cross-linking probes into proteins. She is using these probes to image the AMPA (α-amino-3-hydroxyl-5-methyl-4-isoxazolepropionate) receptor, as well as other receptors.

"Her intensity and enthusiasm for science are very apparent, and it is clear that she will be a leader in the development of novel chemical approaches to investigate biological problems in vivo," says JoAnne Stubbe, Novartis Professor of Chemistry & Biology at MIT.

Ting was born in Taiwan, and at age three she immigrated to the U.S. with her parents and two younger brothers. She grew up in Dallas and attended the Texas Academy of Math & Science, where she developed an interest in organic chemistry.

She cultivated this interest as an undergraduate at Harvard University. "Alice Ting was one of the most impressive undergraduates whom I have known in more than 50 years at Harvard," says Nobel Laureate Elias J. Corey, whose organic chemistry lab Ting joined as a freshman. "She is highly intelligent, mature, and strongly motivated to do first-rate science."

Corey remembers the day Ting appeared in his office and introduced herself. "She was very poised and mature and told me she wanted to do research in my lab and that she liked chemistry," Corey says. "I was positively impressed from that very beginning."

Ting continued to impress Corey throughout the four years she worked in his lab. "Her work was outstanding for an undergraduate," Corey says. "Her written thesis was perfect; not a word had to be changed."

Ting earned a B.S. in chemistry from Harvard in 1996 and went on to receive a Ph.D. in 2000 from the University of California, Berkeley, under the mentorship of Peter G. Schultz. She completed a postdoc in Roger Y. Tsien's lab at UC San Diego. She joined the faculty at MIT in July 2002.

Ting has a long list of awards, including