2000 ACS NATIONAL AWARD WINNERS

Following is the second set of vignettes of the awards administered by the American Chemical Society for 2000. The first set was published in the Jan. 10 issue, page 34. C&EN will publish vignettes of the remaining awardees in successive January and February issues. An article on the 2000 Priestley Medalist, Darleane C. Hoffman, is scheduled to appear in the March 27 issue.

Most winners will receive their awards during the next ACS national meeting in San Francisco, March 26–30. However, the Cope Scholars will receive their awards at the ACS national meeting in Washington, D.C., Aug. 20–24.

ACS Award in Theoretical Chemistry

Sponsored by IBM

ERNEST R. DAVIDSON, one colleague asserts, "is a quantum chemist's quantum chemist." He is noted for myriad contributions to all facets of theoretical chemistry as well as for his penchant for tackling problems that might make other theorists grow faint.

For his accomplishments, Davidson, a chemistry professor at Indiana University, Bloomington, will pick up his second ACS award in the past eight years. He also received the ACS Award for Computers in Chemistry in 1992.

Davidson's peers say they consider him to be a leader in the field who has made advancements in innumerable areas, from density functional theory to electron momentum spectroscopy. For example, Davidson has made vital contributions to a method known as configuration interaction (CI). CI is one of several such methods widely used to improve the accuracy of Hartree-Fock, the standard quantum mechanical strategy for describing the electronic structure of molecules. Davidson's developments in CI have led to enormous progress in the ability to perform accurate calculations, say his colleagues.

In the area of CI, Davidson has tackled the difficult problem of electron correlation, a not-insignificant effect of the interactions between electrons in atoms. Davidson's work on electron correlation in CI, conducted early in his career, produced a way to determine semiquantitative wave functions for molecules with more than two electrons. He and his students created MELD (Many Electron Description), an academic computer program that performs general CI calculations.

Davidson also has applied theory extensively to other problems, including the electronic spectra of porphyrins; the zero-field splitting of formaldehyde; and Jahn-Teller effects in Na_3, NO_2, and CH_4^+.

In 2001, an International Conference on Molecular Quantum Mechanics will be held in his honor in Seattle.

Davidson received a bachelor's degree in chemical engineering in 1958 from Rose Polytechnic Institute (now Rose-Hulman Institute of Technology) in Terre Haute, Ind., and a Ph.D. degree in physical chemistry from Indiana University in 1961. He was a professor at the University of Washington, Seattle, until 1984, when he returned to Indiana University where he currently is a distinguished professor. He was also a visiting professor at Ohio State University, Columbus (1975), and at the Institute of Molecular Science in Japan (1984).

Davidson is a professional and honorary member of numerous organizations, including the American Physical Society, the National Academy of Sciences, and the American Academy of Arts & Sciences. His other awards include the Indiana Academy of Science's Distinguished Scholar Award in 1998 and the University of Wisconsin's Joseph O. Hirshfelder Prize in Theoretical Chemistry in 1997. Davidson is a former associate editor of the *Journal of Chemical Physics* and has been an associate editor of the *Journal of the American Chemical Society.*

Elizabeth Wilson

ACS Award for Creative Work in Fluorine Chemistry

Sponsored by Lancaster Synthesis Inc.

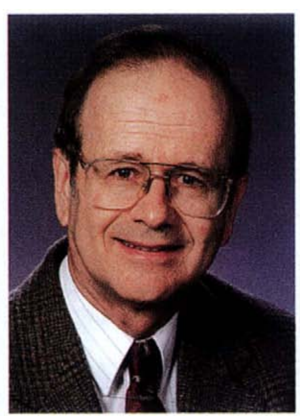
For **WILLIAM R. DOLBIER JR.,** a professor of chemistry at the University of Florida, Gainesville, the surprising thing about his success as a fluorine chemist is that he set out to be a very different kind of chemist. He is a physical organic chemist by training.

Dolbier earned a B.S. degree in 1961 from Stetson University, DeLand, Fla., and a Ph.D. degree in 1965 from Cornell University. He started his career investigating molecular phenomena such as isotope effects and thermal rearrangements.

In the mid-1970s, when National Science Foundation funding for his work on isotope effects was drying up, Dolbier decided to look for something that would affect the reactivity of molecules much more dramatically than deuterium. He settled on fluorine.

Dolbier started making fluorinated cyclopropanes and allenes, compounds he had previously studied with deuterium substitution, and quickly became intrigued by the dramatic effects he ob-


Davidson


Dolbier


Duda

served. "The first two or three years, I would make a prediction about the effect of fluorine, and it would be completely wrong," he says. "This excited me because, as physical organic chemists, we're supposed to be able to predict things."

