ACS 1996 National Award Winners

Following are the first 11 vignettes of recipients of awards administered by the American Chemical Society. Winners will receive their awards during the 211th ACS national meeting in New Orleans, with the exception of the Cope Medalist and the Cope Scholars, who will receive their awards at the 212th ACS national meeting in Orlando, Fla., during the Arthur C. Cope Symposium. The awards in New Orleans will be presented at a banquet on Tuesday, March 26.

Vignettes of the remaining awardees will appear in successive January and February issues of C&EN.

ACS Award for Computers in Chemical & Pharmaceutical Research

Sponsored by IBM North America, Technical Systems & Solutions

If a computer modeling program has assisted your research or development work, chances are that you have **NORMAN L. ALLINGER** to thank.

Allinger has combined a firm grounding in synthetic organic chemistry with an interest in, and an ability to use, computers to enhance research. He has been a pioneer in making computational chemistry, particularly molecular mechanics, an integral part of experimental research. From his 1959 paper in which he included the computer program he developed to calculate the dipole moment of norbornylene to his series of quantum mechanics programs, Allinger's contributions have made it possible for chemists in many fields to further their experimental work. And Allinger's work has made it possible for pharmaceutical, agricultural, polymer, and biotechnology companies to set up computer design programs.

A colleague credits Allinger with "a remarkable ability to interpret the validity of experimental results" and calls MM2 and MM3—Allinger's molecular mechanics programs—the "de facto standards in this field." Allinger's force-field method for calculating molecular interactions is used in many of the current molecular modeling programs.

Recognized as a founder of the field of computational chemistry, Allinger is a research professor of chemistry and director of the Computational Center for Molecular Structure & Design at the University of Georgia, Athens. He is the founder and editor of the *Journal of Computational Chemistry*.

Following early research in natural products, including the first use of nuclear magnetic spectrometry in the determination of the molecular structure of an organic natural product, Allinger became interested in conformational analysis. He published a series of papers, beginning in 1958, in which he emphasized the use of spectroscopic methods to study molecular structure. Much of this work was summarized in the 1965 book "Conformational Analysis," which Allinger coauthored with Ernest L. Eliel, S. J. Angyar, and George A. Morrison.

In the early 1960s, Allinger began to apply quantum mechanics to practical problems in organic chemistry. And as computers became more powerful, he put them to use in quantum calculations of molecular properties such as electronic spectra, optical rotary dispersion, and other properties related to molecular conformation. In the mid-1960s, Allinger turned his attention to molecular mechanics—an empirical method for calculating the structures and properties of molecules. Today, says a colleague, he is considered the preeminent expert in that field.

Allinger also has maintained his dedication to teaching, not only at the university level, but in workshops and professional-level short courses as well.

Allinger received a B.S. degree in chemistry from the University of California, Berkeley, in 1951, and a Ph.D. degree in chemistry in 1954 from the University of California, Los Angeles. After postdoctoral work at UCLA and Harvard, he joined the chemistry department of Wayne State University, Detroit, in 1956. In 1969, Allinger moved to the University of Georgia as a chemistry professor.

Recognition for his contributions has come from many sources. Two of Allinger's publications have been listed as citation classics by *Current Contents*, meaning each has been cited more than 500 times in other publications. He has received national and regional ACS awards—including an Alfred P. Sloan Research Fellowship (1958–60), the Herty Medal (1982), the Arthur C. Cope Scholar Award (1988), and the James Flack Norris Award in Physical Organic Chemistry (1989). Allinger is an honorary member of the Serbian Chemical Society, and he received an honorary doctorate from the Russian Academy of Sciences. In 1994, he was named a Chemical Pioneer of the American Institute of Chemists.

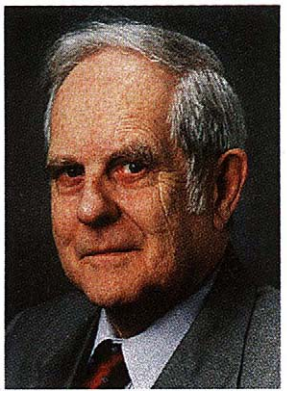
ACS Award for Creative Advances in Environmental Science & Technology

Sponsored by Air Products & Chemicals Inc.

