ACS 1992 Award Winners

Following are vignettes of the second set of recipients of awards administered by ACS. The winners will receive their awards during the spring 1992 203rd ACS national meeting in San Francisco, with the exception of the Cope Medalist and the Cope Scholars. They will receive their awards at the fall 1992 204th ACS national meeting in Washington, D.C., during the Cope Symposium. The awards in San Francisco will be presented at a banquet on Tuesday, April 7, 1992.

Vignettes of the remaining awardees will appear in successive October and November issues of C&EN.

ACS Award for Nuclear Chemistry

ROBERT N. CLAYTON, Enrico Fermi Distinguished Service Professor, University of Chicago, has been hailed as one of the world's leading isotope geochemists, who has made ingenious use of stable isotopes to study Earth, the Moon, and meteorites. In 1973, he discovered oxygen isotope anomalies in meteorites, which has provided striking new insights into the nuclear and chemical history of the solar system.

Born in Hamilton, Ontario, Canada, Clayton attended Queen's University in Kingston, where he received B.S. and M.S. degrees in 1951 and 1952, respectively. In 1955 he obtained a Ph.D. degree at California Institute of Technology. Following postdoctoral work there in geochemistry, he took a position as assistant professor of geochemistry at Pennsylvania State University. He joined the faculty at Enrico Fermi Institute and the departments of chemistry and geophysical sciences at the University of Chicago in 1958, and attained his present title in 1980.

Clayton's work involves high-precision measurement of isotopic ratios by mass spectroscopy. He has used this to study the variations in abundance of the stable isotopes of several light elements in natural materials.

Of special note are the effects found in extraterrestrial materials such as meteorites, the Moon, and solar wind, which relate to the chemical processes during the formation of the solar system. These isotopic variations permit the tracing of elements back to their origins in stellar nucleosynthesis. The award winner's discoveries have not only forced a reappraisal of ideas about the formation of stars and solar nebulae, but they have provided new insights into the origin of the chemical elements themselves.

Clayton has to his credit some 170 publications in research journals. He has been honored with several awards, including the 1976 Exceptional Achievement Award from the National Aeronautics & Space Administration, the 1980 George P. Merrill Award from the National Academy of Sciences, and the 1987 William Bowie Medal from the American Geophysical Union.

He is a fellow of the American Geophysical Union, the Meteoritical Society, the American Academy of Arts & Sciences, the Royal Society of Canada, and the Royal Society of London.

ACS Award for Creative Invention

sponsored by Corporation Associates

"They invented and developed one of the best and most successful drugs in the history of the pharmaceutical industry." So a colleague sums up the work of **DAVID W. CUSHMAN** and **MIGUEL A. ONDETTI.** And what discovery elicited this acclaim? Cushman, a principal scientist at Squibb Institute for Medical Research in Princeton, N.J., and Ondetti, formerly a senior vice president of research, cardiovascular diseases, at the same firm, earned this praise for captopril, a drug that proved to be the first angiotensin-converting enzyme (ACE) inhibitor. It was also a boon to millions of people suffering from hypertension.

Undoubtedly the drug is an overwhelming commercial success: It had annual sales of more than $1.5 billion worldwide in 1990 alone. But its development also carries with it some breakthrough science.

In the late 1960s, Cushman and Ondetti began their search for a way to block biosynthesis of the potent vasopressor, angiotensin II. This proved to be a pioneering approach for the development of novel drugs.

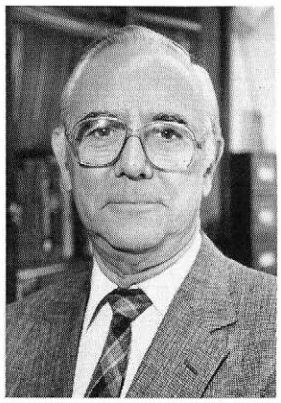
In their initial approach, the researchers, using the venom from the Brazilian pit viper, isolated six peptides that showed promising ACE inhibitory activity, sequenced their amino acid makeup, and synthesized the compounds. One of these, teprotide, showed good ACE inhibition as well as an ability to reduce blood pressure in humans who received it intravenously. Cushman and Ondetti used structure-function relationships among venom peptide analogs to elaborate a model for the ACE active site. Based on the model, they synthesized a biochemically improved version—captopril. They did this via an untried approach: They attempted to design a drug to fit the specific biological receptor, ACE.

