ACS 1982 national award winners announced

Following are the 1982 recipients of awards administered by ACS. All will receive their awards at the 183rd ACS National Meeting in Las Vegas next March, except Thomas J. Barton, who will receive the Frederic Stanley Kipping Award in Organosilicon Chemistry at the 14th ACS Central Regional Meeting in Midland, Mich., in June 1982, and Frank H. Westheimer, who will receive the Arthur C. Cope Award at the 184th ACS National Meeting in September 1982, in Kansas City. A vignette of Bryce Crawford, winner of the 1982 Priestley Medal, appeared in C&EN, July 13, page 19.

ACS Award in Analytical Chemistry

sponsored by Fisher Scientific Co.

In his early career, **RALPH N. ADAMS** pioneered the study of the mechanisms of organic reactions at solid electrodes. His current interests have led to another area of research: the application of electrochemistry to the problems of neuroscience.

A professor of chemistry at the University of Kansas, Adams received a Ph.D. in chemistry from Princeton University in 1953. Since then he has studied neuroanatomy and neurophysiology, and in 1976 completed three years training in clinical psychiatry at the Menninger School of Psychiatry in Topeka, Kan.

Adams' work in organic analytical electrochemistry was diverse and influential. He was among the first to apply electron spin resonance (ESR) to study the involvement of radical intermediates in reactions and to measure electron exchange rates. He also stimulated interest in cyclic voltammetry as a tool for investigating redox reactions. Adams invented the carbon paste electrode, which has been widely used for many important analytical applications.

His research work more recently has focused on the application of electrochemistry to the study of brain chemistry. A colleague, describing his work as the application of analytical chemistry to actual scientific questions, calls it "the highest form of analytical chemistry, all too rare in these days of hardware-oriented analytical engineers." Adams' group was the first to measure neurotransmitter-related species in living brain tissue with a microelectrode. He is mapping the distribution of dopamine and other electroactive substances in the brain with in vivo electrochemistry.

ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry

sponsored by Mallinckrodt Inc.

ARTHUR W. ADAMSON is unusual in having two distinct fields of research interest: coordination compounds and surface chemistry.

Adamson's early work in coordination chemistry in the 1950's involved investigations of the properties and reaction kinetics of coordination compounds, including some of the early uses of labeled ligands. His resulting papers are cited frequently in reference texts.

A later phase of Adamson's work in coordination chemistry is that of photochemistry. His laboratory was a leading one in the U.S. in the 1960's with Adamson the principal U.S. investigator in this field. This earned him the informal title "father of inorganic photochemistry," according to one colleague. Adamson has continued to be a leader in this subject.

A competing interest has been Adamson's work in surface chemistry. Contributions to the understanding of the adsorption of vapors on solids, with respect both to the effect of heterogeneities and to the relation with contact angles, earned Adamson the ACS Award in Colloid or Surface Chemistry in 1979.

Adamson was educated at the University of California, Berkeley, where he received a B.S. in chemistry with honors in 1940. He went on to the University of Chicago where he earned a Ph.D. in physical chemistry in 1944.

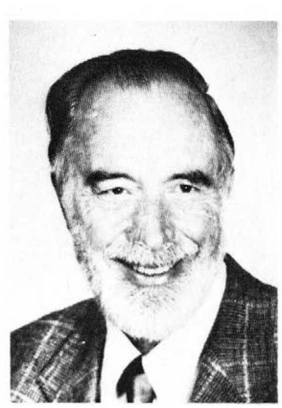
Professor at the University of Southern California, Los Angeles, since 1953, Adamson has received many other recognitions. Included are periods as Unilever Professor at the University of Bristol, England, Alexander von Humboldt senior scientist in West Germany, and visiting professor at the universities of Western Australia and of Queensland, Australia. He received the Tolman Award of the ACS Southern California section in 1967.

Frederic Stanley Kipping Award in Organosilicon Chemistry

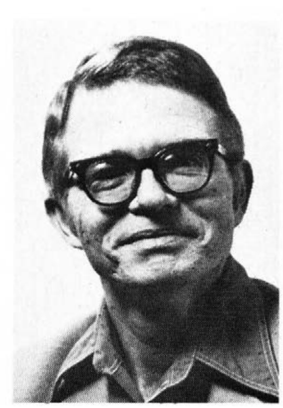
sponsored by Dow Corning Corp.

THOMAS J. BARTON is described by one admirer as "one of the world's most talented organic chemists, and this is proved by the large number of significant discoveries he has made." Although he has worked in the orga-

Adams



Adamson



Barton

nosilicon area for less than a decade, his research has had a tremendous impact on the field, particularly in reactive intermediates. So numerous are his discoveries that it is difficult to choose which to single out for special attention.

After first examining dibenzosilepins, Barton completed a synthesis of the first nonannulated silepin, and demonstrated that this system had no detectable cyclic π-d-π through-conjugation. Recently he and his group succeeded in generating the first example of a C-unsubstituted silole, demonstrating that this system exists in the dimeric form under normal conditions. This has now been extended to provide a unique route to 1-methylbenzo[b]silole and dihydrosilanaphthalene.

Barton's recent dimethylsilole synthesis not only showed that all previous claims of synthesis of this molecule were false, but provided for the first time a C-unsubstituted silole for a synthetic building block. The synthesis of the first example of the 9-silabicyclo[4.2.1]nonatriene system led to the discovery of an unprecedented thermal isomerization to a barbaralane derivative—a photochemical process in the carbocyclic (and other heterocyclic) system. Perhaps Barton's best known achievement was the synthesis of the first example of a silabenzene.

Barton's group has extensively investigated the Diels-Alder reactions of siloles, in order to design better silylene generators. His examination of the benzyne reaction demonstrated that it did not proceed through the intermediacy of the illusive carboxyl phenyl cation. Perhaps most notable was his demonstration that the 7-silanorbornadiene thermally decomposed in a stepwise, free radical process rather than through the generally assumed concerted extrusion of silylene.

In his investigations of the gas phase reaction of dimethylsilylene and cyclooctatetraene, Barton was able to rule out the intermediacy of a 9-silabicyclo[4.2.1]nonatriene, and presented strong evidence for the intermediacy of the unknown 9-silacyclononatetraene.

Barton obtained a B.S. from Lamar State College of Technology, Beaumont, Tex., and a Ph.D. from the University of Florida. After spending a year at Ohio State University as an NIH postdoctoral fellow, he joined Iowa State University in 1967. He was named assistant professor in 1969, associate professor in 1975, and professor in 1978.

ACS Award for Creative Advances in Environmental Science and Technology

sponsored by Air Products & Chemicals Inc.

