# ACS 1976 national award winners announced

*Following are the 1976 recipients of awards administered by ACS. All awardees will receive their awards at the ACS centennial meeting in New York City next April, except Dr. Elias J. Corey, who will receive the Arthur C. Cope Award at the fall 1976 meeting in San Francisco. A vignette on Dr. George Hammond, winner of the 1976 Priestley Medal, was published in C&EN, July 7, page 28.*

## ACS Award for Creative Invention

*sponsored by the Corporation Associates*

**DR. MANUEL M. BAIZER,** distinguished science fellow at Monsanto, is being honored for his development of an electrolytic reductive coupling process for making adiponitrile directly from acrylonitrile. His invention led to the design and operation of a large-scale commercial plant by Monsanto for producing adiponitrile, a key intermediate in making nylon. This technical achievement has received international recognition, and brought Monsanto the 18th biennial Kirkpatrick Chemical Engineering Achievement Award given in 1965 by *Chemical Engineering.*

Baizer's research on electrochemical reductive dimerization of acrylonitrile to adiponitrile has triggered renewed interest in electrochemistry as a commercially viable method of synthesis. The award winner has continued in the forefront of this area, and has received 15 additional patents in organic electrochemistry since the patents on his initial work were issued.

His work in organic electrochemistry also has led to many invitations for him to speak before scientific meetings both in the U.S. and abroad. He has published in a variety of research areas other than organic electrochemistry, including opium alkaloids, fine chemicals, and oxynitration of benzene, and was chosen editor for a new reference book entitled, "Organic Electrochemistry: An Introduction and Guide." He is currently chairman of the organic and biological chemistry division of the Electrochemical Society and was previously chairman of the organic section of the International Society for Electrochemistry.

Baizer received his B.S. in 1934, M.S. in 1937, and Ph.D. in organic chemistry in 1940 under Dr. Ralph Connor, all at the University of Pennsylvania. He taught for some years at Brooklyn College and headed the research department of New York Quinine & Chemical Works from 1947 to 1958 when he joined Monsanto.

Under the auspices of the U.K.'s Science Research Council, Baizer spent the 1973–74 academic year as visiting professor at the University of Southampton in England. His most recent research work has been concerned with electrocarboxylation and utilization of electrogenerated bases.

## ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry

*sponsored by Mallinckrodt*

**DR. DARYLE H. BUSCH,** professor of chemistry at Ohio State University, is regarded by his associates as one of the truly outstanding teachers and researchers in inorganic chemistry. He has played a key role in building the discipline at Ohio State into one of the most productive and recognized academic groups in his major areas of interest, coordination and transition element chemistry.

On theoretical grounds, Busch conceived the coordination template effect. Under this effect, the coordination sphere of a metal ion can function as a template which controls the course of organic reactions. The effect was demonstrated in his laboratory by synthesis of one of the first macrocyclic complexes.

Since macrocyclic ligands are important in nature (porphyrins), Busch and his coworkers have prepared and studied many synthetic macrocycles in attempts to discover those properties that are inherent in the cyclic structure of a macrocyclic ligand. For example, they find that the ligand field strength of a particular donor atom toward any given metal ion is strongly dependent on ring size.

**Baizer**

**Busch**

Busch's research on cobalt(III) complexes of esters has contributed to the understanding of the effect of metal ions in promoting reactions of carboxyl functions. He and his coworkers have shown that the activated species contains coordinated carbonyl oxygen, thus providing a reasonable model for peptidase and esterase activity.

A graduate of the University of Illinois (Ph.D. in inorganic chemistry, 1954), he studied under Dr. John C. Bailar Jr. He was appointed assistant professor of chemistry at Ohio State shortly after graduation, and became professor in 1963.

Busch has lectured widely and currently has more than 160 publications to his credit. He has served as a consultant to various organizations, and has been on the editorial boards of several publications. He has been very active in ACS, particularly the Division of Inorganic Chemistry, of which he has been chairman. He received the ACS Award in Inorganic Chemistry in 1963.

## James T. Grady Award for Interpreting Chemistry for the Public

The search for a safer cigarette, biochemical clues to mental illness, semiconductor memory chips, and what science can do about hereditary diseases are but a few of the topics that **GENE BYLINSKY** has written on for *Fortune* magazine in recent years.

These and his other literary efforts have brought him the Grady Award. Established in 1955, the award carries a gold medal and a $2000 prize. Nominees must have made noteworthy presentations through the medium of public communication to increase the American public's understanding of chemistry and chemical engineering.

Bylinsky, 44, graduated from Louisiana State University in 1955 with a B.A. in journalism. On graduation he became a science reporter for the *Wall Street Journal,* reporting from the paper's Dallas, San Francisco, and New York offices. He later joined the *National Observer* in Washington, D.C., also as a science writer and in 1966 he joined *Fortune.* He has continued to specialize in writing on science and medicine.

Bylinsky's work for *Fortune* gives the magazine's big readership a clear un-

derstanding of a wide range of scientific subjects. His articles set forth the problems and goals of those involved in scientific endeavors, thereby making them of even greater interest and insight.

As the nominating document puts it, "Bylinsky is an excellent spokesman for the scientific community easily bridging the gap between those whose lives are dedicated to science and the layman." And he has a beautiful human touch in doing it. For instance, some years ago he opened a story on plant breeding with "Bent over a microscope, armed with minuscule manipulators, Roy U. Schenk, a crew-cut biochemist at the University of Wisconsin, spends many hours each week guiding two ghostly plant cells in an attempt to fuse them."

