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## AWARDS

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# 2001 ACS COPE AWARD WINNERS

### Recipients are recognized for contributions of major significance to organic chemistry

Following is the final set of vignettes of recipients of awards administered by the American Chemical Society in 2001. An article on Fred Basolo, 2001 Priestley Medalist, is scheduled to appear in the April 2 issue.

Included in this set of vignettes are the winners of the Arthur C. Cope Award and the Arthur C. Cope Scholar Awards. The Cope Award recognizes and encourages excellence in organic chemistry; it consists of a medal, a personal cash prize of \$25,000, and an unrestricted research grant of \$150,000 to be assigned to any university or research institution. Each Cope Scholar Award consists of \$5,000, a certificate, and an unrestricted research grant of \$40,000.

The Cope Award recipient, George Olah, will receive his award at the ACS national meeting in San Diego, April 1-5, and will give his award address during a Division of Organic Chemistry symposium at the ACS national meeting in Chicago, Aug. 26-30. The Cope Scholars will receive their awards and present lectures during the symposium in Chicago.

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### Arthur C. Cope Award

GEORGE A. OLAH promised not to rest on his laurels after winning the 1994 Nobel Prize in Chemistry, and his newest award recognizes that he has certainly kept that promise. The Arthur C. Cope Award is given for outstanding achievement in the field of organic chemistry, the significance of which has become apparent within the five years preceding the year in which the award is considered.

According to Peter J. Stang, editor of the *Journal of Organic Chemistry*, "Olah is among the very best of the most creative, original, and active contemporary practitioners of organic chemistry. He has revolutionized the field through his contributions to our understanding of reactive intermediates and especially carbocation chemistry, the preeminent reactive intermediate in all of chemistry." Stang says Olah's contributions have been made at the most fundamental level as well as the most practical levels. "His work has become a standard part of all elementary textbooks on organic chemistry and is extensively discussed in inorganic texts."



**"OLAH is among the very best of the most creative, original, and active contemporary practitioners of organic chemistry."**

In his new book, "A Life of Magic Chemistry" (New York: Wiley Interscience, 2001), Olah reflects on his life. Born and educated in Hungary,



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Olah received a Ph.D. degree from the Technical University in Budapest, where he stayed as a professor of chemistry until 1956. In October 1956, Hungary revolted against Soviet rule, but the uprising was soon put down by overwhelming force and resulted in the loss of many lives. Later that year, Olah and his wife, Judith, and their son joined the torrent of refugees from Hungary seeking a new life in the West.

Settling in Canada, Olah started working at Dow Chemical in Sarnia, Ontario. He writes that his years at Dow were "productive and rewarding." That is certainly an understatement. It was during this period in the late 1950s that his breakthrough work on long-lived stable carbocations was carried out.

Dow was a major user of Friedel-Crafts-type chemistry, including the manufacture of ethylbenzene for styrene production by reaction of benzene with ethylene. This was assumed to involve cationic intermediates, which were, however, never observed or studied. Olah changed that. He found that the key to obtaining stable, long-lived alkyl cations was in the use of superacids. Olah studied isolable complexes of acyl and subsequently alkyl fluorides with Lewis acid fluorides, including  $\text{SbF}_5$ ,  $\text{AsF}_5$ , and  $\text{PF}_5$ . In the course of his studies it was possible to follow the process by NMR spectroscopy and observe what turned out to be the first stable, long-lived alkyl cation salt: tert-butylhexafluoroantimonate.

Olah realized that the positive ions of hydrocarbons encompass not only the most prevalent trivalent ions, of which  $\text{CH}_3^+$  is parent, but also another significant class of hypercoordinate carbocations in which the carbocationic carbon is simultaneously coordinated to five or more ligands, of which  $\text{CH}_5^+$  is parent. Under stable ion conditions, it was possible to determine the structure of an ever-increasing number of diverse carbocations using NMR spectroscopy as the major tool.

In the summer of 1963, he learned that he had won the ACS Award in Petroleum Chemistry for his work on Friedel-Crafts chemistry. "It was a most welcome recognition for someone who only a few years earlier had fled his native country and started all over on a faraway continent. Although I have received numerous other awards and recognitions over the years, with the exception of the Nobel Prize, no other award touched me as much," he writes.

The study of carbocations has since been extended to that of carbocations (polycations) and varied heteroatom-substituted ions. More important, he succeeded in unifying into a single concept the existing knowledge of such seemingly diverse areas as alkyl-bridged metal alkyls, carboranes, metallocarboranes, mixed metal-carbon clusters, and metal carbides and hypercoordinate carbocations of what he calls "hypercarbon chemistry." He thus extended Kekule's concept of the limiting tetravalency of carbon to five and higher coordinate carbon chemistry.

In 1965, Olah moved back to academia as professor and chairman of the chemistry department at Western Reserve University, Cleveland. While there, he succeeded in combining the chemistry departments of Western Reserve and Case Institute of Technology in 1967. "The merging of the chemistry departments was so successful that it prompted the merger of Western Reserve University with Case Institute of Technology in 1970, forming Case Western Reserve University," he writes.

He moved to the University of Southern California in 1977 to develop a program in basic research and graduate education in hydrocarbon chemistry. With the memory of the first Arab oil embargo still fresh, it wasn't difficult to convince the trustees of the university to establish what has become the Loker Hydrocarbon Research Institute, where he has been ever since.