JACK G. CALVERT, professor emeritus at Ohio State University, is recognized in the scientific community as an authority on atmospheric chemistry. Three of his extensive studies represent major contributions to knowledge of atmospheric chemistry and the reaction of common atmospheric contaminants.

Calvert has unraveled many of the mysteries of sulfur dioxide in the troposphere. Flash photolysis, laser excitation, fluorescence, phosphorescence, Fourier transform, infrared spectroscopy, and chemical product analysis are some of the various techniques he has used to study the role of photo-excited sulfur dioxide in the atmosphere. He is regarded as a world expert in the homogeneous mechanisms of sulfur dioxide conversion in the atmosphere.

Calvert's research also has focused on the pathways of the chemical transformations and removal of formaldehyde in the natural and polluted atmosphere. In recent years he has made a variety of quantitative studies defining elementary steps in the photochemical and thermal reactions which lead to degradation of formaldehyde in the atmosphere. The wavelength dependence of the quantum yields of formaldehyde photochemical decay has been established in his work. In his most recent research, he and his group have established the unusual mechanism of formaldehyde transformation to formic acid through the HO_2 radical.

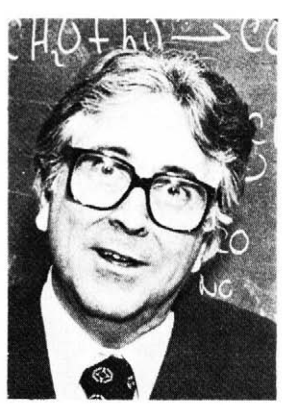
The first attempts at computer simulation of the complex series of chemical reactions occurring in the polluted troposphere were made by Calvert. In his publication, "The Mechanism of Photochemical Smog Formation" and in subsequent more extended treatment of this phenomenon, Calvert gave the first detailed analysis of the role of many atmospheric pollutants and intermediates in the complex, interrelated steps involved in these systems. He also made the first quantitative tests of extensive data collected in Los Angeles for industry-sponsored research groups in that area.

Calvert obtained a B.S. in chemistry from the University of California, Los Angeles, in 1944, and a Ph.D. in physical chemistry (photochemistry) in 1949. He served in the Navy from 1944–46. After a one-year postdoctoral fellowship at the National Research Council, Canada, Calvert joined Ohio State University as an assistant professor of chemistry in 1950. There he moved up the ranks to become professor of chemistry in 1960, chairman of the department in 1964, Kimberly Professor of Chemistry in 1974, and was named Professor Emeritus in 1981. He has served on the editorial boards of the *Journal of Photochemistry & Photobiology*, *International Journal of Chemical Kinetics*, and presently on *Reviews of Chemical Intermediates*.

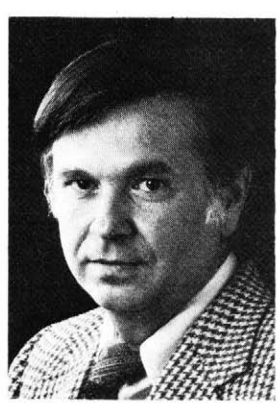
Alfred Burger Award in Medicinal Chemistry

sponsored by SmithKline Corp.

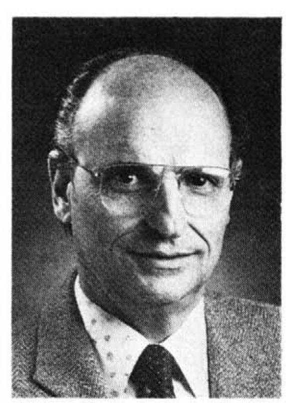
DAVID W. CUSHMAN and **MIGUEL A. ONDETTI** will share this prestigious award for their contribution to the elucidation of the role of the renin-angiotensin-aldosterone system in controlling blood pressure. Specifically, they developed specific and potent inhibitors of one of the key components of this system, angiotensin-converting enzyme (ACE).



Calvert



Cushman



Ondetti

Cushman is senior research fellow and Ondetti is vice president for basic research at Squibb Institute for Medical Research.

Cushman and Ondetti initiated their award winning research by developing a fast test for ACE activity, and then isolating and testing six converting enzyme inhibitors from *Bothrops jararaca* snake venom. They purified and determined the amino acid sequences of these six peptides and found that the peptides all had angiotensin I inhibitory activity. Most of their work, however, was focused on a particular nonapeptide that had the longest lasting inhibitory and antihypertensive action in vivo.

Since this nonapeptide is not active when administered orally, the two researchers set out to develop a stable, orally active angiotensin-converting enzyme inhibitor. The result was Squibb's captopril, which is designed to bind specifically to a hypothetical active site of ACE similar to the known active site of carboxypeptidase A. This was the first time a drug was designed and committed to paper based on purely theoretical considerations.

Cushman and Ondetti verified and optimized each of captopril's proposed binding interactions with the active site of ACE by studying how structural alterations affect inhibitory activity. To further demonstrate the specificity required for enzyme inhibitors, they designed and synthesized inhibitors for carboxypeptidases A and B.

To date captopril has received marketing approval for treatment of hypertension and congestive heart failure in more than 20 countries, including the U.S.

Cushman received a Ph.D. in biochemistry in 1966 from the University of Illinois and joined Squibb the same year. Born in Buenos Aires, Ondetti obtained his doctorate in chemistry from Buenos Aires University in 1957. Ondetti came to Squibb in 1957 as a senior research chemist working in its Argentina labs. He transferred to Squibb's New Brunswick, N.J., labs in 1960.

ACS Award in Colloid or Surface Chemistry

sponsored by Kendall Co.

The unique work of **GERT EHRLICH,** research professor in the coordinated science lab and in the materials research lab, and professor of physical metallurgy at the University of Illinois, Urbana-Champaign, forms the basis of much of the understanding of metal surfaces and a good deal of the knowledge of the behavior of adsorbed gases.

Soon after completing his graduate studies at Harvard in 1952, Ehrlich began the examination of chemisorption on metals using quantitative adsorption and desorption techniques under ultra-high vacuum conditions.

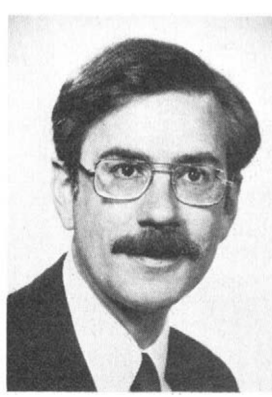
From these studies came direct identification of multiple states of binding for chemisorbed gases and recognition of their importance in chemisorption. Also, there followed comparative investigations of adsorption on macroscopic single crystal planes of different crystallographic orientation.

In the early 1960's, Ehrlich adapted the newly developed field ion microscope to study surface diffusion of metals on metals. In 1966 he completed the first quantitative investigation on the self-diffusion of tungsten atoms on individual faces of a tungsten substrate.