## ACS Award in Chemical Education

*sponsored by Scientific Apparatus Makers Association*

**DR. LEALLYN B. CLAPP,** Newport Rogers Professor of Chemistry at Brown University, Providence, is one of the nation's leaders in chemical education. Over the past 33 years of his teaching career at Brown, he has gained a deep respect and high admiration from his students, faculty associates, and contemporaries alike, many of whom have called him "the greatest professor I've ever had." "His class notes are a student's prize possession. He is not only an enjoyable lecturer . . . but he also takes a special interest in each student as an individual. His students sense the respect he has for them, and in his courses they grow in knowledge and humanity to justify and deserve it." These, and many other such comments, abound in support of this award winner.

An early leader in curriculum reform, Clapp's "Chemistry of the Covalent Bond" (1957) was a landmark in the effort for better freshman chemistry courses. He was one of the "guiding lights" of the CBA (chemical bond approach) project for high school chemistry. As a visiting scientist, he has lectured at more than 60 colleges and universities in this country; he's been a visiting lecturer and adviser in chemical education in more than 40 foreign colleges and universities; hundreds of science teachers, supervisors, and resource personnel on the secondary level have attended the 13 Brown NSF Summer Institutes and three IIIS Summer Projects he organized and directed. Through his ACS activities and the New England Association of Chemistry Teachers, which gave him the John A. Timm Award in 1974 and of which he was president 1961–63, he has maintained a close working association with his students and fellow teachers.

A native of Illinois, Clapp received a B.Ed. from Eastern Illinois State University in 1935, an M.A. from the University of Illinois in 1939 and Ph.D. in 1941. In 1941 he joined Brown University as an instructor; he was named professor of chemistry in 1956.

The measure of this superb educator is probably best summed up in the words of an admiring colleague: "His value is reflected in the learning experiences of his students, and in the human, scientific, and educational contributions of his colleagues and former students. This profound effect magnifies the influence he has had on the organizational and curricular progress of chemical education in the U.S."

## Arthur C. Cope Award

**DR. ELIAS J. COREY,** 47, Sheldon Emory Professor of Chemistry, Harvard University, is adding still another prestigious award to his impressive collection. The $10,000 Arthur C. Cope Award honors him for his elegant total syntheses of complex natural products (particularly his landmark accomplishments in the prostaglandin field), his development of many new synthetic reactions, and his pioneering work in the use of computer analysis for synthetic design. The natural products that Corey has synthesized include triterpenes, sesquiterpenes, alkaloids, toxins, antibiotics, and hormones.

Along with the development of synthetic reactions specifically designed for his total syntheses, Corey's name is synonymous with the discovery or novel use of a wide range of versatile synthetic reagents—diimide, 1,3-dithianes, sulfur ylides, organocopper reagents, nickel carbonyl. He also has developed unusual functional group transformations, including stereospecific olefin syntheses, oxidations, reductions, and formation of macrocyclic lactones.

Born in Methuen, Mass., Corey received his education at Massachusetts Institute of Technology, obtaining his B.S. in 1948 and Ph.D. in 1951. He joined the chemistry department of the University of Illinois in 1951 as an instructor, becoming professor of chemistry in 1956. He moved to Harvard University in 1959 and was named Sheldon Emory Professor of Chemistry in 1968. He holds honorary degrees from Harvard, the University of Chicago, and Hofstra University.

Corey is a member of the American Chemical Society, National Academy of Sciences, and the American Academy of Arts and Sciences. He was a Guggenheim fellow (1957–58 and 1968–69) and Alfred P. Sloan Foundation fellow (1955–57). He was awarded the ACS Award in Pure Chemistry (1960), Ernest Guenther Award (1968), Intrascience Foundation Award (1967), ACS Award in Synthetic Organic Chemistry (1971), Harrison Howe Award (1971), Ciba Foundation Medal (1972), Ohio State University's Evans Award (1972), Linus Pauling Award (1973), Harvard's Biannual Ledlie Prize in Science (1973), and Carnegie-Mellon's Dickson Prize in Science (1973).

The award winner's most recent undertaking is a program on the synthesis and bioorganic chemistry of biologically active macrocyclic substances.

## ACS Award in Pure Chemistry

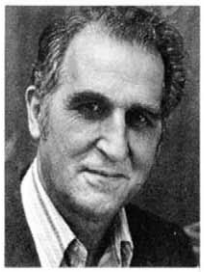
*sponsored by Alpha Chi Sigma Fraternity*

"A theoretical chemist with a rare combination of physical insight and powerful abstract mathematical reasoning," is the way one colleague describes **DR. KARL F. FREED,** associate professor of chemistry at the University of Chicago. Another associate refers to him as "one of the best, possibly the best, of the young theoretical chemists in the U.S. below the age of 35." And the fact of the matter is that in the few years since his doctoral studies, Freed has made numerous outstanding contributions in several important areas of research.

The award winner's early work focused on the theory of hyperfine structure in small molecules, on vibrational-rotational coupling, and on energy barriers in internal rotational modes. These studies evolved into research on the problem of electron correlation in atoms and molecules.

Freed is probably best known, however, for his recent investigations of radiationless processes. As a result of this research, scientists now have a theory that describes the rates of simple radiationless processes (such as occur in almost every large organic molecule) in terms of vibrational frequencies and their differences between different electronic states, electronic energy gaps, and the like. Also of major significance are his contributions to the


**Bylinsky**


**Clapp**


**Corey**


**Freed**

theory of polymer solutions and his work on the nature of semiempirical quantum mechanical methods. Freed's research on pi-electron systems has resolved many of the inherent conflicts of the semiempirical theory.