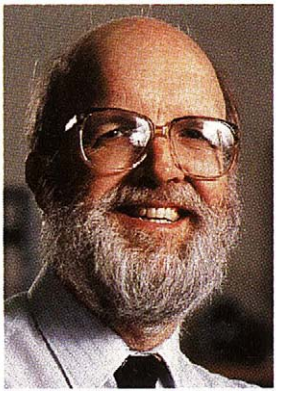
DONALD STEDMAN, Brainerd Phillipson Professor of Chemistry at the University of Denver, is known for a passel of environmentally related accomplishments, especially for inventing and demonstrating a new "vehicular remote-sensing device" that measures tailpipe emissions of carbon monoxide, nitrogen oxide, and hydrocarbons from automobiles. The new device could be a cost-effective tool for allowing state agencies to monitor and enforce regulations concerning automobile tailpipe emissions.

Research that led to development of the new remote-sensing device confirmed that 10% of all cars in the U.S. are "gross polluters"—accounting for half the total automotive pollution. The Environmental Protection Agency has not yet made use of the device mandatory, but the equipment has proven itself in many tests in both the U.S. and abroad.

The system Stedman invented is a setup that projects ultraviolet and infrared beams at tailpipe level across a



Allinger



Stedman

Seppelt

road to a receptor. The infrared absorption caused by the emissions is determined via separate bandpass filters and the results are digitized by computer. As vehicles pass the setup, their license plates can be videotaped. With this information, regulators can inform drivers whether their vehicles passed the emissions inspection.

Stedman's collaborators on development of the device included chemists Gary A. Bishop, James E. Peterson, Theresa J. Hosick, and Paul L. Guenther, all at the University of Denver. Bishop and Stedman share two patents on the device. Stedman developed the optics and Bishop the computer hardware and software. The technique is touted as a cost-beneficial way of testing auto emissions under the Clean Air Act. By both measuring the emissions and videotaping the license plates of passing vehicles, the method might replace required periodic, labor-intensive visits to service garages. Cost per test is estimated at 50 cents per vehicle. The system has so far measured the exhausts of more than a million automobiles in different parts of the world.

Stedman's other achievements include work that led University of Michigan graduate student Chris Cantrell to invent an atmospheric free-radical detector. Called a chemical amplifier, it measures the concentration sums of peroxy radicals $[HO_2]+[RO_2]$ in the atmosphere. Measurements of these radicals, along with [NO], provide a direct estimate of the rate of in situ formation of atmospheric ozone. Stedman also developed a technique to measure toxic nickel carbonyl in workplace environments.

Stedman is a member of the American Chemical Society, the American Geophysical Union, the Royal Society of Chemistry, the Air Pollution Control Association, and the American Association for the Advancement of Science. He was born in the U.K., received a bachelor's degree from Cambridge University, and M.Sc. and Ph.D. degrees from the University of East Anglia. Before joining the University of Denver in 1984, Stedman was professor in the department of chemistry and the department of atmospheric and oceanic science at the University of Michigan. He was a senior research scientist at Ford Motor Co. from 1969 to 1971.

ACS Award for Creative Work in Fluorine Chemistry

Sponsored by PCR Inc.

KONRAD SEPPELT, a professor of chemistry at the Free University, Berlin, has been described as a German wunderkind who has extended the boundaries of fluorine chemistry—and of inorganic chemistry in general—during his 25-year research career.

Seppelt is known for preparing and studying molecules that once were thought to be too unstable to exist. These include CF_3OH, SF_5OH, CF_3NH_2, TeF_5NH_2, SF_5OCN, SeF_5OCN, $O{=}SeF_5$, and *cyclo*-$C_5F_5^-$, as well as non-fluorine-containing molecules such as $AsCl_5$, $AsOCl_3$, Br_2O_3, and Br_2O_5. "I can think of no one who has prepared more examples of [such] 'nonexistent' compounds than Seppelt," says a colleague. "Each success meant the conquering of a unique synthetic challenge, and each is of major importance in advancing the fundamentals of chemistry."

Seppelt's accomplishments in the area of fluorine-stabilized sulfur-carbon multiple bonding also fall under the heading of "nonexistent" compounds. He is responsible for showing how to synthesize $R_2C{=}SF_4$, $R_2C{=}SF_2$, $RC{\equiv}SF_3$, $R_2C{=}SF_2{=}O$, and *cyclo*-$C_5H_4{=}SF_4$, all of which have amazing structural and chemical properties. While others have relied almost exclusively on using bulky groups to stabilize these new bond types, Seppelt has made prominent use of fluorine and fluorine-containing substituents to achieve the same result.