He says an important area of his post-Nobel research "evolved from the realization that our hydrocarbon resources, the marvelous gift of nature in the form of petroleum oil and natural gas, are finite and not renewable. With the rapidly growing population of the world, enormous pressure will be put on energy resources. We must find ways to replace our diminishing natural resources with hydrocarbons made by ourselves in a renewable economical and environmentally adaptable clean way."

He goes on to say, "Atomic energy is man's best hope for clean, practically unlimited energy for the foreseeable future; we must make it safer and solve the problems of disposal and storage of radioactive waste by-products." In addition, he believes that chemical recycling of carbon dioxide into methyl alcohol and its derivatives can increasingly play a

role and provide a renewable base for our hydrocarbon needs. This, however, necessitates much energy, which can be supplied by atomic, solar, or other alternative energy sources when our fossil fuel sources diminish. Olah and his colleagues, together with NASA's Jet Propulsion Laboratory at Caltech, also developed a revolutionary new fuel cell using methyl alcohol directly as liquid fuel.

Other recent work on superelectrophiles emerged from his previous studies on superacidic carbocationic and onium systems. It led to the realization that a variety of electrophiles capable of further interaction with strong Brønsted or Lewis acids can be greatly activated by them. Superelectrophiles--electrophiles that are doubly electron deficient--are the de facto reactive intermediates of many electrophilic reactions in superacidic systems, he says.

Olah is a member of the National Academy of Sciences and is a foreign or honorary member of other academies such as the Royal Society of London, the Italian National Academy, the Royal Society of Canada, and the Hungarian Academy of Sciences. In addition to the Nobel Prize, Olah's work has been recognized by many honors and awards. He is the winner of the ACS Award for Creative Work in Synthetic Organic Chemistry (1979), the Roger Adams Award in Organic Chemistry (1989), the Michaelson-Morley Award (1987), and the American Institute of Chemists' Chemical Pioneer Award (1993). Olah was named California Scientist of the Year in 1989. A prolific writer, Olah has published some 1,200 scientific papers. He also holds 100 patents and has been an author or coauthor of more than 15 books and monographs.--LINDA RABER

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#### Arthur C. Cope Scholar Awards

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GEOFFREY W. COATES, assistant professor of chemistry at Cornell University, says the general theme of his scientific career has been the design and development of single-site catalysts for polymerization and the use of these catalysts in the synthesis of novel polymeric materials.



**COATES** has focused on developing catalysts that can make biodegradable polymers from renewable resources.

"During my doctoral and postdoctoral studies, my research centered on studying alkene polymerization using olefin insertion and olefin metathesis catalysts," he says. "In my independent position here at Cornell, I have focused on developing catalysts that can make biodegradable polymers from renewable resources."

Coates notes that petroleum, the prime feedstock for the synthesis of commodity chemicals, is of limited supply. "It therefore seems reasonable that an important area for chemical research in the near future will be the development of new synthetic routes to bulk polymers using renewable resources," he says. "I am very pleased with our recent research concerning the synthesis of polymers from carbon dioxide as well as the synthesis of new poly(lactic acid) architectures."

Born in 1966, Coates studied chemistry as an undergraduate at Wabash College in Crawfordsville, Ind., where he graduated summa cum laude in 1989. He then carried out pioneering work as a graduate student at Stanford University with chemistry professor Robert M. Waymouth.

"Coates helped put the story of cyclopolymerization together and developed the catalyst system for making stereoblock copolymers," explains Robert H. Grubbs, a chemistry professor at California Institute of Technology. "Either of these pieces of work would qualify for one of the best theses of the past few years."

Coates received a Ph.D. degree in 1994 and then worked with Grubbs as a postdoctoral researcher until 1997. His work with Grubbs included the development of a ring-closing metathesis route for the modification of polybutadienes and a study of the way in which phenyl-perfluorophenyl stacking interactions influence photodimerization and photopolymerization reactions.

After moving to Cornell in 1997, Coates developed a new class of zinc-based catalysts that exhibit high activity and stereoselectivity for the copolymerization of CO<sub>2</sub> and epoxides. He also synthesized novel syndiotactic, heterotactic, and stereoblock poly(lactic acid) microstructures. These polymers, which have physical properties superior to those

of polymers with unordered configurations, represent a step forward in efforts to develop biodegradable plastics from renewable resources as alternatives to polymers derived from petrochemicals. More recently, Coates has developed a combinatorial strategy for the discovery of new polymerization catalysts [Angew. Chem. Int. Ed., 39, 2127 (2000)].

According to Grubbs, Coates is also an impressive writer and an outstanding research director. "He has a quiet, even style with a contagious enthusiasm for chemistry," Grubbs remarks. "He gets the best out of his students."

Coates points out that he chose to pursue an academic career at a research university because he believes that hands-on research is the best tool to educate students. "Polymerization catalysis is a particularly attractive research area since it introduces students to a wide range of chemistry topics, including organic, inorganic, and polymer chemistry," he says.

Coates has published more than 50 research papers and received several awards for his research. Last July, he was one of the invited speakers at the Frontiers of Chemistry Symposium that brought together leading young German and U.S. chemists at Kloster Seeon, near Munich, Germany.--MICHAEL FREEMANTLE

MICHAEL T. CRIMMINS, professor of chemistry at the University of North Carolina, Chapel Hill, "continues to be one of a handful of individuals worldwide who are defining the frontier of synthetic organic photochemistry," according to one of his colleagues, producing more than "a dozen total syntheses, including major syntheses of a number of formidable targets. He has made equally important contributions to synthetic methodology."



**CRIMMINS**  
continues to be one of a handful of individuals worldwide who are defining the frontier of synthetic organic photochemistry.