The two are coinventors on at least 25 patents. In addition, Cushman, a native of Indianapolis, and Ondetti, born in Buenos Aires, are authors or coauthors of more than 95 publications.

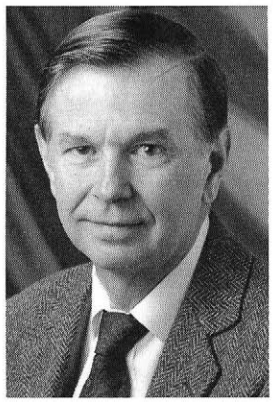
The awardees also have received many honors. They were corecipients of the American Chemical Society's Alfred Burger Award in Medicinal Chemistry in 1982, and in 1983 they received the Ciba award for hypertension research and New Jersey's Thomas Alva Edison patent award.

Cushman received a B.A. degree in zoology in 1961 from Wabash College, Crawfordsville, Ind., and a

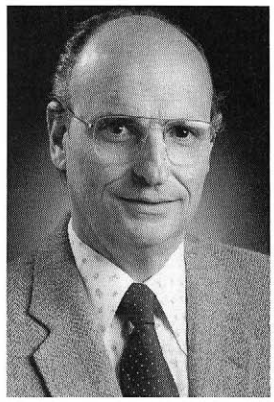
Ph.D. in biochemistry in 1966 from the University of Illinois, Urbana-Champaign. Ondetti received a licentiate in chemistry, in 1955, and a doctor of chemistry degree, in 1957, from the University of Buenos Aires.



Clayton



Cushman



Ondetti

Nobel Laureate Signature Award for Graduate Education in Chemistry

sponsored by J. T. Baker Inc.

MARCOS DANTUS has made pioneering contributions to real-time chemistry on the femtosecond time scale, and in a team effort has been a key graduate student at California Institute of Technology for developing the field and for diversifying its uses. He, along with his preceptor, **AHMED H. ZEWAIL**, will receive the award in recognition of these achievements and of his doctoral thesis, "Femtosecond Transition-State Spectroscopy of Chemical Reactions."

Born in Mexico City, Dantus was a top student at Brandeis University, obtaining both B.A. and M.A. degrees in chemistry in 1985. His doctoral work under Zewail at Caltech on real-time observations of chemical reactions led to the development of the femtosecond transition-state spectroscopy technique, which was used to clock the process of bond dissociation and to observe, in real-time, the transition states of the direct dissociation reactions of such molecules as ICN. Later Dantus applied the method to HgI_2, a triatomic compound with two vibrational coordinates, and bound systems such as the B state of molecular iodine. This research has led him to publish in a number of areas "with impressive and original contributions," according to one colleague, in a record time.

Zewail, who is Linus Pauling Professor of Chemical Physics at Caltech, joined the faculty in 1976 as assistant professor. He was appointed to his present post last year. Zewail has pioneered the development of femtosecond and picosecond chemistry in molecular beams. Using his methods, chemists can now observe quantum state-to-state rates, energy redistribution in molecules, and femtosecond spectroscopy of transition states. Zewail has made numerous major contributions in chemical physics, the latest being the development of femtochemistry and the direct probing of reactions in the transition states with unprecedented (femtosecond) time resolution.