Ehrlich and his coworkers followed this pioneering study for bcc tungsten with a comprehensive investigation of surface self-diffusion on specific planes of the fcc metal, rhodium. Diffusion was measured with only a single migrating atom on the plane under study to avoid complications from interactions between adatoms. Comments one colleague, "This was truly a first; for no other material had surface self-diffusion been measured for a single adatom on a surface." His studies since then have continued to expand the understanding of atomic and molecular behavior on solids.

Born in Vienna, Austria, Ehrlich completed his B.A. at Columbia University in 1948 and his M.A. and Ph.D. in chemistry at Harvard University in 1950 and 1952, respectively.

Ehrlich



Evans

ACS Award for Creative Work in Synthetic Organic Chemistry

sponsored by Aldrich Chemical Co.

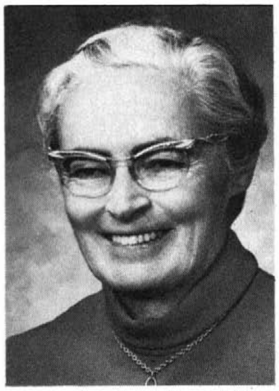
DAVID A. EVANS, just 40 years old, is an established leader in both synthesis methodology and design. His broad contributions span the fields of alkaloid, terpenoid, ionophore, and mechanistic organic chemistry.

Evans, professor of chemistry at California Institute of Technology, earned an A.B. from Oberlin College in 1963 and a Ph.D. from Cal Tech in 1967, where he carried out his thesis research under the direction of Robert E. Ireland. In 1967 he joined the chemistry department of the University of California, Los Angeles, and in 1974 assumed his present position. He is a consultant for Eli Lilly Co.

The diverse research contributions of Evans "demonstrate the creativity of scholarly thought applied to practical problems," according to one of his colleagues. One major theme in Evans' research effort has been the development of sigmatropic rearrangements as useful tools in total synthesis. For example, he has developed the utility of 2,3-sigmatropic rearrangements in the syntheses of bakkenolide-A and hasubanan and has provided new methods for the stereoselective construction of allylic alcohols.

Evans' practical and theoretical studies of the anionic oxy-Cope rearrangement have demonstrated the dramatic substituent effects of charged moieties on thermal rearrangements. This work has "far reaching value to synthetic chemistry and is in itself worthy of recognition," an admirer says.

Grieco



Harrison

Hoffmann

In other research areas, Evans has developed a variety of silicon-based reagents such as trimethylsilyl cyanide which have been effective in carbonyl chemistry. This research effort has led to the development of the utility of blocked quinones in total synthesis. The application of this technology to the total synthesis of colchicine recently has been described. Of late, Evans has been studying enantio- and stereoselective aldol condensations employing boron and zirconium enolates.

His previous honors include a Camille and Henry Dreyfus Teacher-Scholar Award (1971–76), an Alfred P. Sloan Fellowship (1972–74), and the Distinguished Teaching Award of the UCLA Alumni Association.

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

sponsored by Fritzsche Dodge & Olcott

"One of the outstanding practitioners of organic syntheses. . . . His remarkable productivity ensures that he will go on to even greater accomplishments." This is the way one colleague sums up **PAUL A. GRIECO,** professor of chemistry at Indiana University, Bloomington, and his work in the field of natural products and particularly terpene chemistry.

Grieco's contributions to natural products chemistry include a large number of very important total syntheses and development of methods of wide use. Among his noteworthy accomplishments in total synthesis are vernolepin and vernomenin, ambrosin, eriolanin and eriolangin, helenalin, bigelovin, mexicanin I, methynolide, calcimycin, quassin, and fluoroprostaglandins. Some of the methodologies he developed include rhodium catalyzed enone transpositions, conversion of protected lactols into lactones, use of pyridinium *p*-toluenesulfonate as a mild and efficient catalyst for the tetrahydropyranylation of alcohols, construction of sterol side-chains, and chirality transfers.

One interesting and recurring feature of the award winner's syntheses, according to a colleague, is that they demonstrate that careful planning can lead to intermediates in which the same reagent can effect several transformations at once. One example is Grieco's synthesis of eriolangin, where perbenzoic acid simultaneously cleaves a four-membered ketone and a six-membered ketone, and epoxidizes a double bond. Another is the synthesis of quassin, in which base-catalyzed alkylation produces five desired transformations.

Following undergraduate study at Boston University, Grieco did his masters and doctorate work in organic chemistry at Columbia University, receiving a Ph.D. in 1970. He was a National Science Foundation postdoctoral fellow at Harvard University in 1970–71. He joined the faculty at the University of Pittsburgh as an assistant professor of chemistry in 1971, and moved to Indiana University last year.

ACS Award in Chemical Education

sponsored by Union Carbide Corp.

The first woman to serve as president of the American Chemical Society, holder of 11 honorary degrees, and professor emeritus at a college that has sent an exceptional number of women into the chemical profession, with this award **ANNA J. HARRISON** adds another jewel to her crown. After receiving a Ph.D. in physical chemistry from the University of Missouri in 1940 she spent five years at Tulane before joining the faculty at Mount Holyoke College where she was chairman of the chemistry department in 1960–66.

In addition to teaching, Harrison has served the education profession as a member of several editorial boards, as a visiting scientist, as chairman of the ACS Division of Chemical Education where she was instrumental in organizing the Chemical Education Coordinating & Planning Committee, and through papers in scientific journals.

Harrison has consistently championed the development of appropriate educational opportunities in science for all students, also the adult public, and takes the position that it is the responsibility of the chemical profession to use its creative talents and prestige to provide leadership in the evolution of appropriate mechanisms to serve the educational needs of the nation in chemistry.

Her interest in promoting science education for those who will probably not become scientists led her to develop at Mount Holyoke College a first course in chemistry for the student she describes as "intellectually curious but not professionally driven to develop technical competence in chemistry," to serve on the initial advisory board of 3,2,1-Contact—a children's television workshop series on scientific phenomena for eight-to 12-year-olds, and to serve on the initial editorial board for *Science 80*, an AAAS publication for the general public. While ACS president, she called a presidential conference on Chemistry for the Public.

ACS Award in Inorganic Chemistry

sponsored by Monsanto Co.

"Applied theoretical chemistry" is the way **ROALD HOFFMANN** likes to characterize the particular blend of computations, stimulated by experiment and the construction of generalized models of frameworks for understanding, that is his contribution to chemistry. Hoffmann is widely recognized for his work in contemporary theoretical organic, inorganic, and organometallic chemistry.