Others say Crimmins is best known for his work on stereoselective intramolecular photocycloadditions, which he has applied to numerous natural products. He was the first to synthesize laurenene, a structurally novel and complex terpene with a unique naturally occurring fenestrane ring system. This project required elaboration of a ring system for which there was no precedent. Crimmins' work on the project included exploration of thermal effects in photochemical reactions.

He has also addressed the area of synthesis of triquinanes, including silphinene and several pentalenenes. His work in this area explored a conjugate addition-cyclization process based on zinc homoenolates, described by one colleague as "showing considerable generality and practicality."

Crimmins' work on triquinanes also developed his insights into a model for predicting diastereoselectivity in intramolecular [2+2] photocycloadditions. This model can be used to predict not only the sense but also the magnitude, within a few percent, of diastereoselectivity.

This work was broadened to include research into double asymmetric induction in photocycloadditions as well as on the influence of hydrogen bonding on stereoselectivity. Among his latest studies on [2+2] photocycloadditions are a new approach to ginkgolides, complex compounds rich in biochemical and medicinal potential.

His total synthesis of bilobalide has been described as "simply a beautiful illustration of the fusion of mechanistic insight and careful synthetic planning, exhibiting a rich collection of strategic considerations applied with panache." Involving some 17 steps from 3-furaldehyde, this synthesis is considered one of the best in an active research field.

He also worked out the first total synthesis of milbemycin D, one of a class of molecules of biochemical significance, particularly in connection with the treatment of human and animal parasitic diseases. Emerging from this work are novel practical methods for formation of spiroketals, which are useful in the synthesis of the spiroketal subunit of spongistatin, one of the medically important group of antitumor compounds.

He has developed procedures for initiating fragmentations or rearrangements of strained rings. One example is his synthesis of lubimonol, in which a 5-4-5 fused tricyclic system is rearranged and fragmented to a 5-6 spirocyclic system in one step.

And recent work has also involved the short and efficient enantioselective syntheses of antiviral carbocyclic nucleosides (–)-carbovir and (–)-1592U89 (abacavir), which combine

absolute acyclic stereocontrol with an olefin metathesis reaction to prepare enantiomerically enriched carbocycles and heterocycles. An extension of the strategy of combining asymmetric aldol addition with olefin metathesis has resulted in an efficient enantioselective synthesis of six- to nine-membered oxygen heterocycles, a fundamentally new approach to the synthesis of medium-ring ethers.

By utilizing an acyclic conformational constraint, Crimmins has achieved highly efficient ring-closing metathesis reactions of eight- and nine-membered cyclic ethers without cyclic conformational constraints, leading to syntheses of marine metabolites (+)-laurencin and (+)-prelaureatin, an approach of great general value in the construction of a variety of useful chiral synthons.

Current research grants from the National Institutes of Health are supporting his work in asymmetric synthesis of polyketides and of medium-ring ethers.

Crimmins, an Illinois native, earned a B.A. degree in 1976 from Hendrix College, Conway, Ark. That was followed by a Ph.D. degree in chemistry at Duke University in 1980. A year as a postdoc at California Institute of Technology followed in 1981.

In 1981, he joined the faculty at UNC Chapel Hill as an assistant professor. He was appointed a full professor in 1993. He has also served one year as a visiting associate professor at nearby Duke. In addition to his current status as professor in the department of chemistry, he has, for the past five years, served as the department's vice chairman of graduate studies.

Crimmins also is a dedicated teacher. Among his many honors are the "senior-class favorite faculty award" and the Tanner Faculty Award for excellence in undergraduate teaching, one of only five granted in 1999 at Chapel Hill.

According to one observer, he is considered an outstanding graduate student mentor. "His students always give star performances on their oral exams, and new Ph.D.s are highly sought after both by industry and as postdocs," one colleague says. "Crimmins is a superb classroom teacher. Sophomore students clamor to sign up for Mike's introductory organic chemistry course. He delivers exceptionally clear, well-organized lectures. He is sympathetic but at the same time has high expectations of students. At the graduate level, his lectures are up-to-date--no yellowed notes!"--PATRICIA SHORT

"One of the most productive polymer scientists in the world" is how a colleague describes JEAN M. J. FRÉCHET, a professor of chemistry at the University of California, Berkeley. The claim does not seem exaggerated. Author of more than 500 publications and coinventor on more than 50 issued U.S. patents, Fréchet has conducted research at the forefront of organic, macromolecular, and materials chemistry and has established himself as a leader in the area of synthetic polymers.



**FRÉCHET is one of the world's most productive polymer scientists, conducting research at the forefront of organic, macromolecular, and materials chemistry.**

Fréchet was born in Chalon sur Saône, France. He earned an ingénieur-chimiste degree from the Institut de Chimie et Physique Industrielles, in Lyon, and M.S. and Ph.D. degrees in chemistry from both Syracuse University and the State University of New York College of Environmental Science & Forestry. His early work in the 1970s as an assistant professor at the University of Ottawa, in Ontario, involved the design and synthesis of heterogeneous reagents, protecting groups, catalysts, and chiral auxiliaries on polymer supports. This research is the basis for much of the polymer-bound or "bead-based" combinatorial synthesis work that takes place today.

In 1979, as a visiting scientist at IBM Research Laboratory, San Jose, Calif., Fréchet collaborated with other scientists to develop the chemical amplification concept for polymer resist imaging. The concept has had a major impact on the fields of imaging materials, photopolymers, and microlithography, and products based on this chemistry are now manufactured worldwide. One such family of products is the Pentium computer processors.