His group also has pioneered in studying the chemistry of extremely electron-withdrawing substituents such as $-OSF_5$, $-OSeF_5$, and $-OTeF_5$. Seppelt has played a major role in developing the chemistry of SeF_5OH and TeF_5OH. He has shown that the corresponding $-OTeF_5$ derivative of practically any fluorinated compound can be prepared, thanks to that group's ability to stabilize extreme oxidation states. Examples of particular importance include the xenon compounds $Xe(OSeF_5)_2$, $Xe(OTeF_5)_4$, $O{=}Xe(OTeF_5)_4$, and $Xe(OTeF_5)_6$. More recently, by learning how to carry out low-temperature X-ray crystallography, Seppelt has succeeded in obtaining the structures of some very sensitive but conceptually very important species. These include the high-coordinate fluoroanions BrF_6^-, IF_6^-, IF_7^-, IF_8^-, IOF_6^-, TeF_7^-, $ROTeF_6^-$, $ReOF_6^-$, WF_8^{2-}, XeF_7^-, SeF_6^{2-}, $XeOF_5^-$, and CO_2F^-.

Seppelt also has investigated the organic chemistry of bismuth(V). Recently, for example, he and his coworkers prepared and characterized the species $Bi(CH_3)_4^+$, $Bi(CH_3)_5$, and $Bi(CH_3)_6^-$.

That many of Seppelt's discoveries have found their way into inorganic chemistry textbooks indicates their importance for understanding chemical bonding. And these compounds are not all as esoteric as they might seem. For example, CF_3OH turned out to be an important intermediate in Freon decomposition in the upper atmosphere. And another prepared compound, $HC(SO_2CF_3)_3$, forms the best lithium salt for rechargeable lithium batteries.

Seppelt also has gotten kudos as a lecturer. One colleague is so taken with Seppelt's teaching talent that he refers to Seppelt's lectures as "seminal teachings." And when Seppelt visits your lab, this admirer adds, "his mind is always probing," and he is likely to offer great insights into your own research problems.

Seppelt advanced quickly through the German academic system. He completed his "Vordiplom" (B.S. equivalent),

"Diplom" (M.S. equivalent), and Ph.D. degrees in only six years. He began conducting independent research at the University of Heidelberg in 1970 and, within four years, became a member of the faculty. By 1976, his work had received recognition in the form of two German chemistry prizes. Then, in 1980, at the age of 35, he joined the faculty at the Free University, Berlin, as professor and head of the Institute of Inorganic & Analytical Chemistry. From 1992 to 1993, he also served as the university's vice president for science and research. "Seppelt's rapid promotion is exceptional and serves as an outstanding measure of his research accomplishments," says a fellow chemist.

ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences

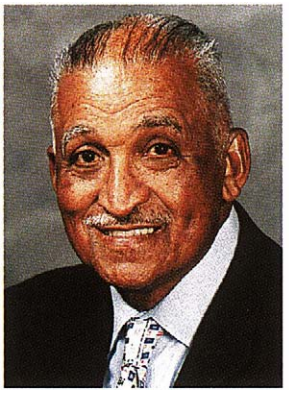
Sponsored by the Camille & Henry Dreyfus Foundation Inc.

Ten years ago, at an age when most people retire, **SAMUEL P. MASSIE**, chemistry professor at the U.S. Naval Academy, Annapolis, Md., arranged his schedule so that he could teach four days per week at the academy and spend a fifth day teaching at minority institutions that lacked minority faculty members. He did so to convince young black men and women not to give up on their dreams just because society makes it tougher for them to get ahead.

Massie's work as a traveling professor is but one entry in a long list of activities meant to encourage disadvantaged minority students to pursue their goals in science. His exhausting teaching schedule lasted four years. At times, it involved flying to as far as New Orleans early in the morning and returning to Annapolis late at night. Institutions Massie served included Virginia State University, Petersburg; Dillard University, New Orleans; and the University of Maryland, Eastern Shore. From the Dillard class, 11 of his 15 students went into science careers.

For this and other activities, Massie received the first Lifetime Achievement Award of the White House Initiative on Science & Technology Advisory Committee, established by former President Ronald Reagan to assist historically black colleges and universities.

In 1991 and 1992, Massie coordinated the Naval Academy's Math & Science Honor Program that allowed interested minority students from a local school system to interact with midshipmen and faculty. Former President George Bush recognized the academy and this successful outreach program with one of his "Points of Light" awards.



Massie

Roscher

In further recognition of Massie's efforts, in 1994 the Department of Energy established the Samuel P. Massie Chair of Excellence in Environmental Science at nine historically black engineering schools. These chairs are funded at $1.8 million per institution during a six-year period.

Massie will add this award to other major teaching awards, including the Manufacturing Chemists Association Award in College Chemistry Teaching (1961); the National Organization for the Professional Advancement of Black Chemists & Chemical Engineers' Outstanding Professor and Henry A. Hill Awards, presented in 1980 and 1982; and the ACS Northeastern Section's James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry (1994).