The awardee's research interests are in the electronic structure of stable and unstable molecules, and of transition states in reactions. In earlier work he made important contributions to theory through the development of the extended Hückel method, and to organic chemistry through his work, with the late Robert B. Woodward, on the conversion of orbital symmetry. He has introduced other novel concepts, such as through-bond coupling, into physical organic chemistry and carried out pioneering studies of the electronic structure of transition states and intermediates in organic reactions.

Recently Hoffmann and his collaborators have been exploring the structure and reactivity of inorganic and organometallic molecules. Approximate molecular orbital calculations and symmetry-based arguments have been applied by his group to explore the basic structural features of every kind of inorganic molecule, from complexes of small diatomics to clusters containing several transition metal atoms. A particularly useful theoretical device, the conceptual building up of complex molecules from ML_n fragments, has been used by the Hoffmann group to analyze cluster bonding and the equilibrium geometrics and conformational preferences of olefin and polyene metal carbonyl complexes.

Hoffmann was born in Zloczow, Poland (now part of the U.S.S.R.) in 1937. He received his early schooling in New York City, and graduated summa cum laude from Columbia University in 1958. He obtained a Ph.D. in chemical physics in 1962 from Harvard University under Martin Gouterman and William Lipscomb.

In 1962 Hoffmann was elected a junior fellow at Harvard, a position he held until 1965. It was during this fellowship period that the collaborative effort with Woodward led to the well-known Woodward-Hoffmann rules.

Hoffmann joined the chemistry department at Cornell University in 1965. He was named John A. Newman Professor of Physical Science in 1974.

Award in Chromatography

sponsored by SUPELCO

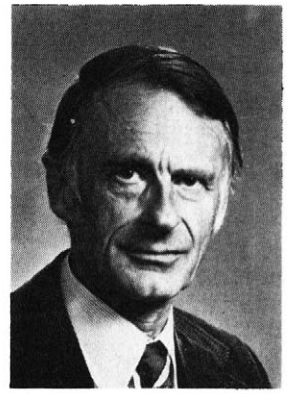
Forty-two-year-old **BARRY L. KARGER,** described by one of his colleagues as a trend setter, has been a significant force in the field of chromatography—pioneering new concepts and applications, training students, and involving himself in professional activities.

Since early in his career Karger has been active in the development of chromatographic separations of chiral species. In 1978 he announced the first successful D,L-separation of amino acids by the addition of chiral metal chelates in reversed phase liquid chromatography. He since has achieved the separation of all common amino acids as their D,L pairs using the metal chelate procedure. Karger also introduced a practical approach to chiral separations involving a column-switching procedure in which achiral separations are performed on one column and then appropriate peaks are switched to a second column for chiral separation. This allows, with flexibility, the separation of any number of amino acids as their D,L pairs.

The awardee was one of the first workers in modern LC. He has made important contributions to the theory and practice of LC. He was the first to adapt ion pair chromatography to small particle packings and to demonstrate the spectacular separation results. Over the years he has developed broad concepts of selectivity to provide optimum separations of innumerable substances, particularly in reversed phase LC. Karger also has been a significant force in the development of a new generation of chemically bonded LC columns. His basic research in this area led to columns that are stable, reproducible, and highly efficient. In a major recent contribution, he has solved a basic problem in coupling reversed phase LC to a mass spectrometer via a moving belt interface through use of a continuous post-column microextractor.

Karger's work also has had a great impact in the bioanalytical field—he has developed a fully automated analysis using high-performance LC; he pioneered and solved many of the basic problems in the coupling of segmented flow (Auto Analyzer) technology to reversed phase LC; he developed reversed phase columns

Karger



Knowles

which allow several thousand serum samples to be injected into each column before it is discarded (such precise, rapid, and automated analyses were not previously possible).

After obtaining a Ph.D. from Cornell University in 1963, Karger joined Northeastern University, where he is professor of chemistry and director of the Institute of Chemical Analysis.

ACS Award for Creative Invention

sponsored by Corporation Associates

WILLIAM S. KNOWLES is *"the* person primarily responsible for what is widely acknowledged to be the most outstanding achievement to date in catalytic selectivity." So says an admiring colleague in describing the award winner and his accomplishment—the invention and development of a homogeneous catalytic asymmetric hydrogenation process.

Discovery of this process by Knowles, who is distinguished science fellow at Monsanto, for the first time has made it possible to convert certain olefins directly to optically active isomers, such as L-amino acids. The new method was applied successfully in 1973 to the large-scale production of L-dopa, an amino acid drug used in the treatment of Parkinson's disease. It replaces the traditional, and costly, process that produces 50-50 mixtures of D- and L-isomers requiring resolution by crystallization of salts with optically active bases, and recycle of the unwanted isomers.

The catalyst used in Knowles' pioneering process is a coordination complex of rhodium and an optically active phosphine ligand. A very effective catalyst is the crystalline complex $[Rh(COD)(bisphosphine)]^+BF_4^-$. COD is cyclooctadiene; the ligand is the chiral [1,2-bis(*o*-anisylphenylphosphino) ethane].

The (−) form of the catalyst converts N-acylaminocinnamic acids directly to N-acyl-L-amino acids in high yields. Using the (+) form, N-acylaminocinnamic acids are converted directly to N-acyl-D-amino acids in high yields.

Knowles has contributed to the development of processes for the total synthesis of steroids, such as cortisone, starting with toluene. He also has done significant research on processes for chloramphenicol, plasticizers, phosphate esters, and aromatic amines. And he has investigated chloro-amine rearrangements and olefin oxidation mechanisms.

Knowles came to Monsanto as a research chemist in the company's central research department in Dayton in 1942 upon obtaining a Ph.D. from Columbia University. He has 23 publications and 32 U.S. patents to his credit.

ACS Award in the Chemistry of Contemporary Technological Problems

sponsored by Mobay Chemical Corp.

Perhaps the most pressing problem of this decade is the energy supply, a problem that **JOSEPH T. KUMMER** of Ford Motor Co. has been heavily involved in. After receiving a Ph.D. in chemical engineering from Johns Hopkins University in 1945, Kummer became a fellow at Mellon Institute of Industrial Research. Working under Paul H. Emmett, he helped contribute to the understanding of the mechanism of Fischer-Tropsch synthesis and to ammonia synthesis.

The awardee spent 1951–60 as an associate scientist at Dow Chemical and joined Ford as a staff scientist in 1960. His present title is senior research scientist. Described by a colleague as "an inquisitive intellect," Kummer is a coinventor (along with Neill Weber) of the sodium-sulfur battery, and the sodium heat engine for energy conversion. He has published extensively on the chemical properties of beta alumina.

Kummer is presently involved in work on chemically regenerative redox fuel cells and new battery systems. He has done extensive work on scientific development of auto exhaust catalysis, on the formation of nitric oxide in the internal combustion engine, and on the problem of fuel economy and emissions.

Kummer has contributed more than 50 papers to the scientific literature and holds 19 patents.