Since the original collaboration, Fréchet has followed up the development with another general approach to polymer imaging through the photogeneration of catalytic amounts of base in functional polymer coatings. He has also proposed the idea of individually addressable macromolecules for molecule-based data and information storage.

Fréchet joined Cornell University in 1987 and expanded his work on functional polymers

with the development of the convergent route to dendrimers, which allows precise placement of functional groups at any location within the dendrimers. This research led to unprecedented polymer architectures such as spherical block copolymers, globular-linear macromolecules, and self-assembling films.

According to a colleague, "Fréchet and his group have probably contributed more than any other group to the physical characterization and development of applications of dendritic macromolecules." The unique properties of dendrimers have prompted Fréchet's group and others to explore applications including biological mimics; drug delivery systems; imaging agents; immunoassays; components of gene therapy systems; rheology control agents; enhanced adhesives; electronic, display, and storage components; and molecular devices.

Another area of exploration for Fréchet has been hydrogen bonding as the driving force for self-assembly of complex liquid-crystalline polymers from simple polymeric donor and small-molecule acceptor moieties. The approach has been used to create nematic displays, ferroelectric displays, and optical switches; its use for commercial production of displays is currently being investigated.

Fréchet has also designed and demonstrated the use of several new types of polymer supports and separation and molecular recognition media based on functional polymers. One novel monolithic macroporous medium, a substitute for classical particulate silica or polymer beads, enables the rapid separation of biological molecules such as proteins or synthetic polymers that differ in only one of a thousand repeat units. Among the other applications of the monolithic medium are highly efficient bioreactors, chiral recognition processes, the fast determination of relative polymer molecular weights, and a new type of capillary electrochromatography.

Fréchet has received many awards: the IUPAC Canadian National Committee Award in 1983; the Polymer Society of Japan Lecture Award in 1986; and ACS's A. K. Doolittle Award in 1986, Cooperative Research Award in Polymer Science in 1994, Award in Applied Polymer Science in 1996, and Award in Polymer Chemistry in 2000. Last year he also was elected to the National Academy of Engineering, the American Academy of Arts & Sciences, and the National Academy of Sciences. In addition, Fréchet serves as a consultant in organic and polymer chemistry for numerous major corporations and has been active recently with several high-tech start-up companies.--DEANNA MILLER

MURRAY GOODMAN, a professor of chemistry and biochemistry at the University of California, San Diego, already had an impressive list of honors earned during his distinguished career in chemistry even before receiving the Cope Scholar Award.

Some of those honors include honorary doctorates from the City University of New York's College of Staten Island and the University of Ioannina, Greece; the Pierce Award of the American Peptide Society (1989); the ACS Ralph F. Hirschmann Award in Peptide Chemistry (1997); the Chemical Pioneer Award of the American Institute of Chemists (1997); and the Herman Mark Award of the ACS Division of Polymer Chemistry. And he has more than 450 research papers divided among areas of organic synthesis, peptide chemistry, conformational studies, and biological evaluation of peptides and peptidomimetics along with one textbook, "Organic Molecules in Action," which he coauthored.



**GOODMAN's work has been a blend of synthesis, spectroscopy, computer modeling, and bioassays in the syntheses of peptides and peptidomimetics.**

He has been at UCSD since 1970, when he took up a post as professor of chemistry. From 1972 to 1974, he was acting provost of Revelle College, the first undergraduate component of UCSD. He chaired the chemistry department at UCSD from 1976 to 1981.

Goodman was a founding member of the National Institutes of Health Study Section on Bioorganic & Natural Products Chemistry; he also chaired the NIH Study Section on Medicinal Chemistry. He has served on the U.S. National Committee for the International Union of Pure & Applied Chemistry and chaired the Chemistry Section of the American Association for the Advancement of Science. He is the founding editor and remains editor-in-chief of the Biopolymers family of journals.

Goodman has also found the time to be what one colleague describes as "a superb mentor" for UCSD young faculty as well as for his Ph.D. students and postdocs.

He started his chemical studies at Brooklyn College, in New York, where he earned a B.S. degree in 1950. He obtained a Ph.D. degree in chemistry in 1953 from the University of

California, Berkeley, where he worked on tracer techniques and the chemical mechanism of photosynthesis. This was followed by postdoc research on peptide synthesis at Massachusetts Institute of Technology and additional work in synthetic nucleotides and peptide natural products at the University of Cambridge.

Goodman joined the faculty of Polytechnic Institute of Brooklyn as an assistant professor in 1956, becoming associate professor in 1960 and full professor in 1964. He was named director of the Polymer Research Institute there three years later, and it was from that post that he moved to UCSD.

According to one colleague, his work has involved an integration of original ideas and a "beautiful blend of synthesis, spectroscopy, computer modeling, and bioassays" for the syntheses of new peptides and peptidomimetics. Some of this work has addressed fundamentally important problems such as the molecular basis for taste, the complexity of opiate-receptor interactions, and the conformational analysis of biomolecules.

Goodman is largely responsible for the concept of incorporating conformationally constrained amino acids into biologically active peptides as an important method of examining and improving peptide-based drug structures, another colleague says. This method can optimize the population of possible conformations, assisting in conformational analysis, and can identify the required pharmacophoric groups and thus enable researchers to generate potent and receptor-specific ligands. It also can lead to the protection of the molecular structure as a whole from metabolic degradation.

In the 1960s, his group developed a stepwise approach for the synthesis of linear oligopeptides as models of protein conformations. He uncovered the "active monomer" mechanism of the N-carboxyanhydride polymerization procedure and elucidated the detailed mechanism of racemization in peptide synthesis. He isolated the first crystalline oxazolinone, the intermediate leading to most racemizations during peptide synthesis.

