ACS 1993 Award Winners

Following are vignettes of the first 10 recipients of awards administered by ACS. The winners will receive their awards during the spring 1993 205th ACS national meeting in Denver, with the following exceptions: The Cope Medalist and the Cope Scholars will receive their awards at the fall 1993 206th ACS national meeting in Chicago at the Arthur C. Cope Symposium. The awards in Denver will be presented at a banquet on Tuesday March 30, 1993. The ACS Award for Creative Work in Fluorine Chemistry will be presented at the 11th Winter Fluorine Conference, which will be held Jan. 25–30, 1993, in St. Petersburg, Fla. The Roger Adams Award in Organic Chemistry will be presented during the 33rd National Organic Chemistry Symposium, to be held in Bozeman, Mont., June 13–17, 1993.

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

ACS Award for Creative Work in Fluorine Chemistry

sponsored by PCR Inc.

RONALD ERIC BANKS is internationally respected as a fluorine chemist, not only for the innovative quality and soundness of his published work over a broad spectrum of organofluorine chemistry, but also for his highly acclaimed books on the subject. In addition to having more than 250 publications, he has trained well over 100 research students.

Banks received a Ph.D. degree in chemistry in 1956 and joined the research department at Imperial Smelting Corp. in the U.K. Since 1958 he has been at the University of Manchester Institute of Science & Technology (UMIST), U.K., where he is currently professor of fluorine chemistry. His experiments as a graduate student, investigating the reaction between chlorine trifluoride and benzene, and in industry, where he discovered the basis of the first commercial route to hexafluorobenzene, provided the stimulus for his creative work in organofluorine chemistry.

From 1958 to 1974, Banks was the senior collaborator in R. N. Haszeldine's large fluorine team at UMIST. Fluorocarbon chemistry (including organoelemental and polymer chemistry) was tackled on a broad front with emphasis on industrial applications. This was a period of several outstanding technical achievements, including original syntheses of pentafluoropyridine and hexafluorocyclopentadiene; discovery of a method for the vulcanization of nitroso-rubber; discovery of electrophilic fluorinating agents of the N-F class; and the first solid evidence for the ring expansion of arylnitrenes to azacycloheptatrienylidines.

In 1974, Banks formed an independent research group. Since then important papers have been published in the following areas: novel *N,N*-dichloro(fluoroaryl)amines; synthesis of partially fluorinated *N*-heterocycles via pyridinium-*N*-imines and methylides; diazotization in anhydrous hydrogen fluoride; polymer-supported fluorinating agents; and electrophilic fluorinating agents of the N-F class. Research in the last area has led to the commercialization of 1-alkyl-4-fluoro-1,4-diazoniabicyclo[2.2.2]octane salts.

The book Banks authored in 1964, "Fluorocarbons and Their Derivatives," is considered by many a classic primary text. A second edition was published in 1970. He has edited or coedited three other reference texts on fluorine and organofluorine chemistry and another book will be published soon.

Banks was one of five scientists chosen to talk on ozone-depleting chlorofluororcarbons (CFCs) and their replacements, at the International Fluorine Symposium in 1988 in Santa Cruz, Calif. His presentation included crucial matters relating to the tropospheric degradation of CFC substitutes of the hydrofluorocarbon and hydrochlorofluorocarbon classes.

He is a fellow of the Royal Society of Chemistry, and a professorial member of the Fluorine & Fine Chemicals Research Center, Tokyo.

James Bryant Conant Award in High School Chemistry Teaching

sponsored by Ethyl Corp.

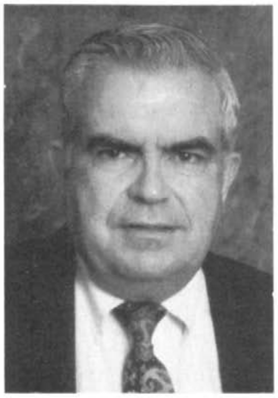
During his more than 30 years in chemical education, **MICHAEL J. BANNON** has developed new curricula, written science software, authored textbooks, conducted teacher workshops, led staff development sessions, founded science teacher support organizations, and mentored his school's science olympiad team. And throughout all this he taught high school chemistry. In fact, Bannon measures the successfulness of his career in education against the yardstick of his students' accomplishments.