A graduate of Columbia University (B.S., 1963) and Harvard University (Ph.D., 1967), Freed joined the faculty of the University of Chicago in 1968 as assistant professor in the department of chemistry and in the James Franck Institute. His many recognitions include his designation as an Alfred P. Sloan Foundation fellow, 1969–71; Du Pont faculty fellow, 1969–70; Camille and Henry Dreyfus Foundation teacher-scholar, 1972–77; and Guggenheim fellow, 1972–73. He received the Marlow Medal of the Faraday division of The Chemical Society (London) in 1973.

## ACS Award in Chromatography

*sponsored by Supelco Inc.*

**DR. JAMES S. FRITZ,** professor of chemistry at Iowa State University, has helped develop a method to isolate, identify, and measure parts-per-billion levels of possibly carcinogenic organic contaminants in the nation's drinking water. Based on gas chromatography-mass spectrometry, the procedure is being used extensively in a nationwide systematic investigation of municipal drinking waters.

Fritz has made many other substantial contributions to the science of chromatography that have been of great utility, not only in analytical chemistry, but in other chemical disciplines, environmental science, and industrial separation processes.

For instance, he was one of the first researchers to recognize the potential for performing very selective metal ion separations on ion exchange resins by utilizing competitive complex formation. And he demonstrated the vast potential and versatility of nonaqueous ion exchange separations for inorganic analysis. A highlight of his work has been development of a rapid, sequential separation procedure for the quantitative analytical separation of 27 different metal ions based entirely on chromatography. He also has introduced a variety of versatile organic chelating and coordinating reagents for use in inorganic chromatographic separations.

Fritz currently is working toward an instrument that will perform inorganic analyses as rapidly and simply as a gas chromatograph performs organic analyses. Based on forced-flow liquid chromatography, the technique promises to revolutionize the practice of routine inorganic analysis.

Fritz's work has been published in more than 130 papers, and he has authored or coauthored several books and chapters in books on quantitative analysis.

He attended James Millikin University (Decatur, Ill.) and did graduate work at the University of Illinois, obtaining his Ph.D. in 1948. He taught at Wayne State University, Detroit, for three years and joined Iowa State in 1951.

Fritz

Good

Hoffman

Holm

## ACS Award in Colloid or Surface Chemistry

*sponsored by Kendall Co.*

**DR. ROBERT J. GOOD,** professor of chemical engineering at the State University of New York, Buffalo, has made outstanding contributions to a great variety of different branches of colloid and surface chemistry, in both theoretical and experimental categories.

Among his accomplishments is the development of a no-adjustable-parameter theory of interfacial energies (in conjunction with L. A. Girifalco and G. Kraus) which makes it possible to predict the interfacial tension between liquids, and the wetting (contact angle) of liquids on solids. It also leads to a method of evaluating the surface free energy of solids. His theoretical work also has included an analysis of intermolecular forces at surfaces.

Good has become well known in several disciplines of science, for his applications of his theoretical work to practical surface chemical problems. For instance, in studying the biological phenomenon of why living cells in mixed aggregates spontaneously "sort out" into nearly homogeneous, discrete aggregates, he employed the theory of solubility of nonelectrolytes, treating the cells as unusually large, polygonized macromolecules, and the "sorting out" as a phase separation. He concluded that the observed effect could be accounted for as owing to differences in surface potentials of the cells of unlike types. This theory has been applied to problems of phagocytosis, which is the body's primary defense mechanism against disease.

Good has worked on the direct problem of the chemistry and physics of adhesive bonding. Recently, he wrote a definitive paper on the theory of the locus of failure in an adhering system —i.e., the question of whether failure is truly at the interface, as opposed to being "cohesive," i.e., within one bulk phase or the other.

Good attended Amherst College, the University of California, Berkeley, and the University of Michigan, receiving his Ph.D. at the last in 1950. Before joining SUNY in 1964, he worked as a chemist for several companies and taught for four years (1953–57) at the University of Cincinnati. He has been active in ACS at both the local and national levels, and was chairman of the San Diego Section in 1961–62. He is editing (jointly with R. R. Stromberg) a series of books, "Techniques of Surface Chemistry and Physics," which he initiated.

## James Bryant Conant Award in High School Chemistry Teaching

*sponsored by CHEM Study (The Chemical Education Material Study)*

**DR. DOROTHEA HEYL HOFFMAN's** innate gift for teaching and her deep dedication to her work combine to make her an outstanding high school chemistry teacher. The superior quality of teaching that she demonstrates is a reflection of her patience and understanding, as well as her ability to impart technical knowledge to her students.

The award winner, who teaches at Westfield Senior High School (Westfield, N.J.), uses a traditional approach. She spends considerable time preparing for class lessons to ensure that fundamentals are stressed and reinforced. Well liked and highly respected by her students, Hoffman is completely aware of the progress of each pupil in her charge, individualizing her program to accommodate those for whom the regular course of study is restrictive. She works long hours in the laboratory with her students, allowing them to spend as much time as is needed in the lab. The results of her work are shown in advanced placement exams and state science tests each year, where her students rank among the first in the state.

Hoffman received a B.A. in 1939, an M.A. in 1940, and Ph.D. in chemistry in 1942, all from Bryn Mawr College. Her Ph.D. thesis contained early work on the allylic reaction known as the Cope rearrangement, named after Dr. Arthur C. Cope, her thesis adviser.

In 1942 the awardee joined the research group headed by Dr. Karl. Folkers at Merck & Co. Highlights of her career there included the elucidation of the structures and syntheses of pridoxal and pyridoxamine and also of the phosphates of these compounds. While at Merck she met and married Dr. Carl H. Hoffman, and in 1952 resigned from Merck in order to raise a family. In 1965 she began her teaching career at Westfield, where she established and currently is teaching courses in CHEM Study, advanced placement chemistry, and organic chemistry. She has authored or coauthored 27 publications and has 12 patents issued to her.