His group was one of the first to use NMR techniques to study oligopeptide conformations in solution, helping to develop spectroscopic methods including NMR and circular dichroism, which are now widely used in deducing secondary structures in proteins. Goodman was the first organic and biopolymer researcher to employ fluorinated solvents such as trifluoroethanol, hexafluoroisopropanol, and hexafluoroacetone hydrates to study molecular conformations in solution. Among his observations in the area of biophysical studies are the importance of aromatic side chain interactions in influencing peptide secondary structures and the contribution of helix dipoles to helix initiation and stability.

Bioactive peptides and peptidomimetics have been a focus of the Goodman group. By reversing the direction of an intervening peptide bond, Goodman was able to show that the systematic peptide bond reversal could serve as a sensitive test of the topological requirements of the protein receptor and that the retro-inverso analogs could be made resistant to enzymatic degradation in vivo.

More recent work has explored the triple helices formed under certain conditions by the peptidomimetic class of synthetic collagen-like monodisperse structures. The 15 papers and two patents resulting from this research focus on the synthesis of novel triple helical structures with exciting applications as biomaterials.

Goodman "has accomplished the synthesis of numerous complex unnatural amino acids and related products that are now taken for granted because most of us forgot who first made these. Murray has also developed many useful reagents that we use on a daily basis," a colleague says. Among them are novel chiral  $\alpha$ -amino acids and a new class of guanidinylation reagents, urethane-protected triflylguanidines, used to create new bioactive molecules.

As one colleague puts it, "His career is marked by a continuous stream of innovative advancements in bioorganic chemistry and related areas."--PATRICIA SHORT

It's just as well that a summer stint at General Motors sent JEFFERY W. KELLY fleeing from the field of engineering. The unhappy experience freed him to rekindle his interest in chemistry, first piqued by an inspiring high school teacher. Undergraduate research at the State University of New York, Fredonia, intensified his passion, and Kelly went on to pursue graduate studies in physical organic and synthetic chemistry at the University of North Carolina, Chapel Hill.



**KELLY uses spectroscopy and related methods to characterize and probe structure-function relationships in proteins.**

Kelly is now Lita Annenberg Hazen Professor of Chemistry at Scripps Research Institute and has changed his research focus quite a bit from those early days. "My lab is much more biophysical than most chemistry labs," he says. His group of 15 graduate students and postdocs uses spectroscopy and related methods to characterize and probe structure-function relationships in proteins. Using the knowledge gained, the group designs small molecules that can interact with and manipulate the properties of the macromolecules.

The lab's identification of the key role of protein misfolding or partial denaturation and assembly in human neurodegenerative diseases "has had a huge effect on numerous disciplines, including the neurodegenerative diseases and biomaterials," one colleague writes. Indeed, Kelly says he is most proud of his work on developing novel therapeutic approaches to human amyloid diseases, which are characterized by the presence of clumps of protein near dead or dying neurons.

"We've designed small organic molecules that prevent conformational changes in proteins that lead to pathology," he says. "We work on orphan diseases that pharmaceutical companies aren't interested in. Industry is vigorously pursuing approaches to Alzheimer's disease, but there are 19 other amyloid diseases with significant numbers of patients."

To keep his enthusiasm level high, Kelly tries to start new research projects about every five years. So while work related to amyloid diseases is continuing in his lab, the group also is exploring the use of small molecules to change the course of protein excretion from cells. "We're working with colleagues from cell biology to address certain defects in protein production and excretion," he says.

Such collaborations are typical of Scripps, Kelly notes. His move there three years ago from Texas A&M University, where he had risen through the ranks from assistant to full professor, "enabled me to be a much more versatile scientist. There are no departmental boundaries here. Cell biologists and X-ray crystallographers are all mixed in with the chemists. There's a lot of synergy," he says.

Kelly was born in Medina, N.Y., in 1960. He earned his B.S. degree in chemistry from SUNY Fredonia in 1982 and his Ph.D. degree at UNC in 1986, working there with chemistry professor Slayton A. Evans Jr. After postdoctoral studies at Rockefeller University with E. Thomas Kaiser, he joined Texas A&M in 1989 and moved to Scripps in 1997.

Kelly doesn't have as much time as he'd like to pursue his interests in running and in racing vintage cars, but he still manages to hit the racetrack in his 1974 Porsche a few weekends a year.

Other honors Kelly has received include the Biophysical Society's National Lecturer Award and the Protein Society's DuPont Young Investigator Award, both in 1999. He won a Camille Dreyfus Teacher-Scholar Award in 1994 and was a Searle Scholar from 1991 to 1994. He has served the scientific community in many roles, including chairing the National Institutes of Health's Bioorganic & Natural Products Study Section.--PAMELA ZURER

If two's company and three's a crowd, then JOHN MONTGOMERY's signature reactions are crowded. But there's nothing unruly or chaotic about them. He devises transition-metal-catalyzed processes that permit three reactive components to combine efficiently, chemoselectively, and stereoselectively. For example, a nickel-catalyzed [2+2+2] cycloaddition reaction allows two rings and four contiguous stereocenters to be introduced in a single step.



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Montgomery is an associate professor of chemistry at Wayne State University, Detroit, and his work there has focused on applications of organonickel chemistry in reaction discovery, synthetic methodology development, total synthesis, and structural organometallic chemistry as well as on development of new methods for the synthesis of amino acids using nitroacetates as glycine templates.