ACS Award in Pure Chemistry

sponsored by Alpha Chi Sigma

STEPHEN R. LEONE's "work in the areas of E-V [electronic to vibrational] energy transfer, elucidation of chain reaction mechanisms, the use of infrared chemiluminescence to study product vibrational distributions in the electronic ground state of products of photolysis, and ion-molecule reactions places him in the top handful of physical chemists in the world," say his admiring colleagues.

Thirty-three-year-old Leone is a chemical physicist with the National Bureau of Standards, Boulder, Colo., as well as adjoint professor of chemistry and fellow of the Joint Institute for Laboratory Astrophysics, University of Colorado and NBS. After a two-year term as assistant professor of chemistry at the University of Southern California, Leone moved to Boulder in 1976. He obtained a B.A. in chemistry at Northwestern University in 1970, and a Ph.D. from the University of California, Berkeley, in 1974.

Leone began his early research work at Berkeley under C. Bradley Moore's group. He invented and developed the first quantitative techniques for laser measurement of E-V energy transfer. This work has had a major impact in the energy transfer field, stimulating work in this area by several major groups.

After moving to the University of Southern California, Leone (with C. Wittig and A. Peterson) exploited his Berkeley work by demonstrating a whole new class of E-V lasers. He also extended his earlier isotope selective studies to obtain the scrambling rate in the $Br' + BrBr \rightarrow Br'Br + Br$ reaction. This work was of considerable importance to basic reaction dynamics, as this process had not been previously measured directly in the gas phase.

Shortly after his arrival in Boulder, Leone developed the S_2 electronic transition visible-ultraviolet laser and the Te_2 laser. From there his work moved into chain kinetics, ion-molecule reaction product state detection, and energy flow in radicals.

Within the past year Leone's research program has grown both in depth and scope. He has utilized photofragment infrared emission spectroscopy to afford a direct determination of the potential surface of the methyl radical in the "umbrella" inversion mode; he has developed new methods to obtain product state distributions of ion-molecule reactions; he has developed a new technique involving hot atom dissociation products to study translation to vibration energy transfer. In collaboration with Steve Bernasek from Princeton, he has moved into an entirely new area, observing vibrational excitation of CO_2 produced in the heterogeneous oxidation of CO on a platinum surface.

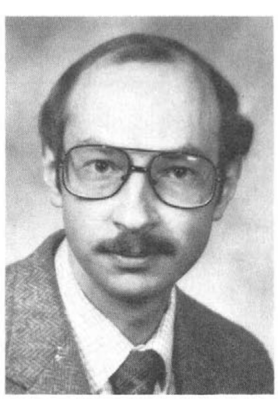
Peter Debye Award in Physical Chemistry

Sponsored by E. I. du Pont de Nemours & Co.

Pioneering research of **PETER M. RENTZEPIS,** head of the physical and inorganic chemistry research department at Bell Telephone Laboratories, has created the new field of picosecond spectroscopy—a field that has far reaching implications in physical chemistry.

Two decades ago 10^{-9} second was considered the limit of resolvable phenomena via the use of the best

Kummer



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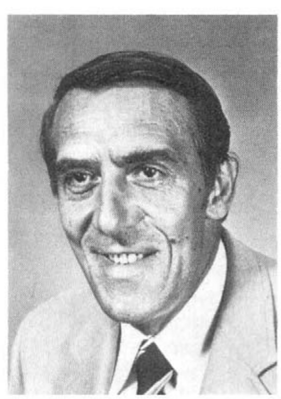


Rentzepis

available electronics. Today, as a result of Rentzepis' research, time resolution down to 10^{-12} is now routine. In this research he found that several laser pulses on different trajectories could be used to measure pulse duration by measuring the spatial region where enhanced fluorescence due to multiphoton excition occurred.

He developed this principle into the technique of picosecond spectroscopy. Using this tool, the award winner probed critical problems in spectroscopy, chemical kinetics, energy transfer, photochemistry, and biochemistry. For instance, he carried out a detailed analysis of the energy redistribution in azulene. He also traced the picosecond kinetics of numerous aromatic molecules, such as benzanthracene and naphthalene, from the isolated molecule case to the condensed phase.

Rentzepis also has elucidated the fundamental mechanism of energy dissipation within large molecules of biological systems. This research has focused on the recognition and kinetics of ultrafast isomers of rhodopsin. He has used picosecond spectroscopy to study short-time events in chemical reactions, such as the formation and decay of the electron produced by the photolysis of potassium iodide in solution.

Born in Greece, Rentzepis was naturalized as a U.S. citizen in 1965. He obtained a Ph.D. from Cambridge University in 1963 and joined Bell Labs the same year. He has received numerous awards, including the Irving Langmuir Prize in Chemical Physics in 1973, and the A. Cressy Morrison Award of the New York Academy of Sciences in 1978. Currently he has about 175 publications and more than 30 patents to his credit.

Garvan Medal

sponsored by W. R. Grace & Co.

SARA JANE RHOADS ranks foremost among American women organic chemists, and as one of the country's finest physical organic chemists. At the University of Wyoming, where she is professor of chemistry, she is described by one of her colleagues as the "ideal blend of the teacher of chemistry and the research chemist."

Rhoads' first major independent contribution was in the elucidation of the mechanism of the para Claisen rearrangement. To understand the importance of this contribution, it should be noted that the same authors who had established $\alpha \rightarrow \gamma$ inversion in the ortho Claisen had established $\alpha \rightarrow \gamma$ inversion in the para Claisen rearrangement as well. This latter fact was discordant with all efforts to construct a self-consistent, conceptual scheme for the rearrangement. In a classical investigation, Rhoads identified and corrected the experimental errors of the earlier workers. Simultaneously, she conducted a careful kinetic investigation that established reliable activation parameters for the first time, and placed the intramolecular character of the para Claisen rearrangement on an unassailable basis.

In bringing the Claisen and Cope rearrangements so close together, a significant step had been taken toward their ultimate recognition as part of a large class of concerted 3,3 sigmatropic rearrangements in which the participation of heteroatoms would no longer be regarded as a major perturbation. The Claisen merged into the oxa-Cope, and the Cope into the carba-Claisen.

Rhoads next turned her interest to nonbenzenoid counterparts, the allyl vinyl ethers. She discovered that geometrically impeding the analog of the Claisen rearrangement elicited a previously unrecognized pathway, which brought acyclic 1,4-diketones into a new role as a single synthon for cyclohept-4-enones. The unravelling of the mechanisms behind this discovery is among the most elegant investigations into the twilight area between concerted and nonconcerted rearrangements.