Her professional memberships include the American Chemical Society, Association for the Advancement of Science, National Science Teachers Association, New Jersey Science Teachers Association, National Education Association, and the New Jersey Education Association.

## ACS Award in Inorganic Chemistry

*sponsored by Texas Instruments*

MIT chemistry professor **RICHARD H. HOLM**'s contributions to inorganic chemistry have been many and varied —centering on physical and synthetic transition metal chemistry. The most impressive quality of Dr. Holm's work, writes one of his peers, "is the thoroughness and determination with which he attacks a problem. The experimental sections of his papers are truly unique . . . [and they] can and do serve as a model for every investigator in the field."

Many chemists consider his most recent work (in collaboration with Dr. J. A. Ibers, Northwestern University) his most spectacular so far. That is the synthesis and characterization of model complexes for the iron-sulfur proteins. Design and synthesis of these compounds has had a major impact on the biological community, because they have permitted an understanding about how these cores carry out biological redox reactions. Recently, he has developed a technique for analyzing the iron-sulfur cores in naturally occurring systems by utilizing the facile ligand replacement reaction that he discovered with his synthetic models. He is continuing work in this area, as well as pursuing the chemistry of the corrin ring nucleus and studies with cytochrome hydroxylase enzymes.

Holm's earlier work has been in two principal areas—structures, structural equilibria, and kinetics and mechanism of rearrangements of metal complexes principally by NMR techniques; and synthesis, structure, and electron transfer properties of metal dithiolenes and electronically related systems.

Educated at the University of Massachusetts and at Massachusetts Institute of Technology (Ph.D. in 1959), he taught for five years at Harvard University, and then for two years at the University of Wisconsin. He joined MIT in 1967. He is a member of ACS, The Chemical Society (London), the American Academy of Arts & Sciences, and the National Academy of Sciences. He received the second Bailar Medal for research in coordination chemistry in 1973. In July of this year he assumed the position of professor of chemistry at Stanford University.

## Garvan Medal

Ever since she developed the symbolic addition method of determining molecular structures directly from x-ray diffraction experiments 12 years ago, **DR. ISABELLA L. KARLE** has continued making significant contributions in crystallography by her analyses of important materials particularly of interest in organic and biological chemistry. She is head of the x-ray analysis section of the Naval Research Laboratory in Washington, D.C., where she began working nearly 30 years ago.

Karle's interest in diffraction work dates back to her college years when she studied for her doctorate, which she received in 1944 at the early age of 22, under Dr. Lawrence Brockway at the University of Michigan. Her research then was electron diffraction on the structure of molecules. For two years before joining the Naval Research Labs, she was an instructor of chemistry at the university.

Prior to her development of the symbolic addition method, crystal structure analysis was laborious and time-consuming, and the type of material that could be solved by existing methods was quite limited. The symbolic addition method enables structure determination of complex molecules previously not amenable to investigation. As a result, one colleague notes, scientists throughout the world are accelerating research on complex structures that will in time become the basis of future developments employing a knowledge of the fundamental atomic and molecular arrangement of matter, for example, in the rapidly developing field of molecular biology. As a result of analytical techniques developed by Karle, about half of the investigations using x-ray structure analysis presented at meetings and published in journals employ the symbolic addition procedure or some variant of it. These comprise hundreds of investigations.

Karle also has been active in teaching—training many postdoctoral students and visitors to her laboratory who wish to learn the new analytical techniques. In addition, she has been a main lecturer at several schools and institutes concerned with structure analysis.

She is a member of several scientific associations, including ACS, and has received a number of awards, including ACS's Hillebrand Award in 1969.

## Frederic Stanley Kipping Award in Organosilicon Chemistry

*sponsored by Dow Corning*

**DR. MICHAEL F. LAPPERT** is primarily an organometallic chemist, but he has made many important contributions to organosilicon and related chemistry. Using his in-depth knowledge of inorganic chemistry plus new physical techniques, he has synthesized a large number of new organic derivatives of silicon, some of them new types. And so he is being honored by the Kipping Award.

To date, Lappert, who is professor of chemistry at the University of Sussex, Brighton, U.K., has published more than 240 papers. More than 60 of them are concerned with organosilicon chemistry—the synthesis of new organosilicon compounds, transition metal-catalyzed organosilicon reactions, organosilicon species as reaction intermediates in organic synthesis, and physicochemical studies of bonding in organosilicon compounds.

Other aspects of his work have helped to elucidate organosilicon chemistry. These include research on organometallic chemistry of other Group IV elements, the problem of $\pi$-bonding for B-N, B-Hal, and B-O compounds, organoboron chemistry, and inorganic polymers.

Perhaps the research that has had the greatest impact on organosilicon chemistry is his synthesis of compounds containing $Me_3SiCH_2$-M and $(Me_3Si)_2CH$-M bonds, particularly in cases where M is a transition metal or a di-(Ge, Sn, or Pb) or tri-(Si, Ge, or Sn) Group IV element. In this study, he showed that oxidation states previously believed to be too unstable to exist are greatly stabilized by the trimethyl silylmethyl substituents. Also, some of these compounds exhibit catalytic properties, a fact that could open new industrial uses for organosilicon compounds.

The 46-year-old award winner was born in Brno, Czechoslovakia. He received his education in London (he is a British subject), obtaining his Ph.D.