Zewail received a B.S. degree in 1967 and an M.S. degree in 1969 from Alexandria University, Egypt, and a Ph.D. from the University of Pennsylvania in 1974. He is a member of the National Academy of Sciences. His numerous awards and honors include the National Science Foundation Award for especially creative research (1984–86, 1988–90), the ACS Eastern New York Section's 1985 Buck-Whitney Award, the ACS Rochester Section's 1989 Harrison Howe Award, the 1989 King Faisal International Prize in Science, and the 1990 Hoechst Prize.

ACS Award for Computers in Chemistry

sponsored by Digital Equipment Corp.

ERNEST R. DAVIDSON, whose career has spanned three decades, began making significant contributions in computational and theoretical chemistry well before "computer" was a common household word.

The award winner is now Distinguished Professor of Chemistry at Indiana University in Bloomington. He received a B.S. degree in chemical engineering from Rose Polytechnic Institute in 1958 and a Ph.D. in chemistry from Indiana University in 1961. Davidson did postdoctoral work at the University of Wisconsin, taught at the University of Washington for most of his career, and has been a visiting professor at both Ohio State University and the Institute of Molecular Science in Japan.

A colleague says that Davidson "develops computational chemistry, he doesn't just practice it." Early in his career Davidson developed the iterative natural orbital method for improving the description of electron correlation by configuration interaction (CI) expansions, providing a foundation for more recent developments in this field. His method for approximately correcting CI results for the effects of simultaneous correlation in disjoint sets of electrons is now widely known as the "Davidson correction" and is used in most CI programs.

MELD (for many electron description), an advanced computer program developed by the award winner and his students, is used by many research groups and widely distributed for free. According to a colleague, Davidson has been the leader in developing computational algorithms appropriate for the difficult job of computing molecules well.

A bibliography of Davidson's research articles is more than 250 items long, and he is the author or coauthor of 26 books or chapters in books. His article "Algorithm Design in Computational Quantum Chemistry," part of the ACS Symposium Series, is considered a classic in the field.

Davidson was chairman of the ACS Division of Physical Chemistry in 1983–84. From 1978 to 1983 he was associate editor of the *Journal of the American Chemical Society*, and currently he is associate editor of *Theoretica Chimica Acta*.

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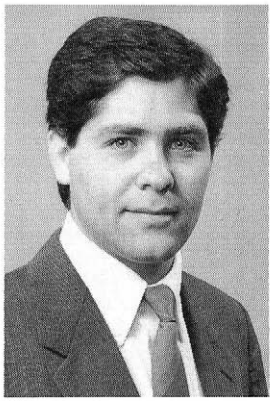
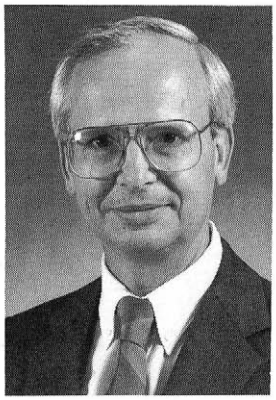
The award winner is a member of the National Academy of Sciences and holds other professional and honorary memberships. In 1967 he was both a Sloan Fellow and a laureate at the International Academy of Quantum Molecular Science; in 1974 he was a Guggenheim Fellow.



Dantus

Zewail



Davidson

Ipatieff Prize

"An engineer and a scientist," whose research is "seminal, inspiring, unexpected, and important," is how colleagues of **MARK E. DAVIS** describe the awardee. A professor of chemical engineering at California Institute of Technology, Davis is widely recognized for his synthesis of "designer catalysts," and of molecular sieve-based catalysts.

His career has been steeped in academia—assistant professor of chemical engineering at Virginia Polytechnic Institute & State University (VPI), Blacksburg, in 1981; associate professor of chemical engineering at VPI and Stanford University in 1985; professor of chemical engineering at VPI and Stanford in 1989; and, currently, a professor at Caltech—but his research has had broad applications in industry. Davis' study of the relationships between molecular structure and catalytic function have led to several new molecular sieves.

The synthesized molecular sieve that initially won him recognition was dubbed VPI-5—a reference to the university at which he was then teaching—and was the first molecular sieve with pores larger than 10 Å. This was followed by the development of VPI-7, a unique material that contains three-membered rings.