This native New Yorker has been a chemistry teacher at Brentwood High School in New York since 1970. Part of this time—six years—was spent as science department chairman. As head of the department, Bannon pioneered the use of computers in the school's science classes and designed and taught courses for the school's teachers on the use of the computer in science education. In addition, Bannon wrote software for Brentwood's chemistry and physics classes. Two of his efforts are distributed nationally: Rutherford, which is marketed commercially, and Reaction Kinetics, which was submitted to the Seraphim Chemistry Library, a science software library.

A strong advocate of the use of demonstrations to enhance science education, Bannon balances lectures with open-ended laboratory experiments, chemistry-at-home labs, and computer simulations. In an effort to respond to requests, he prepared an environmental science curriculum for Brentwood students.

His interest in promoting better science education led him to found ChemNections, an organization for chemistry teachers in the area, and also led to his participation in the Woodrow Wilson Chemistry Institute, held summers at Princeton. Bannon was selected from among the 50 participants to be a member of a four-person team known as Dreyfus Master Teachers. In a six-year


Banks


Bannon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Brown

period, this team has traveled to about 25 colleges and universities giving seminars to chemistry teachers on effective ways to teach chemistry—an effort that has brought Bannon in contact with more than 1000 teachers.

Bannon's own grounding in chemistry came from his education at Catholic University of America (B.S., 1960) and the University of Notre Dame (M.S., 1969). His honors have included the Nichols Foundation Medal, received in 1989, and the Presidential Award for Science Teaching, received in 1990. In addition to being a member of ACS, Bannon belongs to the National Science Teachers Association and the Science Teachers Association of New York State.

ACS Award in Pure Chemistry

sponsored by Alpha Chi Sigma Fraternity

JEREMY M. BERG, professor and director of the department of biophysics and biophysical chemistry at Johns Hopkins University School of Medicine, began his research career during his freshman year at Stanford University, where throughout his undergraduate years, he played an important role in determining the structures of inorganic complexes by using x-ray crystallography. Before completing B.S. and M.S. programs at Stanford in 1980, Berg had authored or coauthored more than 20 publications.

In 1980, Berg began studies at Harvard University as a National Science Foundation predoctoral fellow. Research leading to a Ph.D. degree involved the development of a synthetic analog reaction system for molybdenum oxotransferases. This work has been widely cited and represents a fundamental advance in bioinorganic chemistry. Research carried out with C. Pabo while Berg was a Jane Coffin Childs Postdoctoral Fellow at Johns Hopkins led to the development of methods for the growth of highly ordered protein-DNA complex crystals suitable for high-resolution diffraction studies.

Following reports that a eukaryotic nucleic binding protein contained several zinc ions, each of which appeared to be bound within a stretch of about 30 amino acids (termed a "zinc finger" domain), Berg integrated inorganic and protein structural concepts to develop a systematic search procedure that allowed the identification of previously unrecognized potential metal binding sites in a variety of other nucleic acid binding and gene regulatory proteins. In 1986, he moved to the chemistry department at Johns Hopkins. There, he proposed a three-dimensional structure for the zinc finger domains. This appears to be the first example of the successful prediction of a globular protein from its amino acid sequence, where the structure of a homologous protein was not known.

Berg's group continues to creatively address fundamental questions in the rapidly developing field of metal binding-domain proteins. Recently, the group has converted a zinc finger peptide into one with an open coordination site for substrate binding and, possibly for activation. This work may allow the development of methods for the design of relatively small ligand-binding proteins as catalysts. Another question under investigation is the frequency of occurrence of zinc finger proteins in humans and other species and the structural basis for site-specific DNA binding by these proteins. This multifaceted approach promises important results in fields ranging from pure chemistry to applied biology. More recently, Berg has begun studies of proteins composed entirely of D-amino acids and has revealed their utility in a wide range of studies.