Over time, however, Dolbier learned to use his physical organic chemistry training to his advantage. He got better at predicting the course of fluorine reactions and in the process helped to usher in a mechanistic approach to fluorine chemistry, which historically had been a more empirical science.

Dolbier joined the American Chemical Society's Fluorine Chemistry Division and augmented his knowledge of the field. At the same time, general interest in fluorine chemistry also was expanding tremendously, largely because of the increasingly recognized beneficial effect of fluorine substituents on the activity of pharmacological compounds and the properties of materials in general.

In addition to his work with cyclopropanes and allenes, Dolbier has published several significant papers on the isomerization of perfluorinated and partially fluorinated 1,3-dienes and cyclobutenes. Paul Tarrant, the University of Florida professor who introduced Dolbier to fluorine chemistry, says the results of these studies were dramatic enough to spur a reassessment of the nature of substituent effects in such electrocyclic reactions.

More recently, Dolbier has tackled the subject of fluorinated radical reactivity, a field in which his research group now spends more than half of its time in collaboration with the National Research Council in Canada and DuPont. Using laser flash photolysis studies, along with synthetic, kinetic, and computational work, Dolbier has now put fluorinated radical reactivity "on a more solid quantitative basis," Tarrant says.

Although his interest lies primarily in the physical organic aspects of fluorine chemistry, over the years Dolbier has developed a number of new synthetic methods. He usually turns to synthesis merely to derive a compound his group wants to study, but one synthesis recently discovered by the group may pave the way for a significant new commercial product.

Dolbier and colleagues have received three U.S. patents on processes for preparing octafluoro[2,2]paracyclophane, also known as AF4. This compound is the precursor to a highly thermally stable parylene polymer that shows promise as an interlayer dielectric for the next generation of computer chips. Alpha Metals, a unit of the British chemicals and electronics firm Cookson, has manufactured AF4 on the pilot scale using Dolbier's third method.

Michael McCoy

E. V. Murphree Award in Industrial & Engineering Chemistry

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

J. LARRY DUDA's approach to research fascinates his colleague R. Nagarajan, professor of chemical engineering at Pennsylvania State University, University Park. Nagarajan says Duda, who is professor and head of the chemical engineering department at Penn State, blends "the exploration of complex phenomena from a molecular mechanistic point of view" with the "development of utilitarian techniques for engineering uses." More specifically, Nagarajan says, Duda's many accomplishments include the creation of theoretical models of molecular diffusion in polymer-solvent systems, techniques to determine diffusion coefficients in polymer systems, and environmentally friendly lubricants.

Duda sees a different sort of duality in his work, such that the research process and the lessons that it teaches—particularly to graduate students—are just as important as the technical advances that the research yields.

"I feel the key to graduate education is learning how to solve complex problems that involve the interaction of several diverse technical fields, as opposed to the acquisition of specific information," Duda explains on his web page. "Equally important to the graduate school experience is developing interpersonal skills to work as part of a team. Consequently, most of my projects involve collaboration with other faculty from chemical engineering or other departments in conjunction with graduate students with backgrounds in chemical engineering, chemistry, or other related disciplines."

Born in 1936 in the small steel-mill town of Donora, Pa., Duda says he was an average student hampered by reading problems. High-school proficiency exams indicated he wasn't cut out for college or a technical career, and he wasn't very dexterous, which ruled out options such as becoming a machinist. A guidance counselor suggested he consider the service industry. "My friends say I would have made a very good bellhop," Duda jokes.

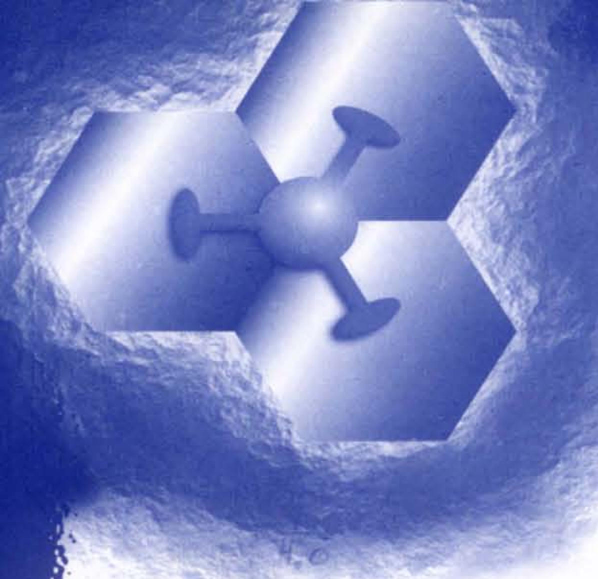
He and his parents ignored this advice, and he went on to earn a B.S. degree at Case Institute of Technology in 1958 in Cleveland and M.S. (1961) and Ph.D. degrees (1963) at the University of Delaware in Newark, all in chemical engineering. It wasn't until years later—when his own son was diagnosed with dyslexia—that Duda discovered that he himself had this learning disorder.