A native of North Little Rock, Ark., Massie received an A.A. degree from Dunbar Junior College, Little Rock, in 1936; a B.S. degree from A.M. & N. College of Arkansas (now the University of Arkansas, Pine Bluff) in 1938; an M.A. degree from Fisk University, Nashville, in 1940; and a Ph.D. degree in organic chemistry from Iowa State University, Ames, in 1946. He has authored several research papers and a review on the chemistry of phenothiazine.

Massie served as chairman of the departments of chemistry at Langston University, Okla., and at Fisk University, as well as chairman of pharmaceutical chemistry at Howard University, Washington, D.C. He was an associate program director at the National Science Foundation from 1960 to 1963, after he was a director of NSF's Summer Institutes for high school teachers and students from 1956 through 1960.

From 1963 to 1966, Massie was president of North Carolina College, Durham. He joined the U.S. Naval Academy as a professor of chemistry in 1966. He was the academy's first black faculty member. While there, he taught at 12 different NSF Summer Institutes, and he was a visiting scientist at 24 institutions.

Massie recently retired from the Naval Academy, but he is still active in science education. He recently took a position with Bingwa Multicultural Software Co., Atlanta, to help in the design of software to teach math and science using the life stories of distinguished minority scientists.

ACS Award for Encouraging Women into Careers in the Chemical Sciences

Sponsored by the Camille & Henry Dreyfus Foundation Inc.

"For more than three decades, Nina has devoted herself to the development of women in chemistry, both at American University and around the country," is how one colleague describes **NINA MATHENY ROSCHER**, chairman of the chemistry department at American University, Washington, D.C.

Roscher's role as an advocate for women chemists began in 1963 during her graduate student days at Purdue University, West Lafayette, Ind., when she founded the Iota Sigma Pi chapter of the Honor Society for Women in Chemistry. "Her service to Iota Sigma Pi has persisted through the years," notes another colleague. Roscher also "has assisted women at all stages of their career development," the colleague adds. These women include her students, who often are coping with issues of child care and dual-career families; older women seeking to reenter science; young women looking for their first professional positions; and female

colleagues who want to mentor other women or to advance professionally.

The award winner has used various strategies to encourage women in chemistry. In 1976, for example, with funding from the National Science Foundation's Women in Science Program, she designed a reentry program for women with degrees in chemistry or biology that comprised a year of intensive course work in chemistry or toxicology at American University. She administered the program through 1981 when financial constraints led to the demise of the NSF program. The 75 women who participated had been out of school for as many as 15 years; their average age was 40. The program served two purposes—it brought the women's science knowledge up to date, and it gave them the personal support they needed to go on to graduate school or to enter the workforce. In 1986, 10 years after the program was implemented, nine women had received Ph.D. degrees in chemistry, 25 had earned master's degrees in chemistry and other disciplines, and eight were in graduate school. Several others had found teaching positions or other employment in science fields.

Roscher has worked tirelessly to secure funding for women graduate students at American University. She has published several papers on distinguished women chemists, on women in academia, and on reentry programs for women. Across the country, she has lectured extensively on women's issues.

"Dr. Roscher is noted for encouraging women to work to their fullest capacity while maintaining a balance between their professional and personal lives," says a colleague. "She exemplifies this balance in her own life."

Roscher received a B.S. degree in chemistry from the University of Delaware, Newark, in 1960, and a Ph.D. degree from Purdue University in 1964. Her research focuses on physical organic chemistry, especially on the reaction of alcohols with bromine and silver salts. More than half of her current graduate students are women.

Roscher served on the American Chemical Society's Women Chemists Committee from 1974 to 1979, including as chairman from 1976 to 1978. Among many other professional affiliations she is president of the Chemical Society of Washington (1995) and a fellow of the American Institute of Chemists.

ACS Award for Nuclear Chemistry

WILLIAM D. EHMANN, chemistry professor emeritus at the University of Kentucky, Lexington, has made a significant contribution over the past 35 years to the practice of neutron activation analysis. His principal interests have been in developing or improving nuclear methods of elemental analysis and the application of those methods to fundamental research problems in the fields of geochemistry, meteoritics, lunar chemistry, and studies of the relationship of brain trace element imbalances with neurological diseases.

Ehmann's early research dealt with measuring trace element abundances in meteorites by neutron activation analysis and relating those data to predictions derived from theories of nucleosynthesis of the elements. His group was among the first to suggest that iridium would be an excellent indicator for the presence of extraterrestrial material in terrestrial rocks and sediments—a measurement that is now common. In 1969, his research group was among those selected by the National Aeronautics & Space Administration to analyze the first returned lunar samples collected during the Apollo 11 mission. Ehmann's group subsequently analyzed samples from all the Apollo lunar missions and also those from several Russian lunar missions.