Among his awards are a Camille & Henry Dreyfus Foundation Distinguished New Faculty in Chemistry Award (1986), Searle Scholar Award (1987), Presidential Young Investigator (1988–93), Alfred P. Sloan Fellowship (1988), and an ICI Excellence in Chemistry Award (1992). The first Eli Lilly Grant in Biochemistry was awarded to Berg in 1988. Berg was the E. Bright Wilson lecturer at Harvard, also in 1988.

ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry

sponsored by Mallinkrodt Specialty Chemicals Co.

THEODORE L. BROWN, professor of chemistry and director of the Beckman Institute for Advanced Science & Technology at the University of Illinois, Urbana-Champaign has, over the past three-and-a-half decades, made major contributions to the understanding of how chemical reactions proceed. His pioneering research into the nature of organolithium compounds in the vapor state and in solution has helped into convert a rather confusing field to a well-ordered one. Brown's approach consists, in part, of measuring how rapidly reactions occur, and how the reaction rates are affected by changes in temperature or concentrations of the reactants. In recent years, his research has expanded to include studies of reactive transition-metal organometallic systems in solution.

In 1975, with J. D. Atwood, Brown began a series of papers on cis-labilization. The term refers to the observation that when a bound carbonyl group in a six-coordinate transition-metal carbonyl com-

Carberry

Carr

Cleland

pound is replaced by a sigma donor ligand that is a poorer pi acceptor than carbonyl, the positions cis to the ligand are stereospecifically labilized toward ligand dissociation. By using ^{13}CO labeling studies and by invoking the principle of microscopic reversibility, they established for the first time that the labilization is stereospecific.

The discovery by Brown and B. H. Byers of the radical chain mechanism for substitution of $HRe(CO)_5$ ushered in a period of great interest in metal carbonyl radicals, a class that was virtually unknown to that point. These studies carried with them the implication that radicals are capable of rapid atom transfer reactions, and, most unexpectedly, are extremely labile toward substitution. Brown's group was the first to prepare persistent metal carbonyl radicals and to fully characterize them spectroscopically and chemically.

Two comparatively new initiatives show that Brown continues to break new ground in research. The first involves the application of flash photolysis and low-temperature infrared methods to discern the detailed mechanisms of reactions, particularly those involving ligand dissociation as a key step in forming reactive intermediates. The second area of new research involves the application of molecular mechanics to the determination of ligand steric parameters. Brown has defined the ligand repulsive energy, which provides a quantitative measure of the relative steric requirements for phosphines and many other related ligands.

Brown received a B.S. degree from Illinois Institute of Technology in 1950 and a Ph.D. degree from Michigan State University in 1956. He received the ACS Award for Research in Inorganic Chemistry in 1972, a Guggenheim Fellowship in 1979, and was elected a fellow of the American Association for the Advancement of Science in 1987.

E. V. Murphree Award in Industrial & Engineering Chemistry

sponsored by Exxon Research & Engineering Co.

The research **JAMES J. CARBERRY,** chemical engineering professor at the University of Notre Dame, has conducted on reaction and catalytic phenomena has brought him worldwide recognition from his peers in academia. Carberry's research also has led to several technical achievements that have stood him in good stead in the industrial community.

In 1964, Carberry developed a gradientless spinning-basket reactor (also known as a Carberry-Notre Dame reactor). This device, which facilitates the study of the kinetics of catalytic reactions, has been pivotal to the design of fixed-bed and tube wall reactors.

Carberry's analyses of the effectiveness of porous catalysts under nonisothermal conditions and his analyses of yields as opposed to mere conversions in industrially important reaction and reactor networks have proven critical to industrial catalysis operations.

The experimental kinetic studies Carberry conducted on the total oxidation of carbon monoxide and olefins over supported metals revealed the complex kinetic character of these reactions—work that has had important consequences for pollution abatement devices such as automobile catalytic converters.