Duda joined Dow Chemical in 1963 and moved to Penn State in 1971. There his work centers around molecular diffusion in polymers with industrial applications, including the production of polymer foams and the formation of coatings and films. In addition to his responsibilities as head of the chemical engineering department, Duda is codirector of the university's Center for the Study of Polymer-Solvent Systems. Sponsored by industry and the National Science Foundation, the center's researchers study the phase equilibria and diffusion behavior of solvents in polymers.

Though he looks back fondly on his Dow tenure, Duda found that he was "always interested in the wrong question" while he was there. "In industry, you really want to know how to do something, and I was always asking why things were happening," he recalls. He found that academia was a more natural home for such musings.

Duda's shift to Penn State was also impelled by the quality of new chemical engineers coming into industry. "I thought they didn't know things, and somebody should be teaching them better," he says wryly. He has advised nearly 70 master's degree and 45 doctoral students at Penn State and worked with more than 80 undergraduates on research projects.

He believes his own learning problem has helped him relate to students for whom "things don't come easy." And he thinks it also has contributed to his research success. "I was very used to making mistakes and learning from them, and that really prepared



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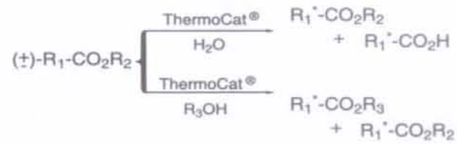

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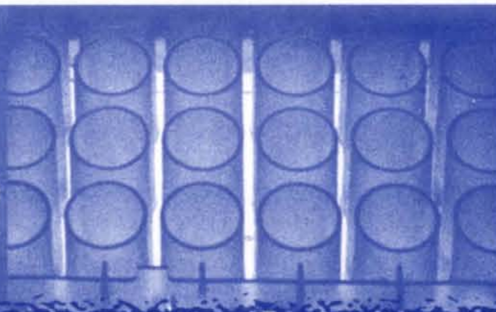

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me for research," he says. On the other hand, those who sail through college without any trouble can find the transition to research to be challenging, Duda says. "They're not used to making mistakes."

Duda has provided consulting services for companies including Dow Chemical, Monsanto, Air Products & Chemicals, and Johnson & Johnson. He is a member of the National Academy of Engineering and a fellow of the American Institute of Chemical Engineers (AIChE). His other honors include AIChE's Warren K. Lewis Award for Chemical Engineering Education and the American Society for Engineering Education's Chemical Engineering Division Lectureship Award.

Even more important to Duda than his career success are his marriage and the raising of four successful children. "That has more impact on me and has given me more satisfaction in life," he says.

Sophie Wilkinson

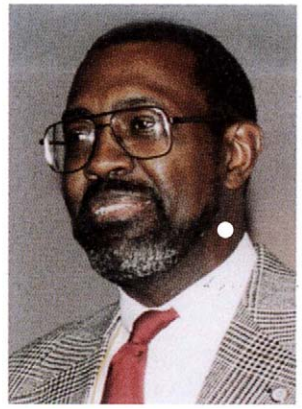
ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences

Sponsored by the Camille & Henry Dreyfus Foundation

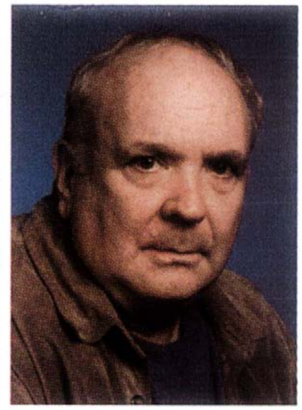
When **SLAYTON A. EVANS JR.** joined the faculty of the University of North Carolina, Chapel Hill, in 1974, the campus had just become racially integrated after 170 years of segregation. The federal government was pressing the university for more meaningful minority enrollment figures. And there was a good bit of turmoil when minority students were enrolled with insufficient qualifications and—given no special help—failed out in large numbers after a year or two.

At that time, Evans took some black chemistry students under his wing, helped them succeed, and encouraged some to go on to graduate work in chemistry. "Evans never lowered his standards—he nurtured students but did not coddle them, and he always made it clear that success was ultimately up to the student," says a University of North Carolina colleague, Professor Emeritus Ernest L. Eliel.