More recently, the award winner's research has turned to studies of the relationship in brain trace element imbalances to diseases such as amyotrophic lateral sclerosis (ALS), Alzheimer's disease, and Pick's disease. His group was the first to point out that there is an apparent elevation of mercury in the brain of Alzheimer's patients. Ehmann and his coworkers have also reported on extensive studies showing the localization and concentration of aluminum in the brain of Alzheimer's patients.

Ehmann received a B.S. degree with honors in 1952 and an M.S. degree in 1954, both in chemistry, from the University of Wisconsin, Madison. He went on to receive a Ph.D. degree in radiochemistry in 1957 from the Carnegie Institute of Technology (now Carnegie Mellon University), Pittsburgh, and carried out postdoctoral work (1957–58) at Argonne National Laboratory under a National Research Council/National Science Foundation fellowship. He also was a Fulbright Research Scholar (1964–65) at the Institute of Advanced Studies at Australian National University, Canberra.

Ehmann received the 1994 Charles Herty Medal from the ACS Georgia Section for significant contributions to chemistry by a chemist in the southeastern U.S. He has also been recognized as an educator and researcher by the University of Kentucky, receiving the College of Arts & Sciences' Distinguished Professor Award (1968–69), the university's Sturgill Award in 1987 for outstanding contributions to graduate education, and the Special Faculty Incentive Award for Research (1988–90). He was elected the 1982 Distinguished Scientist in Kentucky by the Kentucky Academy of Science.

Ehmann has more than 200 publications in nuclear chemistry, chemical education, geochemistry, medical, and other journals and has coauthored with D. E. Vance a 1991 textbook, "Radiochemistry and Nuclear Methods of Analysis," that is widely used for introductory radiochemistry courses. He is also coauthor of the biennial review "Nuclear and Radiochemical Analysis" that appears in *Analytical Chemistry*. Ehmann is currently a member of the editorial board of the *Journal of Radioanalytical & Nuclear Chemistry* and of the *Journal of Trace & Microprobe Techniques*.

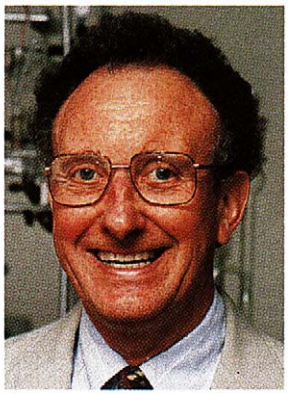
ACS Award for Research at an Undergraduate Institution

Sponsored by Research Corp.

NORMAN C. CRAIG, chemistry professor at Oberlin College, Ohio, is the 1996 recipient of this award, given annually to an exemplary teacher-scholar who has made major contributions to chemical research and who has inspired undergraduates to pursue quality research.

According to the award citation, Craig's efforts in the undergraduate research program have been truly exceptional. He was appointed to the Oberlin faculty in 1957, and throughout his career he has always been prepared to give any effort and time necessary to make his experience available to students. He believes that undergraduate student par-

Ehmann



Craig

ticipation in actual research is an integral part of a chemistry education.

Craig has had a substantial impact on the students under his tutelage. Of the 107 students who have done research with Craig, 47 have received a Ph.D. degree in chemistry or a related field and 11 are currently enrolled in doctoral programs. Another 17 have pursued an M.D. degree. Eighteen of his students who have already received Ph.D. degrees are teaching at the college or university level, and another 21 are engaged in chemical research in nonteaching positions.

Craig's own research in vibrational spectroscopy is widely recognized for its high quality. His principal contributions have been in the study of small, unsaturated, or cyclic molecules. He synthesized a host of new, small fluorocarbons and their isotopomers for use in infrared and Raman spectroscopy, and he made vibrational assignments and normal coordinate analyses of most of these molecules to obtain force constants.

In his work, Craig frequently has had to develop new synthetic strategies to make previously unknown molecules or ions or to find ways to isolate for study unstable ones. His studies of halogenated molecules, especially fluorinated ones, have contributed to an understanding of cis/trans isomerism in ethylenes and diazenes and in cyclopropanes, cyclopropenes, and cyclobutenes. Of Craig's 61 research papers, 39 were coauthored by undergraduate students.

Craig received the ACS Catalyst Award in Chemical Education in 1987. He is a member of the ACS Committee on Professional Training, and is a former member of the Petroleum Research Fund advisory board. He has also served on various presidential task forces. In 1992, Craig was appointed the Robert & Eleanor Biggs Professor of Natural Science at Oberlin.