Born in Brooklyn, N.Y., Carberry focused on chemical engineering throughout his academic career: He received bachelor's and master's degrees from the University of Notre Dame in 1950 and 1951, and a doctorate from Yale University in 1957. From 1951 to 53 and 1957 to 61, Carberry worked as a chemical engineer at DuPont.

This year's Murphree Award is one of the latest in a solid list of honors Carberry has garnered. He was made National Science Foundation Senior Fellow at Cambridge University in 1965 and received the Yale Engineering Association Award for Advancement of Pure & Applied Science in 1968. In 1974, he was named Hays-Fulbright Senior Scholar at the University of Rome. He was appointed Mellon Fellow (1979) and twice named Churchill Fellow (1979, 1982) at Cambridge University. Carberry was named Fellow of the Royal Society of Arts in London in 1980, and was appointed Visiting (1987) and now Life Fellow at Clare Hall at Cambridge.

To this impressive list can be added a body of published literature that contains a textbook and 106 papers, and a visiting professor roster that features universities in California, Italy, and England. Carberry was named to the National Academy of Engineering in 1989. From the American Institute of Chemical Engineers, he has received the R. H. Wilhelm Award (1976), the William H. Walker Award (1989), and the organization's first Thiele Award (1992).

ACS Award for Creative Invention

sponsored by Corporation Associates

The inventor of Seldane, **ALBERT A. CARR,** has spent his entire career in the labs of Marion Merrell Dow, which was known as the William S. Merrell Co. in 1958, when Carr joined the company as a research chemist in the organic chemistry department. He's now distinguished scientist of discovery chemistry at the Marion Merrell Dow Research Institute in Cincinnati, and has been directly responsible for the discovery of 13 candidate drugs for clinical study.

For decades, the discovery of a truly nonsedating antihistamine had been the goal of nearly every pharmaceutical company. Carr's approach, which was an outgrowth of an antipsychotic project, led to a potent series of antihistamines devoid of both central nervous system effects and sedative properties. The first nonsedating antihistamine, terfenadine (tradename Seldane), was the result.

Seldane has had a major impact on

the health of millions of Americans as an advance in the treatment of allergic conditions, and has probably contributed to reducing accidents associated with the use of classical sedating antihistamines.

Recently, Carr's work has led to the discovery of materials that demonstrate a potential new approach to the treatment of schizophrenia, but that lack the undesirable side effects of typical antipsychotic agents.

Carr has published more than 20 papers and holds 43 U.S. patents. An additional 356 international and foreign equivalent patents are also held by Carr. In 1988, he received the Distinguished Scientist Award from the Technical Societies Council of the Engineers & Scientists of Cincinnati, and he was named Chemist of the Year by the ACS Cincinnati Section in 1987. He is a member of both ACS and the New York Academy of Sciences.

Seldane also received an award, given by *Science Digest,* as one of the top 100 scientific/technological innovations of 1985.

Carr received both B.S. (1953) and M.S. (1955) degrees from Xavier University, Cincinnati; he earned a Ph.D. degree in 1958 from the University of Florida, Gainesville.

Alfred Bader Award in Bioinorganic or Bioorganic Chemistry

W. WALLACE CLELAND, M. J. Johnson Professor of Biochemistry and Steenbock Professor of Chemical Science at the University of Wisconsin, Madison, has spent his career developing methods for determining the mechanisms of enzyme-catalyzed reactions. This work has involved not only the variation of reaction rates with the concentration of substrates, products, and inhibitors, but also the use of isotope effects and the pH variation of kinetic parameters to deduce the chemistry of enzymatic reactions.

Cleland first used inert coordination complexes of adenosine 5′-triphosphate (ATP) with chromium(III) and cobalt(III) as probes of enzyme stereochemistry and mechanisms. Cleland and coworkers have recently characterized the isomers of monoamminechromium ATP, which are useful for micromapping enzyme active sites. The development of dithiothreitol as a reducing agent for sulfhydryl groups also resulted from work in his laboratory.