He accepted a faculty position at Wayne State in 1993 after receiving his Ph.D. degree in organic chemistry under Louis S. Hegeudus at Colorado State University in 1991 and completing a postdoc with Larry E. Overman at the University of California, Irvine. In his relatively short independent career, Montgomery has made a name for himself as a "first-rate scientist who has had a significant impact on chemistry," according to a colleague. He has "brought together the elements of a successful and promising contemporary research program, an insightful amalgamation of transition-metal chemistry, synthetic methods, and strategies with a high level of innovation."

Montgomery is known especially for his contributions to nickel chemistry. He developed a new area involving the combination of organozinc and organonickel chemistry in which the reductive coupling of doubly unsaturated organic molecules is the central synthetic feature. The work provides a direct and efficient method for creating exocyclic double bonds in a stereoselective manner, which is a long-standing and significant problem in synthetic organic chemistry. The three-body reactant scenarios are an offshoot of this work and just one aspect his group is pursuing.

More recently, Montgomery has focused on complex synthetic applications of the nickel-catalyzed reactions discovered in his group. Indeed, in 1999 he published total or formal syntheses of members of the pumiliotoxin, kainoid, and triquinane families of natural products. He has also recently developed a new approach for the synthesis of unnatural amino acids that allows four types of diversity to be incorporated in the end structures. Montgomery's work in this area will likely have applications in combinatorial chemistry and in the preparation of compounds with multiple isotopic labels.

In addition to establishing a productive research group, Montgomery has demonstrated prowess as an educator and a colleague. He teaches regular and honors introductory organic courses as well as special topics courses. Montgomery generally supervises at least two undergraduates in his lab, and several of these students have produced publishable results. This attention to undergraduate research is not surprising--Montgomery says his own undergraduate research experience in organometallic chemistry at the University of North Carolina, Chapel Hill, with Maurice S. Brookhart and Joseph L. Templeton is the primary reason he chose to pursue a career in chemistry.

Montgomery has received the Camille Dreyfus Teacher-Scholar Award (1998), a National Science Foundation CAREER Award (1996-00), and a 3M New Faculty Award (1996-98); at Wayne State, he has received both research and teaching awards. As another colleague puts it, Montgomery "appears to be a solid bet for a position of leadership in the field for years to come."--ROBIN GIROUX

It's life in the fast lane--the study of it, at least--that appeals most to MATTHEW S. PLATZ, Melvin S. Newman Professor of Chemistry at Ohio State University.

"I am interested in the chemistry of short-lived, high-energy, reactive molecules such as radicals, biradicals, carbenes, nitrenes, and highly strained alkenes," Platz says.

Platz's early work in high-speed chemistry was done in the generation, characterization, and chemistry of biradicals such as m-xylylene, a realm in which he utilized the techniques of electron spin resonance spectrometry and laser flash photolysis.

He also has made a name for himself in the field of carbene chemistry. "Prior to Platz's work, our understanding of the reactivity of carbenes and related species was relatively poor," according to chemistry professor emeritus Kenneth B. Wiberg, of Yale University. At the time of Platz's research, it was widely thought that simple carbenes had such short life spans that they couldn't be studied directly. But Platz disproved that notion.

"His observation that pyridine would form a ylide with some reasonable lifetime provided the key to unraveling much of carbene chemistry," Wiberg says.

And according to OSU colleague David J. Hart, Platz's pyridine-ylide method, developed in the early 1990s with then-postdoctoral fellow Ned Jackson, remains "the only method available for studying the absolute reactivity of simple carbenes and has become a standard tool in laboratories throughout the world that study carbenes by flash photolysis."

Another concentration for Platz and his group has been nitrene chemistry, specifically the photochemistry and thermal chemistry of phenylazide, in which they have made numerous achievements.

Platz and OSU colleague Terry A. Miller explained how photolysis of phenylazide forms a singlet nitrene, which, in the gas phase, is born vibrationally hot and rearranges to form cyanocyclopentadiene in an endothermic reaction. From there, the nitrile sheds a hydrogen atom to become a radical. Prior to this work, scientists had mistakenly assigned the radical's spectrum to the nitrene, but the new observation made it possible to identify the transient species formed in solution.

Platz and OSU professor Nina Gritsan then demonstrated that 2,6-difluorination of phenylazide would extend the lifetime of the singlet nitrene to 20–200 nanoseconds, which is long enough to chemically trap the intermediate, nitrene, Hart explains, adding that "the work has major implications for the design of photoaffinity labeling reagents for use as biological probes."

"We are also heavily involved in using photochemistry to develop new biotechnology," Platz says. More specifically, he and his research group have been working on ways to use photochemistry to inactivate viruses such as HIV and hepatitis from donated blood and tissues for transplantation. "The odds of HIV viral transmission in transfusion medicine have been estimated as one in every million units of blood product," Platz says.

In collaboration with industry chemists, primarily former OSU undergraduate Raymond P. Goodrich, he is working on methods to inactivate the virus without compromising the blood. Platz has created sensitizers that selectively bind nucleic acids in the virus and generate aryl radicals when excited with 365-nm light, a process that, according to Hart, activates the sensitizer-virus complex, generates radicals, and inactivates the virus.

"To simulate the worst-case scenario in a blood bank, Platz and Goodrich have deliberately spiked a unit of platelet concentrates with a million particles of HIV," Hart adds.

"Following the addition of 100  $\mu$ g per mL of sensitizer and photolysis, they were able to completely inactivate the HIV and recover platelets with excellent in vitro properties."