*Karle*

*Lappert*

from Northern Polytechnic. He taught there from 1952 to 1959, when he joined the faculty of technology at the University of Manchester. He was named senior lecturer there in 1961. In 1964 he moved to the University of Sussex; he was appointed professor of chemistry at Sussex in 1969. Among the honors he has received is the first British Chemical Society Award for main group metal chemistry in 1971.

## ACS Award for Pollution Control

*sponsored by Monsanto*

Since 1932 **DR. THURSTON E. LARSON** has been associated with the Illinois State Water Survey, where he is currently assistant chief and head of the chemistry section. In 1962 he was appointed professor of sanitary engineering, department of civil engineering, University of Illinois.

"Dr. Larson combines the best characteristics of sound technological skills with rational judgment and leadership. These traits have been repeatedly demonstrated by his contributions to the identification and solution of environmental problems and his unstinting service to his profession and his nation." So comments a professional colleague. His research interests are varied, but corrosion studies rank high. He has investigated about every facet of the cause and treatment of corrosion and tuberculation with metals used in water systems and water qualities.

Larson has developed and holds patents on the steam purity analyzer used worldwide to monitor steam purity. He has published more than 75 works. They include such diverse fields as water treatment, analytical methodology, corrosion, and fundamental aqueous chemistry.

A native of Illinois, Larson graduated from the University of Illinois in 1932 with a B.S. in chemical engineering and obtained a Ph.D. in sanitary chemistry there in 1937. A licensed professional engineer, he is a past president of the American Water Works Association (1970–71). He has been an active member of the American Chemical Society, serving as councilor of the ACS Division of Water, Air & Waste Chemistry (now the Division of Environmental Chemistry) from 1947–53 and 1959–75, as well as chairman of the division in 1956. He led the 26-member task force which prepared "Cleaning Our Environment—The Chemical Basis for Action" and he is chairman of the task force presently preparing a revision of this work. At present, he is chairman of the ACS joint board-council Committee on Environmental Improvement.

Larson is a fellow in the American Association for the Advancement of Science, and the American Institute of Chemists; a member of the National Association of Corrosion Engineers, Water Pollution Control Federation, and the Society for Water Treatment and Analysis; Diplomate in the American Academy of Environmental Engineers.

Larson

Malmstadt

Mark

Morgan

## ACS Award in Analytical Chemistry

*sponsored by Fisher Scientific*

**DR. HOWARD V. MALMSTADT,** professor of chemistry at the University of Illinois, is being honored for his outstanding contributions to research in analytical instrumentation and instrumental methods of analysis. He has developed the "Electronics for Scientists" system, a unique electronics instrumentation laboratory for training scientists and science students and for laboratory research and development work, and he has pioneered the development of reaction-rate methods of analysis, automatic derivative titrators, and time-resolved analytical spectrometric systems.

Malmstadt together with Dr. Chris G. Enke (Michigan State University) has collaborated in the development of many modular electronics instruments applicable both in research and in the training of scientists and science students. Their "Electronics for Scientists" text in 1961 provided the basis for many new courses and was adopted in hundreds of universities throughout the world and utilized in thousands of laboratories. Their "Digital Electronics for Scientists" (1969) and "Computer Logic" (1970) texts were the first to bring into focus for scientists the new concepts introduced by integrated circuits.

In the past year a new Malmstadt-Enke Instrumentation Series of modular texts presents modern analog and digital electronics together with the major measurement and control concepts and applications. A new unifying systems approach provides a broad perspective and general understanding of instrumentation before launching into specific principles and devices. Malmstadt's leadership in developing and providing the know-how of electronics measurements to lab scientists has been a monumental achievement.

Early in his teaching career at the University of Illinois, the award winner modernized the teaching and research activities in spectrochemical methods as well as introducing his course, "Electronics for Scientists," which attracted much interest. Since 1960, for 14 years this course also was offered as a three-week summer short course at the University of Illinois for professors and industrial scientists including chemists, physicists, engineers, and medical scientists. His research interests at present remain in the general areas of analytical spectroscopy, kinetic methods of analysis, clinical methodology, and automation of scientific measurements.

## ACS Award in the Chemistry of Plastics and Coatings

*sponsored by Borden Foundation*

**DR. HERMAN F. MARK,** founder and now dean emeritus of the Polymer Research Institute at Polytechnic Institute of New York, is probably one of the best-known figures in polymer chemistry. His contributions include not only fundamental research in the physical chemistry of polymers but 35 years of enthusiastic teaching to both academic scientists and to industry of the nature of macromolecules and their potential uses.

"Many of us who were coming of age scientifically in the 1940's remember Herman Mark as one of the decisive influences that stimulated our interest in the emerging science of macromolecules," says an admiring colleague. He was then, and continues to be, "the indefatigable missionary traveling to universities, industrial laboratories, and scientific meetings to discuss the exciting pioneering advances he made around the world in polymer science and in its technological application."

Among his more tangible contributions to promoting polymer science is the Polymer Research Institute, which Mark founded in 1946. There he developed the first complete curriculum in polymers to be offered in the U.S. He also established the *Journal of Polymer Science*, the first U.S. journal devoted exclusively to that field. Among the extensive list of works he has edited is the monograph series High Polymers, which includes many of the classics of polymer science.

Mark's early research in polymers included collaboration on the first x-ray analyses of several natural polymers and an early explanation of some of the mechanical properties of polymers in terms of their structure. Later he and his students helped to determine the nature of copolymerization

through synthesis and analysis of graft- and block-copolymers. His current research interests include the combustion properties of polymers and ways of reducing the fire hazards of plastic materials.