Colleagues regard him as the world's outstanding authority on enzyme kinetics. His nomenclature, analytical approaches, computer programs, and use of isotope effects to examine the chemical mechanisms of enzyme reactions have been adopted wherever enzyme research is conducted. He is sought as a collaborator by investigators in many different universities in the U.S. and abroad. The results of his own and of collaborative investigations have provided detailed information on the kinetics and chemical mechanisms of a large number of enzyme-catalyzed reactions.

Cleland, together with his students and collaborators, has published studies of the chemical and kinetic mechanisms of 48 enzymes. He has developed methods for determining the chirality of metal-nucleotide complexes and for determining the absolute configuration of some types of compounds, has adapted spectrophotometers for assay of enzyme catalysis in extremely dilute solutions, and has developed chemical procedures for the synthesis of a variety of substrates, substrate analogs, and enzyme inhibitors.

Cleland received an A.B. degree in chemistry from Oberlin College (1950) and both M.S. (1953) and Ph.D. (1955) degrees in biochemistry from the University of Wisconsin, Madison.

He is a member of the ACS, the National Academy of Sciences, the American Academy of Arts & Sciences, the American Society of Biochemistry & Molecular Biology, and Sigma Xi. He received the Merck Award from the American Society of Biochemistry & Molecular Biology in 1990.

Corey

Crabtree

Diamond

Roger Adams Award in Organic Chemistry

sponsored by Organic Reactions Inc. and Organic Syntheses Inc.

E. J. COREY, professor at Harvard University since 1959, has been described by a colleague as "the world's undisputed leader in synthetic organic chemistry. He has literally changed the way people think about the problem of creating organic architecture. No one individual, now living, has had such a profound impact on this field."

Winner of the 1990 Nobel Prize in Chemistry, the Japan Prize in Medicinal Sciences in 1989, and the Wolf Prize in Chemistry for 1986, Corey has been contributing to organic and medicinal chemistry since receiving a Ph.D. degree from Massachusetts Institute of Technology in 1950. He has more than 700 publications in scientific journals and has held over 100 special lectureships. Corey is a member of ACS and the National Academy of Sciences; he has received numerous honorary degrees and has honorary memberships in the Royal Society of Chemistry, the Chemical Society of Finland, the Chemical Society of Japan, and the Pharmaceutical Society of Japan.

His research interests include synthesis of complex bioactive molecules; the logic of chemical synthesis; new methods of synthesis; molecular catalysts and robots; theoretical organic chemistry and reaction mechanisms; organometallic chemistry; bioorganic and enzyme chemistry; eicosanoids and their relevance to medicine; and application of computers to organic chemical problems, especially to retrosynthetic analysis.

After receiving a Ph.D. degree, Corey was for several years a member of the chemistry faculty at the University of Illinois, Urbana-Champaign—a job that was offered to him by Roger Adams.

In 1968, Corey published the first of his 50 pioneering contributions to the prostaglandin eicosanoid field. He was the first to synthesize the major representatives of this class of fatty-acid-derived hormones, including prostaglandins and leukotrienes. He has also studied the biosynthesis of the eicosanoids with regard to intermediates and effective inhibition. His work established fundamentally different pathways for prostaglandin biosynthesis in mammalian and marine systems. The design principles and ideas that he developed are now the basis for the pharmaceutical research and production of new therapeutic agents in the eicosanoid field.

Corey also has had a major impact as an educator. During the past 35 years, he collaborated with more than 375 individuals; 82 were students who received Ph.D. degrees under his direction and 295 were either postdoctoral fellows or visiting faculty who spent from one to three years in his laboratory. Of these, 160 hold academic positions in major universities throughout the world. One of his postdoctoral colleagues subsequently was awarded the Nobel Prize in Medicine. According to a colleague, students in Corey's research group are educated by their involvement in a wide range of challenging research projects at the frontiers of fundamental chemical science.

ACS Award in Organometallic Chemistry

sponsored by Dow Chemical Co. Foundation

Yale University's **ROBERT H. CRABTREE** is considered a pioneer in the field of alkane activation. His 1979 publication on the stoichiometric homogeneous dehydrogenation of alkanes was a landmark for future studies of alkane activation by homogeneous catalysts. This and subsequent papers were to have a major impact on the course of organometallic research in the 1980s. Extensive current activity in this area can be traced to the crucial research reported by Crabtree in 1979.