Before joining Ohio State in 1978, Platz completed two bachelor's degrees in 1973, one in mathematics and one in chemistry, from the State University of New York, Albany, and a Ph.D. degree in chemistry in 1977 from Yale University. He conducted postdoctoral work at the University of Chicago in 1977 and 1978.

OSU has recognized his work through its Distinguished Scholar Award (1987) and Outstanding Teaching Award for the College of Arts & Sciences (1993). Other awards include an Alfred P. Sloan Fellowship (1983) and a Camille & Henry Dreyfus



**PLATZ'S** interests are in the chemistry of short-lived, high-energy, reactive molecules such as radicals, biradicals, carbenes, nitrenes, and highly strained alkenes.

Teacher-Scholar Award (1985).

Platz has published almost 200 research papers, close to half of them in the Journal of the American Chemical Society, and he has given more than 160 invited lectures around the world. In addition to his work at OSU, Platz teaches organic chemistry a few days each week at Centennial High School in Columbus.--KEVIN MACDERMOTT

Science was always a strong point in NICOLE S. SAMPSON's family, according to the associate professor of chemistry at the State University of New York, Stony Brook. One grandfather was a nuclear physicist, her mother is a structural engineer, and her father is an M.D. with a degree in physics. "My father made sure I understood what an atom was at a young age," she says.



**SAMPSON** uses organic synthesis, spectroscopy, and kinetics to answer fundamental questions in molecular biology.

It was early in high school that Sampson first was exposed to chemistry as a discipline. Then while majoring in chemistry at Harvey Mudd College in Claremont, Calif., she was advised that working in a research lab as an undergraduate was a good way to check out possible future graduate research advisers. That advice paid off, for after spending a summer with chemistry professor Paul A. Bartlett's group at the University of California, Berkeley, she returned to Berkeley for graduate school. There she studied synthetic organic chemistry with Bartlett, obtaining her Ph.D. degree in 1990. After a postdoctoral fellowship with Jeremy R. Knowles at Harvard University, she joined SUNY Stony Brook as an assistant professor in 1993.

Sampson's current research focuses on proteins. "We are using chemistry to answer very biological questions," she says. "The techniques come from chemistry--organic synthesis, spectroscopy, and kinetics, for example. We also use a lot of molecular biology, which some would argue really is chemistry." Sampson spent the 1999-00 academic year on sabbatical leave at Biogen in Cambridge, Mass., learning biological techniques.

In one project, Sampson's group is exploring protein-protein interactions in mammalian fertilization. Using photochemical labeling, her group has identified the receptor on the surface of eggs for the protein fertilin $\beta$ , which is found on the outer surface of sperm. The group has designed and synthesized small molecules that inhibit egg-sperm binding in mice. And she hopes to probe the effects of their inhibitors not just on the cell, but also on cell signaling.

"The fertilization area is an important topic that wasn't being researched by chemists, that had been virtually abandoned, although biologists had recently made important discoveries," Sampson says. "I'm excited about developing things in the lab that could impact cell biology."

Chemists familiar with Sampson's work praise her ability to pick important areas of inquiry, then draw on all available methods to carry out her investigations. "Her confident use of just the right technique, from X-ray crystallography to parallax-quench, and from site-directed mutagenesis to NMR, gives her work a quality that is all too rare," one admirer writes. "She poses the critical question and then designs the right experiment exquisitely to answer it. As a result, her work will be more widely cited and will have a lasting quality that is properly denied to those who merely collect data."

Among her honors, Sampson has received a Camille & Henry Dreyfus Foundation New Faculty Award, a National Institutes of Health FIRST Award, and a National Science Foundation CAREER Award. Her interests outside chemistry center on water--a lifelong swimmer, she more recently took up windsurfing.--PAMELA ZURER

Massachusetts Institute of Technology chemist RICHARD R. SCHROCK continues his string of honors for his work in organometallic chemistry. As this latest award indicates, his contributions are numerous and impressive and they have strongly influenced the progress of synthetic organic chemistry over the past two decades.



**SCHROCK's** work to develop organometallic polymerization catalysts has strongly influenced the progress of synthetic organic chemistry.

According to one colleague, "It is clear that, without his accomplishments, the area of organic chemistry, and, in particular, organic synthesis, would be far different."

Schrock is being recognized first for his pioneering development of catalysts for olefin ring-closing metathesis. He has synthesized a large number of alkylidene complexes, usually containing tungsten or molybdenum, that permit the preparation of increasingly complex molecules with superb levels of efficiency and selectivity. An extremely important application of these catalysts is the synthesis of small, enantiomerically pure organic molecules from racemic or meso precursors.

Schrock has also contributed significantly to the field of ring-opening metathesis polymerization (ROMP), which is the synthesis of ordered polymers containing organic or inorganic semiconductors, metal clusters, polyenes, and others from cyclic olefins such as norbornenes. This is done in what is termed a "living manner," in which there is no chain termination or chain transfer, that yields low polydispersity polymers with molecular weights of 100,000 or more. Recent research also includes the development of new ligand systems to stabilize early transition metals for the living polymerization of simple olefins, such as 1-hexene.

Furthermore, the impact of these discoveries is moving beyond the laboratory into industrial use. Some of the molybdenum complexes for asymmetric metathesis are becoming available commercially, and more are being developed. "These developments are clear and true testimony that Schrock's contributions to organic chemistry have an impact that reaches beyond the exclusive wall of academic experts," a colleague writes.