Rhoads received a B.S. from the University of Chicago in 1941. In 1945 she entered the graduate school of Columbia University, where she received a Ph.D. in organic chemistry in 1949. Rhoads joined the University of Wyoming, Laramie, in 1948, as a chemistry instructor, advancing to assistant professor in 1951, associate professor in 1953, and professor in 1958. The awardee received the Manufacturing Chemists Association Award for Outstanding College Teaching in 1964 and the George Duke Humphrey Distinguished Faculty Award of the University of Wyoming in 1974.

Rhoads

Roe

James Bryant Conant Award in High School Chemistry Teaching

sponsored by Ethyl Corp.

ROBERT ROE JR. loves what he's doing—teaching high school chemistry, physics, and physical science—and his enthusiasm rubs off on his students. Many of them have chosen chemistry, chemical engineering, and physics as their college majors, and a large number of them have become chemists and other science-related professionals.

Roe's day at Skyline High School in Dallas begins early and ends late. In addition to his teaching responsibilities at Skyline where he has taught since 1974, he is cosponsor of a coed outdoor club affiliated with the Explorer Scouts, of the high school science club, and of an annual science achievement day contest. He also originated the Bryan Adams High School Science Symposium, a program designed to bring into the school area scientists and engineers to introduce students to their specialized knowledge. Now in its 18th year, the symposium has served as a model for other such programs in the area.

Not only does Roe have his high school students' interests at heart, he initiated a continuing education program for area high school chemistry teachers and science supervisors with a workshop on lab safety.

Roe graduated from Southern Methodist University in 1959 with a B.S. in education. He obtained an

M.Ed. from East Texas State University in 1962, an M.S. in natural science from New Mexico Highlands University in 1964, and a Ph.D. in organic chemistry from North Texas State University in 1970. In addition to his formal education, Roe has completed courses in electronics, chemical engineering, and computer science.

Because of his diverse background and experience, he often comes up with novel approaches to his teaching. The principal at Skyline sums up Roe as "a teacher of change [who] is meeting the changing needs" of science in today's education world.

James T. Grady Award for Interpreting Chemistry for the Public

For more than 25 years, **ALBERT ROSENFELD** has written lucidly about science for the general public—and won the respect of both his peers and scientists while doing so. He has reported the news from a broad range of disciplines, including chemistry, as well as writing about the ethical and social aspects of science and technology.

Rosenfeld obtained a B.A. in history and social science from New Mexico State University, which later awarded him an honorary doctorate. He has written for many magazines, and covered Los Alamos and White Sands Proving Ground as part of his beat as correspondent in the Southwest for *Time*, *Life*, and *Fortune*. While on the staff of *Life* from 1956 to 1969, he gained a national reputation as a leading communicator of science. As science editor of that magazine Rosenfeld produced a series of major articles on such topics as "DNA," "The Atom," and "The Control of Life," many of which are still sold as educational reprints.

From 1973 to 1979 Rosenfeld served as science editor for *Saturday Review*, where he wrote the column "Scienceletter" as well as articles and editorials. He is currently a columnist and contributing editor at *Science 81*, and an adjunct assistant professor of human biological chemistry and genetics at the University of Texas medical branch at Galveston, as well as a consultant on future programs for the March of Dimes Birth Defects Foundation.

In addition to his writing and editing, Rosenfeld has worked to improve the quantity and quality of science reporting and has encouraged young writers. He is on the executive board of the Council for the Advancement of Science Writing, having served three terms as president of that organization.

Among books Rosenfeld has written are a biography of Nobel Prize-winning chemist Irving Langmuir; "The Second Genesis: The Coming Control of Life," one of the first examinations of the revolutionary changes in molecular biology and genetics; and "Prolongevity," about research on aging.

Rosenfeld previously has won the Lasker Award, the AAAS-Westinghouse Writing Award, the Aviation/Space Writers Award, the Claude Bernard Science Journalism Award, and the Jesse H. Neal Editorial Achievement Award.

ACS Award in Polymer Chemistry

sponsored by Witco Chemical Corp. Foundation

The contributions of **JOHN K. STILLE,** professor of chemistry at Colorado State University, to the field of polymer chemistry have been of a basic nature and in addition have had "a very significant impact in the real world, since a number of commercially valuable products and industrial syntheses have resulted," an associate says.

His research in the field has centered on the mechanisms of polymerization reactions and the synthesis of novel polymers to better understand structure-property relationships. He has explored Ziegler-Natta polymerizations, cyclopolymerization reactions, and the initiation of the chain polymerization of vinyl monomers and cyclic ethers through charge transfer complexes.

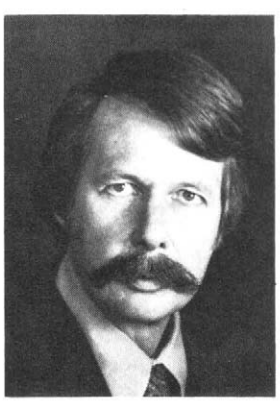
Stille's syntheses of rigid-chain, high-performance polymers have helped delineate the principles regarding the requirements for thermal stability, morphology, and solubility. One class of polymer, the polyquinoxalines, is attractive to the aerospace industry because of its excellent adhesive properties even at high temperatures.

A promising development from Stille's group is a method of cross-linking thermally stable aromatic polymers which allows them to be processed at relatively low temperatures. An advantage of this technique is that the polymers ultimately can be used at temperatures above the glass or crystalline range of the materials.

In addition to his work in polymer chemistry, Stille has carried out a vigorous research program in organic synthesis involving organometallic intermediates. He has combined his interests in attacking projects such as his recent asymmetric syntheses of organic compounds through optically active organometallic catalysts bound to polymer resins.

Stille obtained B.S. and M.S. degrees from the University of Arizona and a Ph.D. from the University of Illinois. He was on the faculty of the State University of Iowa from 1957–77.


Rosenfeld


Stille


Streitwieser

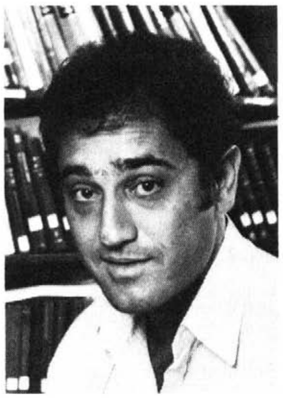
James Flack Norris Award in Physical Organic Chemistry

sponsored by the ACS Northeastern Section

During the past 30 years, **ANDREW STREITWIESER JR.** has made major contributions to physical organic chemistry. Says one colleague, "His recognition in this regard is long overdue."

A member of the chemistry faculty since 1952 and professor of chemistry since 1963 at the University of California, Berkeley, Streitwieser re-

Warren



Pines

Weller

ceived a B.A. in 1948, M.A. in 1950, and Ph.D. in 1952 from Columbia University. He was an Atomic Energy Commission postdoctoral fellow at Massachusetts Institute of Technology in 1951–52.