In addition to his research papers, Craig has written 18 articles on chemical education. He is the coauthor of a book, "Composition, Reaction and Equilibrium: Experiments in Chemistry," published in 1970, and the sole author of "Entropy Analysis," published in 1992. His experimental and computer studies have received almost 30 years of uninterrupted support from many sources, including the National Science Foundation, the National Institutes of Health, the ACS Petroleum Research Fund, and the Research Corp.

Craig received a B.A. degree in chemistry from Oberlin College in 1953 and a Ph.D. degree in physical chemistry from Harvard University in 1957.

Joel Henry Hildebrand Award in the Theoretical & Experimental Chemistry of Liquids

Sponsored by Exxon Research & Engineering Co. and Exxon Chemical Co.

A major intellectual force in liquid state theory for more than 30 years is how colleagues describe **GEORGE STELL**, a professor of chemistry at the State University of New York, Stony Brook. His accomplishments include developing thermodynamic, dielectric, and transport theories of liquids as well as general methods of assessing the probability distribution functions that describe the microstructure of liquids. Stell's results have elucidated the nature of phase transitions and criticality in fluids, especially ionic and polar fluids, and the behavior of fluids in porous media.

One of Stell's first contributions was an article in the collection, "The Equilibrium Theory of Classical Fluids." He made clear how to combine the general graphical theoretical formalism of Mayer and others with techniques based on functional differentiation in a way that has proven to be very generally useful in the theory of liquids. Stell introduced the name "topological reduction" for one of these techniques, which continues to be an important tool. About this reference, a colleague writes, "I often reread it and almost always learn something new."

Another colleague writes, "Stell has made an unmistakable mark on numerous aspects of the chemical physics of equilibrium classical fluids. He has carried over equilibrium fluid concepts to transport, random medium, and quantum phenomena, creating a vast body of knowledge, serving as a foundation for a world of applications."

Stell earned a bachelor's degree from Antioch College, Yellow Springs, Ohio, in 1955 and a Ph.D. degree from New York University in 1961. He began his teaching career as a physics instructor at the University of Illinois, Chicago, in 1955. He became a leading professor in the chemistry department at SUNY, Stony Brook, in 1986, where he holds a joint appointment in the mechanical engineering department.

Stell's list of publications stretches beyond 300. He has served on the editorial boards of the *Journal of Statistical Physics*, the *Journal of Chemical Physics*, and *Molecular Physics*, and as a reviewer for *Mathematical Reviews*.

Stell has also held numerous visiting positions and consultantships, including research scientist at the University of California's Lawrence Radiation Laboratory (now Lawrence Livermore Laboratory); exchange professor at the Theoretical & High-Energy Physics Laboratory at the University of Paris; Lars Onsager Professor at the National Institute of Technology in Norway; and research scientist at the Atomic Energy Research Establishment, Harwell, England.

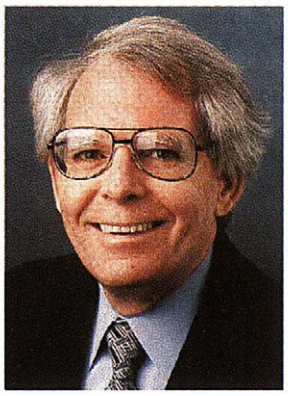
Stell is a fellow of the American Physical Society and the Royal Norwegian Society of Sciences & Letters; in 1984, he was named a John Simon Guggenheim Fellow.

Ralph K. Iler Award in the Chemistry of Colloidal Materials

Sponsored by DuPont Co.

C. JEFFREY BRINKER has spent his professional career working in sol-gel processing of ceramics. He joined the technical staff of Sandia National Laboratories (SNL) in New Mexico in 1979, after receiving bachelor's, master's, and doctoral degrees in ceramic science at

Brinker



Lineberger

Mochida

Rutgers University, New Brunswick, N.J., between 1972 and 1978.

One of his first assignments at SNL was to initiate a program in sol-gel processing of multicomponent glasses. Since then, he has worked on preparation of ceramic materials with novel microstructures and properties from colloidal precursors by the sol-gel process.

Among other developments, Brinker has devised an ambient temperature and pressure process for making silica aerogel films, which hold promise as thermal insulating films, low dielectric-constant films, and sensors. The process is safer and requires less energy than conventional processes. Moreover, it is amenable to continuous processing operations, such as film coating, and is compatible with a wide range of substrates and gels, including bioactive composites that would otherwise suffer degradation under traditional supercritical conditions.