## ACS Award in Polymer Chemistry

*sponsored by Witco Chemical Foundation*

**DR. PAUL W. MORGAN** is a research pioneer in low-temperature condensation polymerization (interfacial and solution methods). His discoveries have had a profound effect on the rapid scientific and technical growth of polymer chemistry. Application of the methods and principles he developed has made possible synthesis of literally thousands of new polymers for scientific study and development. These include aromatic polyamides such as Nomex aramid fibers and papers, polyimides, and a variety of unique new structures such as block copolymers.

While coworkers and colleagues have contributed to these discoveries and accomplishments, Morgan was the force leading the research effort. His ideas, publications, patents, and book have stimulated scientists around the world to further explore new polymers accessible to them by applications of the principles and methods first discovered and/or developed by him.

An equally, if not more, important field of research pioneered by Morgan is the area of stiff chain polyamides. Some of these have been developed as the new family of Kevlar aramid fibers. They have a tenacity and modulus exceeding steel and glass, setting them apart from conventional fibers such as nylon and polyesters. The extended chain configuration of these polymers in solution and in the solid state and the highly oriented nature of the chains in spun fibers are providing unusual new structures for study in many academic and industrial laboratories.

Morgan graduated from the University of Maine, college of technology, with a B.S. in chemistry in 1937. He received his Ph.D. in organic chemistry in 1940 from Ohio State University, where he did research under the late Prof. M. L. Wolfrom on the structure of plant pigments. After a year as a postdoctoral fellow at Ohio State, he joined Du Pont in Buffalo, N.Y., as a research chemist. He was named senior research fellow in 1973 (the only chemist at Du Pont holding this highest position in the technical advancement ladder).

## ACS Award for Nuclear Applications in Chemistry

*sponsored by G. D. Searle & Co.*

A nuclear scientist "of great competence in broad aspects of nuclear chemistry. He combines ingenious experimental expertise with extraordinary theoretical ability [and] has the pedagogical talent of imparting an insight and understanding of complex problems and their solutions to his students and colleagues." Thus does one associate describe **DR. JOHN O. RASMUSSEN,** professor of chemistry at the University of California, Berkeley, and 1976 winner of the Nuclear Applications in Chemistry Award.

The first milestone in Rasmussen's illustrious career was his Ph.D. thesis work in 1951 on alpha radioactivity in the rare-earth elements. In 1949 Dr. S. G. Thompson, Dr. A. Ghiorso, and Rasmussen, working in Dr. Glenn T. Seaborg's laboratory, discovered an entirely new group of radioactive, alpha particle-emitting isotopes. Previously, alpha radioactivity was known chiefly in elements heavier than lead.

This work led Rasmussen into the first comprehensive restudy of alpha decay theory in two decades. As a result, he has contributed more than 20 articles and two major monographs on alpha decay theory, particularly on the microscopic description of alpha cluster formation in spherical and deformed nuclei.

He also was one of the first to recognize the importance of the Bohr-Mottelson description of collective effects in nuclei. He demonstrated that a large portion of University of California data on complex alpha spectra of heavy nuclei supports the theory. Using chemical and nuclear techniques, he has discovered and studied the radioactive decay characteristics of many isotopes of rare earth and heavier nuclei.

A native of Twin Falls, Idaho, the award winner received his B.S. in chemistry from California Institute of Technology in 1948, his Ph.D. from the University of California, Berkeley, in 1952. He has spent his entire career at the Lawrence Berkeley Laboratory and at the university except for four years at Yale University (1968 to 1972). He received the Atomic Energy Commission's E. O. Lawrence Award in 1967.

## E. V. Murphree Award in Industrial and Engineering Chemistry

*sponsored by Exxon Research & Engineering*

**DR. JAMES F. ROTH,** director of catalysis research in the corporate research department of Monsanto, is personally responsible for establishment of the catalysis research section. His foresight, planning, and leadership, says a colleague, have led to the formation of a first rate interdisciplinary research group of scientists and engineers capable of studying and solving problems in all areas of industrial catalysis chemistry.

*Rasmussen*

*Roth*

The award winner is the principal inventor of two large-scale commercial processes. One is a method for producing acetic acid, using a novel homogeneous catalyst that permits the synthesis of acetic acid via low-pressure carbonylation of methanol. The catalyst system, consisting of a rhodium complex and an iodide promoter, is scientifically important as a practical example of a reaction controlled by an oxidative addition step. The process is important economically in that it shifts the feedstock for acetic acid from ethylene (Wacker process) to lower-cost methanol.

The second process is a heterogeneous catalytic process for producing linear olefins via the direct, one-step catalytic dehydrogenation of higher normal paraffins. This process, brought on stream in 1964 by Monsanto, was a major factor in the conversion of the detergent industry in the U.S. from nondegrading to biodegradable LAS (linear alkylbenzene sulfonate) detergents. Roth has received four U.S. and 38 foreign patents covering this catalyst and process.

Roth also has been a leader in the development of catalysts for automotive emissions control. As early as 1961 he proposed the use of dual catalytic converter systems to control nitrogen oxides as well as carbon monoxide and hydrocarbon emissions. This type of system was investigated extensively by every major auto maker to meet the 1976 federal standards for auto emissions.

Born in Rahway, N.J., Roth received an A.B. in chemistry from the University of West Virginia in 1947. He obtained his Ph.D. in physical chemistry from the University of Maryland in 1951. He joined Monsanto in 1960, becoming director of the catalysis research section in 1973.

## The Ernest Guenther Award in the Chemistry of Essential Oils and Related Products

*sponsored by Fritzsche Dodge & Olcott*

**DR. ALASTAIR I. SCOTT,** professor of chemistry at Yale University, has a long list of achievements to his credit in the fields of diterpenoids, sesquiterpenes, and circular dichroism correla-

tions among diterpenoids and steroids. And his research has been of major importance in clarifying the role played by terpenes in the biogenesis of the indole alkaloid family.