Other significant developments followed, such as the catalytic photodehydrogenation of alkanes and the development of an iridium hydrogenation catalyst that he and others showed subsequently to have unusual selectivity patterns. This catalyst shows stereofacial selectivity determined by the presence of an oxygen-containing functionality, typically a hydroxyl group. It also is one of the few homogeneous catalysts that efficiently reduce tri- and tetrasubstituted olefins.

Along a different line of research, he began to develop the coordination and organometallic chemistry of halocarbons. This led to the discovery of coordinated fluorine in an organofluoride and ultimately to an approach to enhance the reactivity of organic halides via coordination to metals.

Another active area is sigma bond complexation, including dihydrogen complexes, where he has developed some catalytic chemistry of these systems and devised an NMR method for studying metal hydride structures.

One of his most recent contributions has been the development of a preparative-scale mercury-sensitized photochemical dehydrodimerization reaction that provides novel routes to alkanes, alcohols, amines, and ethers. The process allows a one-step synthesis of a potentially useful ligand that had been very difficult to obtain.

His textbook "The Organometallic Chemistry of the Transition Metals" promises to be a widely used text in undergraduate and graduate courses. Crabtree's research is characterized by a flair for uncovering new and different areas of organometallic chemistry. His work has set the stage for developing areas of intense activity in organometallic chemical research.

Crabtree received a B.A. degree in 1969 from Oxford University, and a Ph.D. degree in 1973 and a D.Sc. degree in 1985 from Sussex University, U.K. He received the 1991 Organometallic Chemistry Prize of the Royal Society of Chemistry.

ACS Award for Nuclear Chemistry

During a career that spans more than 40 years, **RICHARD M. DIAMOND** has made enormous contributions to the field of nuclear chemistry and related nuclear structure. He has been described by a colleague as having "an outstanding record of scientific accomplishment."

Diamond has been doing research in chemistry since 1951, when he received a Ph.D. degree from the University of California, Berkeley, and has published over 250 papers. Currently retired from Lawrence Berkeley Laboratory, he remains involved in the development of Gammasphere, the largest and most sensitive gamma-ray spectrometer array in the world.

Diamond's early career focused on the development of cation exchange methods for separation of transplutonium elements. From 1950 until 1965, his research involved experiments and theory explaining ion-exchange resin and solvent extraction behavior. At the same time, however, he was becoming interested in nuclear chemistry. For some years, he simultaneously pursued programs in nuclear reactions and spectroscopy as well as fundamentals of ion-exchange and solvent-extraction chemistry. A testimony to his reputation in both of these disciplines is that he was elected to organize and serve as chairman of Gordon conferences in each—nuclear chemistry in 1965 and ion exchange in 1969.

After joining the staff of Lawrence Berkeley Laboratory in 1958, he began research in high-spin nuclear physics, in collaboration with Frank S. Stephens. This work included the first experiments demonstrating multistep Coulomb excitation with heavy ions and early in-beam studies to produce the highest spin states observed at the time, demonstration of centrifugal stretching of nuclei under rotation, discovery of decoupled bands, observation of a second band-crossing in a nucleus, observation of a rotational band termination in a rare-earth nucleus at high spin, and superdeformed bands in nuclei. He also helped design and build the first large germanium-detector array.

Diamond has received numerous honors. He is a member of ACS and a fellow of the American Association for the Advancement of Science and of the American Physical Society. He has received fellowships for research and study in Denmark, Australia, and Japan, and was a member of the U.S. physics delegation to the Soviet Union in 1966. In 1980, he and Stephens shared the Tom W. Bonner Prize in Nuclear Physics given by the American Physical Society. Most recently, in May 1991, he gave the first Raymond and Beverly Sackler Foundation Distinguished Lecture in Physics at the Niels Bohr Institute in Copenhagen. ☐