Another area of interest is the reduction of dinitrogen. Schrock's ultimate goal in this research is to study methods of activating and reducing dinitrogen using protons and electrons. Using new multidentate di- or triamido ligand complexes, he has explored the reactions of vanadium, molybdenum, tungsten, and rhenium that are relevant to dinitrogen activation.

Schrock received his undergraduate degree in 1967 from the University of California, Riverside, and a Ph.D. degree in 1971 from Harvard University. He spent a year as an NSF postdoctoral fellow at the University of Cambridge and worked several years at DuPont Central Research & Development. He joined the faculty at MIT in 1975, became a full professor in 1980, and was named Frederick G. Keyes Professor of Chemistry in 1989.

In addition to this award, Schrock has received the ACS Award in Inorganic Chemistry (1996), the ACS Award in Organometallic Chemistry (1985), and the Harrison Howe Award from the ACS Rochester Section (1990). He has been an Alfred P. Sloan Fellow and a Camille & Henry Dreyfus Teacher-Scholar. Schrock has also been elected to both the National Academy of Sciences and the American Academy of Arts & Sciences. He was associate editor of *Organometallics* for eight years and has published more than 350 research papers.--DAVID HANSON

VICTOR A. SNIECKUS, the Alfred R. Bader Chair in Organic Chemistry at Queen's University, Kingston, Ontario, has "revolutionized synthetic aromatic chemistry and made chemists think in nonelectrophilic substitution paths," notes a colleague in summarizing the award winner's wide influence in the organic chemistry field. His work has also greatly enhanced the stature of Canadian research and influenced promotion of the academic-industrial interface.



**SNIECKUS'** metalation reactions are a key concept in aromatic and heteroaromatic synthesis.

"The Cope Scholar Award comes from having a group of talented young students working with me--they alone are my reward, especially when I see their accomplishments in Canada and internationally," Snieckus says. "It is a wonderful encouragement for doing what we love most: discovering new synthetic reactions and making them useful."

In the late 1970s, Snieckus set the groundwork that led to the emergence of the directed

o-metalation (DoM) reaction as a key concept in aromatic and heteroaromatic synthesis. His research has led to the discovery of new metalation methodologies and their inventive use in total syntheses. Highlights of the work done by the Snieckus laboratory include the now widely applied silicon protection tactic of reactive aromatic C–H sites, one-pot tandem DoM processes, and anionic equivalents of Friedel-Crafts and Fries rearrangement reactions.

Building on the early work, Snieckus linked the DoM strategy with transition-metal-catalyzed cross-coupling reactions and, for the first time, demonstrated the combined metalation-Suzuki tactic. This work also yielded other novel cross-coupling reactions involving aryl O-carbamates and S-thiocarbamates with Grignard reagents. More recently, he devised a directed remote metalation reaction for diaryl amides and O-carbamates, a theme that has recast the conceptual framework for diverse aromatic and heterocyclic synthesis.

These strategies have been utilized by his research group to yield a wide range of natural products as well as by synthetic chemists in academia and industry. An industrial colleague notes, "In our business, when someone says, 'Let's do it by Snieckus chemistry,' everyone knows exactly what that means."

His current focus includes the direct synthesis of planar chiral ferrocene and the application of these ligands in enantioselective catalysis and in new connections of DoM to metathesis and other modern metal-mediated protocols.

Snieckus was born in 1937 in Kaunas, Lithuania, and spent his childhood in Germany during World War II before immigrating to Canada in 1948. He received a B.S. (honors) degree from the University of Alberta in 1959; an M.S. degree from the University of California, Berkeley, in 1961; and a Ph.D. degree in organic chemistry from the University of Oregon in 1965.

After a one-year postdoctoral study at the National Research Council in Ottawa, Snieckus joined the faculty at the University of Waterloo, in Ontario. He was the Monsanto/NSERC Industrial Research Chairman from 1992 to 1998 before moving to Queen's University.

Among his honors are the Canadian Society for Chemistry's Alfred Bader Award in Organic Chemistry (1993) and the R. U. Lemieux Award in Organic Chemistry (1997). He also received the Humboldt Research Award from the Alexander von Humboldt Foundation (1996). In 2000, he received the prestigious Canadian Killam Research Fellowship in recognition of his contribution to Canadian scholarship as well as the Award in Heterocyclic Chemistry of the International Society of Heterocyclic Chemistry.

Snieckus currently serves as editor for Synlett and the Canadian Journal of Chemistry. Outside of the laboratory, he delights in teaching, including short courses to medicinal and process chemists. He also enjoys playing hockey with his research group, jazz, and the history of chemistry in, he quips, "inverse order as I get older."--SUSAN MORRISSEY

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## Passer Education Grants available

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Passer education grants provide support for teachers in small programs at two- and four-year colleges that do not have advanced degree programs in the chemical sciences. The awards support continuing education activities that must be directly related to the applicant's teaching and takes them away from their campus. The applicant must be a full-time faculty member. There is no formal application form, but the grant seeker must include a description of the proposed activity and how it relates to the applicant's teaching. The proposal must include dates, locations, titles, and contacts for the proposed activity; a brief description of the applicant's institution and department; a short C.V.; an itemized estimate of expenses; the amount of aid requested; and sources of all supplemental funds.

Closing dates are Jan. 1, April 1, and Sept. 1. For further information, contact Donald E. Jones, 3726 Connecticut Ave., N.W., Apt. 108, Washington, DC 20008; e-mail: [djones@erols.com](mailto:djones@erols.com).

The grants are made possible through a donation of Dorothy & Moses (Mike) Passer.

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Moses Passer, who passed away in 1999, was for many years the head of the ACS Education Division. All applications receive committee review.

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