Born in Glasgow, Scott graduated from Glasgow University with a B.S. in 1949, Ph.D. in 1952. He has spent most of his career in the U.K. and Canada. Following a short stint in industry, he taught at Glasgow University and then at the University of British Columbia, Vancouver. In 1965, he returned to England as professor of chemistry at the University of Sussex. He came to Yale in 1968.

In his work with diterpenoids, Scott established the absolute stereochemistry of the plant growth homone gibberellic acid, of cafestol, and of the diterpenes of the rosololactone series. From these studies he developed a biogenetic rule for the relative trans-anti-trans configurations of the polycyclic diterpenoids—a rule that has proved to have no exception.

Using chemical and x-ray techniques, Scott has determined the structure and absolute stereochemistry of an unusual class of fungal terpenes, the hirsutic series. And in a test of the olefin octant rule developed in his laboratory, he has studied some 400 olefins, primarily of the terpenoid and steroid group. The award winner deduced the stereochemistry of all but a few of these compounds.

Another example of Scott's distinguished research is the first experimental proof of the monoterpene nature of the indole alkaloid family. He predicted that a number of indole alkaloids would fit the monoterpene hypothesis and work at other laboratories largely has borne out his prediction.

Scott's current work continues to focus on the biosynthesis and absolute configuration of monoterpene-derived indole alkaloids. More recently, a detailed investigation of porphyrin and corrin biosynthesis has revealed the biogenetic connection between these complex natural product systems. This will be the topic of his award address at next spring's New York meeting.

## ACS Award in Petroleum Chemistry

*sponsored by Lubrizol*

Among the many accomplishments of **DR. JOHN H. SINFELT** is the development of a catalyst for reforming petroleum naphthas to produce higher-octane, low-lead gasoline. The catalyst, KX-130, was commercialized in 1972 and is now in use in more than 20 reforming units throughout the world.

Sinfelt is a scientific adviser heading a basic research group in heterogeneous catalysis at Exxon Research & Engineering Co.'s corporate research laboratories in Linden, N.J. His is one of the highest technical positions in the company. The 44-year-old chemical engineer developed the reforming catalyst from his pioneering work on "bimetallic cluster" catalysts, which refer to highly dispersed metallic clusters composed of atoms of two different metals. His bimetallic cluster concept can be extended to polymetallic systems and is not limited to combinations of metals which are highly miscible in the bulk. Such highly dispersed clusters comprise mainly surface atoms, and one can obtain compositions not possible in bulk crystals.

Scott

Sinfelt

Sondheimer

Waugh

Much of Sinfelt's work has been on the mechanism and kinetics of hydrocarbon reactions on metals and bifunctional catalysts, as typified by his work on hydrogenolysis of ethane, dehydrogenation of methylcyclohexane, and isomerization of *n*-pentane. One of his major accomplishments has been in catalytic specificity whereby he has clearly defined the relationship of catalytic activity to the periodic classification of a metal, most notably for the hydrogenolysis of alkanes.

His catalysis research has led to publication of 62 papers and 32 U.S. patents. Besides the reforming catalyst, Sinfelt's work also has led to commercialization of a process for xylene isomerization and to improved understanding of catalytic reforming reactions.

Sinfelt has been at Exxon Research & Engineering since 1954, when he received his Ph.D. from the University of Illinois. Earlier he had obtained a bachelor's degree from Pennsylvania State University. While maintaining his status at Exxon, he has been visiting professor of chemical engineering at the University of Minnesota, a distinguished visiting lecturer in catalysis at Penn State, and William N. Lacey lecturer in chemical engineering at California Institute of Technology. He has received the Alpha Chi Sigma Award in chemical engineering research and the Paul H. Emmett Award in fundamental catalysis. Recently he was elected a member of the National Academy of Engineering.

## ACS Award for Creative Work in Synthetic Organic Chemistry

*sponsored by Synthetic Organic Chemical Manufacturers Association*

**DR. FRANZ SONDHEIMER,** professor of chemistry at University College, London, has made important contributions in synthetic work on acetylenes, terpenes, and steroids (particularly cardiac aglycones). However, his most important work probably has been synthetic development of the entire field of large-ring conjugated systems that are now called annulenes, a name he coined.

Before Sondheimer's work in this field, there were essentially no conjugated monocyclic systems containing more than six aromatic pi electrons. He has opened up a very large field by producing myriad large-ring fully conjugated systems, including hydrocarbons, ions, and ketones. These have been the subject of intensive physical and theoretical study, and they also stimulated the discovery of paramagnetic ring currents and related theoretical advances. A prolific researcher, Sondheimer has authored or coauthored almost 300 publications.

Sondheimer's personal and professional lives have spanned several countries. Born in Germany in 1926, his family emigrated to England when he was 10 years old. He attended the University of London and received his Ph.D. in 1948. He spent two years as a postdoctoral fellow with Robert B. Woodward at Harvard University working on the total synthesis of steroids. He then joined the pharmaceutical firm Syntex S.A. in Mexico City, where he first was associate director of chemical research and then vice president of research. Overlapping part of this period, he also was functioning as head of the organic chemistry department of the Weizmann Institute of Science in Israel. In 1964 he returned to England as Royal Society Research Professor at the University of Cambridge, and in 1967 he became Royal Society Research Professor at University College, London.

Sondheimer has received awards in several countries, but this is his first from ACS.