Davis helped create two new classes of molecular sieve catalysts. Although such catalysts are traditionally used as solid acid catalysts, Davis synthesized zeolite catalysts that can serve as solid base catalysts. His group also has synthesized molecular sieves that have isolated one-atom redox centers; these have been shown to have the ability of performing shape-selective redox reactions within the pores of molecular sieves. Davis is working on synthesizing chiral molecular sieves.

Davis' group also has synthesized a new class of heterogeneous organometallic catalysts that has widespread implications for stereoselective liquid-phase reaction chemistry.

Davis' research, which has so far generated more than 90 journal articles and one textbook, has been widely honored. In 1985, he received a National Science Foundation presidential young investigator award. The International Zeolite Association presented him with its 1989 Donald Breck Award for the most significant contribution to molecular sieve science, 1986–1988. Davis became the first chemical engineer to win NSF's Alan T. Waterman Award (1990), and has been awarded the Union Carbide Innovation Recognition Award for academic achievements in catalysis for three consecutive years (1989–91).

ACS Award in Analytical Chemistry

sponsored by Fisher Scientific Co.

One of the few electrochemists to have made measurements in the nanosecond region, **LARRY R. FAULKNER**, professor of chemistry and dean of the College of Liberal Arts & Sciences, University of Illinois, Urbana-Champaign, is regarded as a world leader in electroanalytical chemistry. Faulkner is responsible for some of the first work on the transfer of energy and information by electron and exciton migration in chemical systems of controlled architecture.

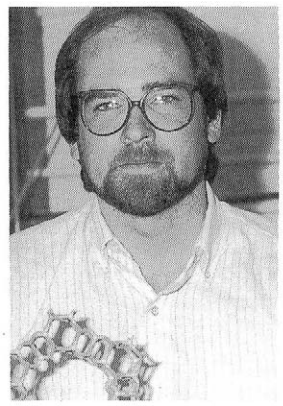
The award winner received a B.S. degree at Southern Methodist University in 1966 and a Ph.D. at the University of Texas, Austin, in 1969. As a graduate student, he did some of the definitive work on the mechanism of electrogenerated chemiluminescence, and he discovered the magnetic-field effect on triplet-triplet annihilation in liquid solution. These early studies gave rise to major research efforts on using magnetic-field effects in the elucidation of reactions involving paramagnetic intermediates.

Developing techniques for measuring very small currents at short time scales or at high pressures, Faulkner and his collaborators have carried out studies of electrochemical reactions in organized structures, including the solid state. His research has also laid groundwork for the application of electrodes modified by polymer films as analytical sensors. And his development of a cybernetic electrochemical instrument has changed the manner in which electrochemical and electroanalytical experimentation have been conducted.

Faulkner has many publications to his credit, including the text, "Electrochemical Methods: Fundamentals and Applications," written with Allen Bard, and published in 1980. He was on the editorial advisory board of *Analytical Chemistry* (1986–88) and served as U.S. regional editor of the *Journal of Electroanalytical Chemistry* (1980–85). Currently, he is president of the Electrochemical Society.

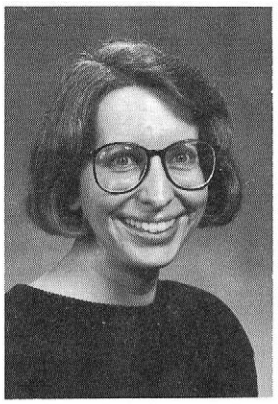
His many awards include the School of Chemical Sciences Teaching Award from the University of Illinois in both 1976 and 1986. Faulkner's colleagues describe him as a "highly creative individual" who has made outstanding contri-

butions as a teacher and "brilliant lecturer." His lectures and teaching in electrochemistry have been widespread, and have played an important role in the growing use of electroanalytical techniques.