Streitwieser's experimental work has included the development of new tools for the study of reaction mechanisms, and the applications of these methods are now standard techniques in physical organic studies. Much of his early research made novel use of the deuterium isotope: as a macroscopic tracer, its primary and secondary kinetic isotope effects, and as a stereochemical marker including optical activity through hydrogen-deuterium asymmetry.

His pioneering work on orbital symmetry principles resulted in an important experimental contribution—the synthesis of uranocene—a discovery that has revitalized organoactinide chemistry.

Author and coauthor of more than 200 publications, Streitwieser's book "Molecular Orbital Theory for Organic Chemists" was a landmark contribution and has had a major effect on the thinking of organic and physical organic chemists.

Nobel Laureate Signature Award for Graduate Education in Chemistry

sponsored by J. T. Baker Chemical Co.

Commenting on **WARREN S. WARREN**'s doctoral thesis a reviewer remarked, "There's a very good chance that [he] has removed the last and perhaps the greatest obstacle to opening up a field of application of the greatest importance to the community of chemists and biologists." Under the direction of **ALEXANDER PINES** at the University of California, Berkeley, Warren worked together with Daniel Weitekamp and other students on the development of multiple quantum NMR spectroscopy. He dealt with the question of whether a molecule can be made to absorb and emit photons only in groups of n, where n is an integer subject to experimental control.

A complete theory of selective excitation by phase shifted and time reversal pulse sequences was developed. Warren went on to demonstrate this selective n-quantum excitation in NMR experiments on a number of molecules, obtaining, for example, the 4,6, and 8-quantum spectra of molecules oriented in liquid crystals. Applications deriving from this type of spectroscopy have included analysis of complex spectra, study of molecular conformations and correlated motions, high resolution NMR in inhomogeneous fields, and the separation of local fields in solids. Warren and Weitekamp feel there will also be analogs and applications in the field of pulsed laser spectroscopy.

Warren received an A.B. in chemistry and physics from Harvard University in 1977, and an M.S. in 1979 and Ph.D. in 1980 from Berkeley, where he was an NSF predoctoral fellow. Currently he is working as an NSF postdoctoral fellow with Ahmed Zewail at Cal Tech.

Pines studied chemistry, physics, and mathematics at Hebrew University of Jerusalem, obtaining a B.Sc. in 1967, and received a Ph.D. from Massachusetts Institute of Technology in 1972. He is professor of chemistry at Berkeley and faculty senior scientist at Lawrence Berkeley Laboratory. He has been Miller Research Professor at Berkeley, Distinguished Visiting Lecturer at the University of Texas, Austin, Richard Merton Guest Professor of the German Science Foundation, and Robert W. Vaughan Memorial Lecturer at Cal Tech. Recent areas of research in his laboratory include pulsed and solid-state NMR, quantum mechanical tunneling and rotational polarization in solids, effects of nuclear spin on chemical processes [e.g., chemical reactions and molecular rotation] and laser magnetic double resonance.

E. V. Murphree Award in Industrial & Engineering Chemistry

sponsored by Exxon Research & Engineering Co.

SOL W. WELLER, professor of chemical engineering at the State University of New York, Buffalo, is one of the leading scientists in the field of industrial chemistry. His work in coal liquefaction and catalysis is classic, and his research on gas separation also has had lasting impact.

Predictive models for the mechanism and kinetics of the hydrogenolysis of coal to oil which Weller first developed still influence contemporary work on coal liquefaction 25 years later. In addition, Weller discovered that improved catalyst dispersion—specifically impregnation of coal—could allow successful conversion of coal to oil at low pressures using inexpensive iron catalysts.

In the field of catalysis, Weller and coworkers showed that alumina cannot be considered an inert, high surface area support. Weller also developed the first nondestructive method of determining residual hydroxyl content in dehydroxylated alumina through isotopic exchange with deuterium gas. His research on chromia, though not released for scientific publication, led to an improved commercial catalyst.

Weller has led efforts to develop standardized methods for testing catalysts to allow better design of catalytic reactors and better understanding of catalyst deactivation. He is chairman of the United Nations Committee on Catalyst Standardization and is responsible for the creation of the American Society for Testing & Materials' Committee D32 on Catalysts.

The first to develop a theory of the separation of gases by fractional permeation through membranes, Weller also holds patents in the field. One patent described a practical permeation unit for large-scale separation of gas mixtures. "Membrane separation technology is now on the verge of becoming an important industrial unit operation," according to one of Weller's colleagues.

Weller received a B.S. from Wayne University in 1938 and a Ph.D. from the University of Chicago in 1941. After a postdoctoral year at New York University, he worked on the Manhattan Project. He spent five years in the coal hydrogenation section of the U.S. Bureau of Mines, then joined Houdry Process Corp. in 1950. Weller later worked at Ford and Philco-Ford before joining the chemical engineering department at SUNY Buffalo in 1965. His current research interests include coal liquefaction with efficient catalysts, aging of coal-derived liquids, sintering of shell catalysts, and characterization of the specific surface areas of supported transition metal oxide and sulfide catalysts.

ACS Award in Petroleum Chemistry

sponsored by Lubrizol Corp.

IRVING WENDER over the past three decades has been very active in research related to petroleum, chemicals from petroleum, and synthetic fuels. Beginning in 1950, Wender showed that the addition of CO/H_2 to olefins to produce alcohols could be carried out homogeneously using cobalt octacarbonyl. Before this discovery, the reaction had been known to occur only with supported cobalt catalysts. He widened the range of applicability of the oxo reaction by demonstrating that alcohols also react under oxo conditions to give the next higher alcohols.

By investigating the role of cobalt carbonyl, Wender showed how Lewis bases react with cobalt carbonyl, thus opening the way to new directions in metal carbonyl chemistry and catalysis. Carrying this work further, Wender discovered that the unsaturated bonds in acetylene could replace the carbonyl groups in metal carbonyls. This discovery had a great impact not only on the chemistry of oxo reaction, but on metal carbonyl induced catalysis. It led to the idea that hydroformylation involves complex formations between the metal carbonyl and olefin.

Wender has made many important contributions to the production of synthetic fuels. These have been mainly in two areas—knowledge of coal chemistry, and the Fischer-Tropsch synthesis. In coal chemistry, two studies stand out—one concerned with hydrogenation-dehydrogenation of coal, and the other with determination of the hydroxyl groups in coal. Wender's studies resulted in a much better insight into the structure of coal, particularly in the makeup of the ring structure that dominates the chemistry of coal.

The awardee's contributions have had an equally important impact on large-scale production of chemicals and petroleum fuels. His work on the oxo reaction has had profound effects on the commercial production of higher alcohols which are used extensively in the plastics industry (as plasticizers for PVC), in the detergent industry, and in a large variety of specialty chemicals.