The process enables preparation of films with porosities greater than 98%, through surface derivatization of a sol. Although capillary forces cause contraction of the film during drying, the surface treatment prevents condensation reactions that would otherwise occur between silanol groups, so the shrinkage is reversible. The gel contracts, then springs back, exhibiting volume changes as great as a factor of six.

Another part of Brinker's work involves a "template" approach to preparing microporous inorganic membranes, overcoming limitations inherent to both conventional inorganic and organic membrane approaches. This method uses fugitive organic groups to produce membranes with both high selectivity and high permeability.

As one colleague describes the template work, Brinker's key was to use two-step acid catalysis to produce a gel matrix that could readily be densified so the only porosity was that created by oxidation of methyl ligands. These inorganic films provide selectivity equal to the best organic membranes but with 1,000 times greater permeance.

Brinker joined the SNL Ceramic Development Division in 1979. In 1990, he accepted a joint professorship at SNL and the University of New Mexico, Albuquerque. He is currently a Distinguished Member of the technical staff at SNL's Advanced Materials Laboratory, and Distinguished National Laboratory Professor in the University of New Mexico departments of chemistry and chemical engineering.

Brinker is an associate editor of the *Journal of the American Ceramic Society* and serves on the editorial boards of *Chemistry of Materials, Journal of Sol-Gel Science & Technology, Journal of Porous Materials,* and *Current Opinion in Solid State & Materials Science.* He has a host of publications—more than 150, with more pending—and he is the co-author of a text on sol-gel science. He has 17 patents either issued or applied for.

A cofounder of the "Materials Research Society Symposium Series: Better Ceramics Through Chemistry," Brinker has been a coeditor of Volumes I through VI. He is also a member of the National Research Council's Committee on Polymer Science & Engineering.

A variety of awards have come Brinker's way, including the Department of Energy's Basic Energy Sciences Award in 1992 and 1994 for significant implications for DOE-related technologies in ceramics and metallurgy. In 1993, he was a senior research fellow at the Pierre & Marie Curie University, Paris. In 1995, he received a DOE Basic Energy Sciences Award for sustained outstanding research in metallurgy and ceramics.

Irving Langmuir Award in Chemical Physics

Sponsored by General Electric Foundation

W. CARL LINEBERGER, professor of chemistry and biochemistry at the University of Colorado, Boulder, and a fellow at JILA (formerly the Joint Institute for Laboratory Astrophysics), also in Boulder, has been honored for his leadership and creativity in the field of chemical physics.

Lineberger's research is experimental, using a wide variety of laser-based techniques to study the structure and reactivity of gas-phase ions. He is best known for his contributions to the knowledge of negative ions, and he transformed the field of electron affinities from one of sporadic knowledge to a body of well-substantiated data.

Early in his career, he developed high-resolution methods for studying photo detachment. Later, in a groundbreaking study of molecular ions published in 1984, Lineberger reported his observation of the dipole bound state of a negative ion—a novel observation at the time. His most recent work on negative ions, especially in clusters, has revealed dynamics of fragmentation and recombination, and of isomerization. He has worked on elucidating the structure of transient reaction intermediates and understanding the evolution of physical properties from isolated molecules to solvated species.

The award winner has been at JILA since 1968, when he joined as a research associate. He became an assistant professor of chemistry at the University of Colorado, Boulder, in 1970, a professor in 1974, and the E. U. Condon Distinguished Professor of Chemistry in 1985.

Before joining JILA, he was an assistant professor of electrical engineering at Georgia Institute of Technology, Atlanta, and a research physicist in the U.S. Army Ballistic Research Lab, Aberdeen, Md. He also has been a visiting professor at Stanford University and the University of Chicago, and he has held nearly two dozen lectureships.

Lineberger has been on the editorial and advisory boards of several journals, including *Chemical Physics Letters, Chemical Physics,* and the *Handbook of Chemistry & Physics.* He has published more than 150 papers, articles, and book chapters.

Lineberger holds bachelor's, master's, and Ph.D. degrees from Georgia Institute of Technology, which he received in 1961, 1963, and 1965. He has been the recipient of several major awards, including the Earle K. Phyler Prize and the Herbert P. Broida Prize from the American Physical Society and the William F. Meggers Prize from the Optical Society of America.

In addition to his membership in those societies, Lineberger is a member of the National Academy of Sciences, the American Academy of Arts & Sciences, and the American Chemical Society; he is a fellow of the American Association for the Advancement of Science.

Henry A. Storch Award in Fuel Chemistry

Sponsored by Exxon Research & Engineering Co.