Davis

Faulkner



Fruen

James Bryant Conant Award in High School Chemistry Teaching

sponsored by Ethyl Corp.

LOIS FRUEN is head of the science department and academic dean at Breck School, Minneapolis, Minn., where she began her teaching career in 1975. Colleagues describe her as "a teacher that makes a teacher feel proud of the profession ... dedicated to hands-on for fellow teachers as well as for students." Fruen is lauded for the quality of her teaching, her ability to challenge and inspire students, her extracurricular work, and her continuing education activities.

In Fruen's classroom, chemistry is related to everyday life. Students might titrate Rolaids or Tums and use computers to record the data. They discuss topics such as nuclear energy, acid rain, catalytic converters, octane rating, sodium streetlights, and kidney stone precipitates. For Fruen's students chemistry is fun, and her humor and experiments make the concepts stick. Social issues don't escape her classroom either: In 1989, two of her students, concerned about ozone loss, were responsible for the school's discontinuing use of styrofoam cups and plates.

Fruen is a strong believer in outreach programs. Her students have participated in projects at local colleges, 3M, Gray Freshwater Biological Institute, General Mills, and the University of Minnesota, for example. She arranges special short courses for gifted students, and reasons that working with professional mentors will encourage talented students to pursue careers in science. Several of her former students have completed medical school or graduate programs in science.

Fruen has participated in, or organized, from one to five continuing education programs a year since 1978. Topics include physics, geology, field ornithology, and women and minorities in science. She has written extensive curricular materials and contributed to "Source Book for Chemistry Teachers" (American Chemical Society, 1981); "Classical Chemical Periodicity" (Woodrow Wilson Foundation, 1985); "Search for Life" (Learning Works Inc., 1987); and "Science Experiments on File" (Facts on File Publications, 1988). She chaired the committee that researched and rewrote 15 widely used chemistry experiments that are unsafe. The outcome: a new manual, "New Chemicals for Old" (Minnesota Department of Education, 1987).

Fruen received a B.A. in chemistry from St. Olaf College (1971) and an M.A. in education from College of St. Thomas (1973).

ACS Award for Creative Advances in Environmental Science & Technology

sponsored by Air Products & Chemicals Inc.

GLEN E. GORDON is widely regarded for his development of nuclear methods used to analyze aerosol particles for many elements, and for his skillful use of the data to determine the origins of atmospheric aerosols. He is a chemistry professor at the University of Maryland, College Park, where he has taught since 1969, after teaching at Massachussetts Institute of Technology for nine years.

Gordon's research for the past 15 years has involved the development and testing of "receptor models," methods by which the sources of airborne particles are identified by their detailed compositions. For example, particles from oil-fired plants are enriched in vanadium and nickel, and those from refuse incinerators, in zinc, cadmium, antimony, and tin. These methods are now well enough established that the Environmental Protection Agency recommends that local and state agencies use them for designing control strategies to achieve particulate air quality standards.

The award winner has earned respect not only for his research and dedication as a teacher, but also for his commitment to serve on committees and editorial boards of both government and professional organizations. For 10 years he has been a member of EPA's Review Panel for Atmospheric Chemistry & Physics, Extramural Grants Program, and he was chairman from 1983 to 1987. He has also done other advisory work for EPA as well as for the National Science Foundation, National Institutes of Health, National Academy of Sciences, Maryland Academy of Sciences, and others. And he has been an active member of the American Chemical Society.

A colleague says Gordon "is certainly one of the leaders in applying the techniques involving radioactivity to the solution of environmental problems." Another says that Gordon's work as senior author of many receptor modeling oriented journal articles, book chapters, and proceedings papers has established him as one of the leaders in the area of environmental science.

Gordon received a B.S. degree in chemistry from the University of Illinois in 1956 and a Ph.D. in chem-

istry from the University of California, Berkeley, in 1960. Among his awards and honors are an NSF Senior Postdoctoral Fellowship (1966) and the ACS Award for Nuclear Applications in Chemistry (1977).