Wender is the codeveloper of the Costeam process, a new coal liquefaction procedure that needs no added catalyst and uses synthesis gas instead of hydrogen in the conversion of coal to synthetic crude.

Wender obtained a Ph.D. from the University of Pittsburgh (1950). He joined the Bureau of Mines, Pittsburgh Coal Research Center, in 1946. In January 1980, he was named director of the Office of Advanced Research & Technology, Office of Fossil Energy, DOE. Wender left government service in January 1981 to become research professor, department of chemical & petroleum engineering, University of Pittsburgh.

Arthur C. Cope Award

In each decade of his career, **FRANK H. WESTHEIMER** has made "important contributions which have led not only to new knowledge but to major changes in the way in which chemical or biochemical problems are studied," says a colleague of the award winner. Through his explorations of the chemistry of enzymes with the techniques of physical organic chemistry, he pioneered the area of science dealing with bioorganic reaction mechanisms.

Westheimer received his B.A. from Dartmouth and his M.A. and Ph.D. from Harvard University, where he now holds the Morris Loeb Chair of Chemistry. His early research was in the area of physical organic chemistry. His studies of the mechanism of oxidation of alcohols with chromic acid clarified an important synthetic reaction, and his use of isotopic hydrogen labeling in that work advanced a powerful technique for the investigation of reaction mechanisms. He also explored the mechanisms of other reactions, including decarboxylation and aromatic substitution.

In the early 1950's Westheimer's focus shifted to the study of biochemical reactions. Since then, "he has set the style of simultaneously working on chemical model systems and on the enzyme itself in order to achieve maximum understanding," an associate says. Among his important work in this area are studies of the transfer of hydrogen in biological oxidation-reduction reactions, of the mechanisms of enzymic decarboxylations, and of pseudorotation in the hydrolysis of phosphate esters.

A new investigative technique called photoaffinity labeling is one of Westheimer's most significant contributions. In this method a light-sensitive, radiolabeled molecule is designed to bind to an enzyme's reactive site. Once combined with the enzyme, the compound is irradiated, creating a reactive intermediate that binds covalently to portions of the enzyme within or near the active site. The "tagged" (radiolabeled) fraction is then studied using standard techniques.

The photoaffinity labeling technique of probing biologically active molecules in solution can be used to study membranes, antibodies, and almost any macromolecular system. The method's growing use by many investigators is a clear example of the wide impact of Westheimer's influential work.

Wender

Westheimer

Irving Langmuir Award in Chemical Physics

sponsored by General Electric Foundation

BENJAMIN WIDOM is perhaps best known in the chemical physics community for his fundamental work on critical phenomena, in particular his formulation of the so-called "homogeneity" or "scaling laws" and corresponding "critical exponent relations."

Widom early on recognized how the interfacial tension in critical fluids must scale, and so provided the first correct explanation of the value of the corresponding critical exponent in real fluids. His work represents one of the most significant advances in qualitative and quantitative understanding of the states of fluids since van der Waals' original work. His basic hypothesis and its consequences are often referred to as the Kadanoff-Widom scaling laws.

Following the theory of critical points in single-component fluids, Widom showed how the theory applied to two- and three-component fluid mixtures. His more recent studies of multicomponent systems have led to major new developments in the theory of tricritical points, including the three-phase tricritical "monohedron."

After laying the basic groundwork of scaling theory, Widom went on to develop it and to discuss the behavior of interfaces near critical points. Again, the classical theories of surface tension and of the interfacial profile, going back to van der Waals, were revised in a fundamental way.

In the area of chemical kinetics, Widom is best known for his development of stochastic models for chemical processes. In particular, Widom has pointed out that the macroscopic rate constants that are measured experimentally are not simply related to the underlying microscopic rate processes. This work is of fundamental importance in interpreting experimental studies of gas phase reactions in terms of elementary reactions.

Widom received an A.B. from Columbia University in 1949 and a Ph.D. from Cornell University in 1953. After spending two years as a research associate at the University of North Carolina, Widom joined Cornell University in 1954. He was named professor of chemistry in 1963, and was chairman of the department from 1978 to 1981.

ACS Award for Nuclear Chemistry

sponsored by EG&G ORTEC

LEO YAFFE's contributions to the field of nuclear chemistry span nearly 40 years and are measured by a publications list of more than 150 papers. They begin in the early 1940's when he worked in the Canadian atomic energy project, first at Montreal and later at Chalk River, Ont., and have continued through his many years at McGill University, where he has just retired as vice principal of administration and is once again full-time Macdonald Professor of Chemistry.

A key aspect of Yaffe's early research at Chalk River was the measurement of radioactivity. He conducted some of the first measurements of half-lives and beta-radiation energies, and of the parent-daughter relationships that exist among the products of uranium fission.

His first nuclear reaction studies were of neutron-induced reactions and also were carried out at Chalk River. These resulted in the measurement of neutron-capture probabilities, including those of particular importance to the design of nuclear reactor systems. Later, at McGill, he began investigating proton-induced reactions. Many of the products of these reactions were poorly characterized, and Yaffe and his students conducted decay scheme studies of them.

Probably the award winner's most significant contribution to nuclear chemistry, however, is his work in nuclear fission, particularly that induced by projectiles in the energy range from zero to 100 MeV. He has concentrated on the distribution of the nuclear charge of the fissioning nucleus among the fission products, an area where full theoretical understanding has been lacking and where experimental data are difficult to obtain. He also has made a noteworthy contribution to the literature of experimental data on isomer yields as well as their relationship to angular momentum.

In the past few years Yaffe has turned his attention to the use of nuclear chemistry methods to study archeological problems. Specifically, he has applied neutron activation and x-ray fluorescence analyses to archeological artifacts from Canada, Greece, and Turkey.

Yaffe joined the faculty at McGill in 1952 (he received a Ph.D. from McGill in 1943). He was director of the research labs of the International Atomic Energy Agency in Vienna from 1963–65. He currently is national president of the Chemical Institute of Canada.

Widom

Yaffe

ACS Awards for Outstanding Performance by Local Sections are:

(Small) **Norwich, Wichita Falls-Duncan**
(Medium Small) **Corning, Richland**
(Medium Large) **Kalamazoo**
(Large) **Akron, California, St. Louis**

ACS Regional Awards in High School Chemistry Teaching are:

Harry E. Choulett, Western
Ronald G. Crampton, Midwest
Gladysmae C. Good, Central
Douglas A. Halsted, Great Lakes
Dorothy S. Helms, Southeast
Norman G. Mills, Northeast
Robert Roe Jr., Southwest
Lewis R. Sanford, Middle Atlantic