Work in what has been traditionally considered the nuisance materials, coal and coke, has been the career research of **ISAO MOCHIDA.**

Mochida, a professor at the Institute of Advanced Material Study at Kyushu University in Japan, has played a key role in advancing coal science internationally over a wide range of investigative areas. He is particularly involved in coke chemistry, bringing what one colleague dubs the "world of coke" to many researchers who have hitherto regarded the material as a nuisance, only fit for burning as a fuel.

Mochida has published approximately 500 papers, written 10 books, and holds 30 patents. His major publications cover the chemistry and engineering of coke and carbon, chemistry in production and utilization of needle coke, solvents and catalysis in coal liquefaction, and application of coke products.

These publications cover his work over the past several decades in the science and technology of coal and its derivatives. During that time, he has investigated a number of areas, including coal structure and reactivity, carbonization, and coal liquefaction.

For example, Mochida has developed a multistage coal liquefaction process with the following steps: coal pretreatment, dissolution with a suitable donor at high temperature and short contact time conditions, and a catalytic upgrading stage, including recovery and repeated use of a mobilized bed unit.

More recently, Mochida has turned to the use of coal-derived materials in catalysis, directing his investigations toward environmental pollution control devices. His interests are focused on the surface chemistry of coke in order to tailor the material for removal of SO_x, reduction of NO_x, and elimination of hydrogen chloride from chlorohydrocarbons.

Mochida has been working with Mitsui Mining Co. on the preparation of active coke from coal. He established that the activity for NO_x reduction by NH_3 is intimately related to the oxygen functionality induced during the removal of absorbed SO_2. This process has been commercialized in Japan. His next project will involve improving the efficiency of the reaction by using other forms of carbon, such as active carbon fiber, that offer a higher activity and selectivity pattern.

One of Mochida's colleagues says he is "unique among his colleagues in that he has discovered the secrets of the circuitous route to successfully transferring basic research data to the development of a commercial process. He has been responsible for demonstrating the need for performing basic research in coal; in these times of austerity, this is a tremendous accomplishment."

Major awards Mochida has received include the Young Chemist Award of the Chemical Society of Japan, awards from the Japanese Petroleum Institute, the Japanese Fuel Society, and the C. E. Pettinos Award of the American Carbon Society. In 1994, the Carbon Society's R. A. Glenn Bituminous Coal Research Award recognized Mochida's contributions to developing key chemistry for the removal of SO_x and NO_x over activated carbon fibers.

Mochida received bachelor's, master's, and doctoral degrees from the University of Tokyo's department of synthetic chemistry between 1963 and 1968. He was named a lecturer in 1968, and then became an assistant professor at Kyushu University, where he taught from 1969 to 1982. He has been a research associate at the University of Illinois and at the University of Newcastle-upon-Tyne, England. In 1982, he became a full professor at Kyushu University's Research Institute of Industrial Science, which in 1988 was reorganized by the Institute of Advanced Material Study. Mochida is now director of the institute.

Carbohydrate Chemistry Division award winners

The ACS Division of Carbohydrate Chemistry awarded the 1995 Melville L. Wolfrom Award to Chi-Huey Wong of Scripps Research Institute in La Jolla, Calif., and its Horace S. Isbell Award to Daniel Kahne of Princeton University.

The Wolfrom Award recognizes excellence of contributions to carbohydrate chemistry as a science and a profession and/or outstanding service to the Division of Carbohydrate Chemistry. The Isbell Award recognizes scientists who are under 41, and who have demonstrated excellence in carbohydrate research as well as promise of continued quality contributions to the field.

Wong received both B.S. and M.S. degrees from National Taiwan University and a Ph.D. in chemistry from Massachusetts Institute of Technology. After a postdoctoral fellowship at Harvard University, Wong was appointed assistant professor of chemistry at Texas A&M University in 1983. Since 1989, he has been professor and Ernest W. Hahn Chair in Chemistry at Scripps. He is also head of the Frontier Research Program on glycotechnology at the Institute of Physical & Chemical Research in Japan. His current research interests include bioorganic and synthetic chemistry, especially the development of new synthetic chemistry based on enzymatic and chemoenzymatic reactions, and the rational development of mechanism-based inhibitors of enzymes and receptors. He has authored or coauthored more than 250 publications and holds 35 patents.

Kahne graduated from Cornell University in 1981 and received a Ph.D. from Columbia University in 1986. After a postdoctoral fellowship at Columbia, he became assistant professor of chemistry at Princeton in 1988. His many awards include the Cornell College Scholar award (1977–81); the National Research Service Award, Columbia University (1983); Columbia's Pegram Award (1985); Searle Scholar Award (1989–91), the National Science Foundation's Presidential Young Investigator Award (1990–95); and the Alfred P. Sloan Research Fellow Award (1992–94). □