## The Irving Langmuir Award in Chemical Physics

*sponsored by General Electric Foundation*

**DR. JOHN S. WAUGH,** Arthur Amos Noyes Professor of Chemistry at Massachusetts Institute of Technology, has

pioneered the application of nuclear magnetic resonance techniques to chemical analysis of solids. Much of his recent work has centered on a technique of using intense radio-frequency field pulses to "average out" direct nuclear dipole-dipole interactions of solids. With these dominant effects neutralized, it's then possible to measure the much smaller effects of chemical shifts and indirect spin-spin interactions—quantities that yield significant information about the structure of samples.

Based on this and related research, Waugh and his students have found, among other things, a double resonance method to study small amounts of impurities and isotopes—a method that is proving valuable in a variety of fields ranging from surface chemistry to biochemistry.

In some of his recent research, Waugh has made an extension of his double resonance methods that promises to be of the greatest importance, according to one of his colleagues at MIT. It permits the selective and precise measurement of chosen dipole-dipole interaction constants, and thus the accurate determination of bond lengths and angles. This method restores the hope, his colleague says, of determining molecular structures from NMR in solids—a hope that existed in the earliest days of NMR but that has until now been thwarted by the overlap of multitudinous spectral lines into an unresolvable continuum.

After graduating from Dartmouth College, Waugh pursued graduate studies at California Institute of Technology. Since receiving his Ph.D. in 1953 he has been a member of the chemistry faculty at MIT. He has authored an impressive list of publications and has received several prizes and honors. Last year he was elected a member of the National Academy of Sciences.

## The James Flack Norris Award in Physical Organic Chemistry

*sponsored by the ACS Northeastern Section*

**DR. HOWARD E. ZIMMERMAN** is one of the leading researchers in the area of physical organic chemistry. His work, says an admiring colleague, "has been characterized by soundness, breadth of interest, and conspicuous originality."

The many contributions of Zimmerman, who is professor of chemistry at the University of Wisconsin, fall primarily into mechanistic chemistry, theory, and synthesis. Much of his work in mechanistic chemistry has been concentrated in photochemical reactions. For instance, he has delineated many of the subtle details controlling the course of excited state

*Zimmerman*

*Zwanzig*

transformations in photochemistry. He has played a major role in bringing mechanistic organic photochemistry to the point where super-fast excited-state rates can be measured and correlated with structure rather than simply relying on quantum efficiency.

In the area of theory, the award winner recently introduced a new method, termed "MO Following," for determining reaction allowedness based on the form of the eigenfunction as a reaction proceeds. The method can be applied where other commonly used methods cannot. His 1966 Möbius-Hückel method is the counterpart of the Woodward-Hoffmann rules.

Two unusual compounds first synthesized by Zimmerman and his students are barrelene, a Möbiuslike molecule that exhibits electron delocalization without the usual attendant resonance stabilization, and semibullvalene, a truncated bullvalene type of molecule. Semibullvalene is the most rapidly valence tautomerizing molecule known.

A graduate of Yale University (Ph.D., 1953), Zimmerman taught at Northwestern University before moving to the University of Wisconsin in 1960. He is the author of more than 140 publications and a recent book on quantum mechanics for organic chemists, and has given many lectures (he has lectured at more than 80 universities) both here and abroad. He has been a member of the editorial board of *The Journal of Organic Chemistry* and of *Molecular Photochemistry*, has served as chairman of the International IUPAC symposium on photochemistry, and has received the first ACS Northeastern Section award for his research in photochemistry. Of his research students, 57 are in academic positions and more than half have earned tenure.

## The Peter Debye Award in Physical Chemistry

*sponsored by Exxon Chemical Co., U.S.A.*

**"ROBERT W. ZWANZIG** is a world authority on statistical mechanics and the theory of irreversible process. Conservatively we would put him in the top 10 in the world in that field. In his age group, he . . . may be without peer." So write two admirers of the 47-year-old research professor of the Institute of Fluid Dynamics and Applied Mathematics and the Institute of Molecular Physics of the University of Maryland, College Park.

Another colleague adds that Zwanzig has the same breadth of vision and recognition of the unity of physical phenomena that characterized the career of Debye himself.

Zwanzig, who received his Ph.D. from California Institute of Technology in 1952, has made lasting and influential contributions in many areas of theoretical chemistry. For instance, he introduced the so-called projection operator methods for deriving various equations in nonequilibrium statistical mechanics. Their purpose was to remove a lot of the mathematical manipulations called for by earlier methods and so focus attention on the main physical ideas.

He also has worked on a method for getting the equation of state of a liquid. And another area of his activity has been the development of ideas aimed at finding the best way to understand motions of liquids from the molecular point of view. He also has been involved in many other topics. These include energy transfer, phase transitions, dielectrics, and polymer solution dynamics.

Zwanzig was born in Brooklyn, N.Y. He earned his B.S. at Polytechnic Institute of Brooklyn and his M.S. at the University of Southern California. After receiving his doctorate he was a research fellow at Yale University for three years. This was followed by work at Johns Hopkins University and the National Bureau of Standards. He took up his present position in 1966.

## ACS Regional Awards in High School Chemistry Teaching

**DANIEL B. DONOVAN,** Northeast Region
**PATRICIA D. ECKFELDT,** Middle Atlantic Region
**EDWIN L. FANKHAUSER,** Northwest Region
**GARY A. GREENING,** Great Lakes Region
**CHARLES W. HENDRICKSON,** Central Region
**PAULA J. MARTIN,** Southeast Region
**JAMES E. STEVENS,** Midwest Region

## ACS Awards for Outstanding Performance by Local Sections

Four awards for different-size sections:
(Large) **DELAWARE**
(Medium Large) **ORANGE COUNTY**
(Medium Small) **CENTRAL NORTH CAROLINA**
(Small) **SOUTH PLAINS**