Alfred Bader Award in Bioinorganic or Bioorganic Chemistry

Gordon

Holm

Huber

The "person who built the intellectual bridge between biological and inorganic chemistry" is the way a colleague describes **RICHARD H. HOLM**, Higgins Professor of Chemistry at Harvard University.

Holm's studies of the iron-sulfur clusters that form the cores of many important redox proteins have resulted in findings important to understanding the function and origin of these proteins. His work suggests that the electron-transfer properties of the iron-sulfur metalloproteins are those naturally associated with these iron sulfide cores as independent entities: The protein does not determine these properties by forcing the inorganic groups into a strained or abnormal geometry. The details of the environment provided by the protein are undoubtedly important in "tuning" these properties, but are not their major determinant.

His work also demonstrates that the iron-sulfur clusters are stable, structurally well-defined entities that can be synthesized, characterized, and studied without any requirement for association with a stabilizing protein. Both concepts have led to the evocative proposal that these metalloproteins have evolved by surrounding a naturally occurring, stable, self-assembling iron-sulfur cluster with a protein coat.

Holm's most recent work has centered on the development of the synthetic analog approach for the elucidation of the structure and function of metal-containing sites and metal clusters in proteins and enzymes. He has developed syntheses and structural, electronic, and reactivity characterization of small molecules that serve as representations of the active sites in ferredoxins, and enzymes such as hydrogenase, nitrogenase, carbon monoxide dehydrogenase, and molybdo-oxotransferases. According to a colleague, Holm's success with oxotransferase systems establishes him as the leader in this enterprise.

Holm received a B.S. degree in 1955 from the University of Massachusetts and a Ph.D. in 1959 from Massachusetts Institute of Technology. Among his honors are the ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry (1990); the Dwyer Medal, Royal Australian Chemical Society (1987); Centenary Medal, Royal Society of Chemistry (1980); and the ACS Award in Inorganic Chemistry (1976). He is a distinguished lecturer and author or coauthor of over 300 articles.

ACS Award in Chromatography

sponsored by SUPELCO Inc.

Active in the field of chromatography for some 30 years, **JOSEF F. K. HUBER** has made outstanding contributions to the development of modern high-performance liquid chromatography (HPLC). In addition, his concept of multidimensional liquid chromatography switching methods has proved to be a powerful tool in trace and environmental analysis.

Huber, who is professor of analytical chemistry and director of the Institute of Analytical Chemistry at the University of Vienna in Austria, has worked in chromatography since 1958 and became interested in liquid chromatography (LC) in the mid-1960s. Much of his research since then has focused on column LC and the evaluation of fundamentals leading to HPLC as a practical analytical tool. This work led to the development of very small particles as packing material for highly efficient LC columns. Huber also designed high-performance detectors to meet the requirements of the new LC columns.

In addition, the award winner has worked out several noteworthy problem-solving strategies for analytical chemistry. In numerous papers and lectures he has demonstrated the resolving power of coupled LC column systems for environmental and medical trace analysis—applications that are very challenging in analytical chemistry.

Born in Salzburg, Austria, Huber received a Ph.D. degree in chemistry at the University of Innsbruck in 1960. Upon graduation he joined the faculty at the University of Technology in Eindhoven, the Netherlands. In 1965 he moved to the University of Amsterdam, and in 1974 to the University of Vienna.

Huber is author and coauthor of more than 150 publications, mainly on chromatography. He is a member of the editorial board of a number of journals. Recently he edited a book entitled "Instrumentation in High-Performance Liquid Chromatography." He is currently president of the Austrian Society of Analytical Chemistry.

His numerous awards include the TSWETT-Medal of the Soviet Academy of Sciences in 1978; the Dal Nogare Award of the Delaware Valley Chromatography Forum in 1981; the A. J. P. Martin Award of the Chromatographic Society, Great Britain, in 1988; and the Fresenius Award of the German Chemical Society in 1991. □