At the end of the 1970s, by which time he had achieved tenure, Evans realized that more black student role models were required and that the university needed to make efforts to enroll more outstanding minority students. He became a member of the Pogue (minority) Scholarship Selection Committee, which picked the candidates for the scholarship program that had just been created.



Evans



Fetters

"At the time," Eliel recalls, "there were 15 Pogue scholarships, but the stipend was nominal; it covered tuition and fees but no living expenses. Evans fought for several years to get this changed and in the process resigned from the committee in protest. But finally, in 1988, he achieved his aim and rejoined the committee as chair." As a result, there are now 25 Pogue scholarships that cover both tuition and living expenses.

Although Evans says he made no specific efforts to turn the Pogue scholars toward chemistry, the presence of a successful black chemistry professor on the interview and selection committee induced many of the Pogue scholars to take chemistry courses. And some became chemistry majors—Evans admits to some persuasion and push at that stage.

Mentoring is very important to Evans, who counts as two of his most influential mentors UNC's Eliel and Andrew L. Ternay of Case Western Reserve University, Cleveland, Ohio. "Eliel and Ternay both stressed to me how important it was to persist in the discipline. And they helped me to prepare for the future as a chemist," Evans says. He recalls that Ternay pointed out that public speaking and articulating ideas clearly was important. "Eliel's emphasis was that writing clearly was important, and he helped me with this," Evans says. And Evans has tried to pass these very ideas on to students he has mentored.

Although his role is not confined to minority students, a number of minority students have benefited from his guidance. Derrick Tabor, now professor of chemistry at Johnson C. Smith University, Charlotte, N.C., who earned a Ph.D. degree under Evans' leadership, was the first black chemistry Ph.D. student ever to graduate from UNC, Chapel Hill. He says, "My professional life is a living testimony to the fact that teaching is not just about subject mastery and excellent delivery; it is also about changing lives."

Tabor goes on to say that Evans, as a research adviser, "went beyond teaching me the mere content of chemistry; he taught me how to create, ways to think, and how to work productively as a research scientist and university professor. Informally, by accompanying him to ACS meetings, I learned how to interact on a professional and social level with other chemists. By attending seminars and presentations with him, I learned how to analyze the work of our colleagues and how to create and pose questions in nonthreatening ways that illuminated the essence of the science being presented."

Mentored by Evans as an undergraduate and graduate student, Maria Curry-Nkansah of Amoco Chemicals Group says: "As a former diamond in the rough, I am grateful to Dr. Evans for helping me to believe in what I thought was the impossible—receiving a Ph.D. in the chemical sciences. I am also grateful that I am one of the many African Americans who have benefited from his strength of character, tough love, sound judgment, and relentless pursuit of excellence."

Evans received a B.S. degree in chemistry from Tougaloo College, Tougaloo, Miss., in 1965 and a Ph.D. degree from Case Western Reserve University in 1970.

Linda Raber

ACS Award in Applied Polymer Science

The influence of a good educator on someone's future path cannot be underestimated. **LEWIS J. FETTERS** traces his interest in polymers back to 1957,

when as an undergraduate student at the College of Wooster in Wooster, Ohio, he undertook an independent study project directed by a new faculty member, Thomas Ferrington. Fetters had chosen Wooster primarily for its chemistry program, but Ferrington showed him more specific areas in which he could expand.

"[Ferrington] worked with Arthur V. Tobolsky, at Princeton," Fetters says. "Tobolsky was conducting research that involved the areas of polymer chemistry and polymer physics. Thus Ferrington had this diverse list of projects, and I selected one."

This initial project "never got away from square one," Fetters recalls. "It was a radical polymerization with some disulfide species whose name I have long since forgotten. Most of the polymerizations we observed were just due to plain thermal processes," he adds. Philosophically, he sums up, "that is the game of research."

From these humble beginnings, Fetters has since made his mark in the world of polymers. A fellow chemist who has known Fetters for 20 years comments: "Fetters has long been recognized as a leader in the field of anionic polymerization. He has earned an international reputation for synthesizing polymers with precise architecture and purity. Recently, Fetters and John Huang of ExxonMobil tackled one of the unanswered questions in anionic polymerization—that is, What are the states of aggregation of living lithomacromolecules?"

A Princeton scientist familiar with Fetters says that he is a "collaborator par excellence" who "extends his own range by finding people with similar interests and complementary skills." The scientist notes that Fetters "achieves great leverage in this way, which allows him to progress both broadly and quickly toward resolving technical questions." Concerning his ability to recruit young and bright researchers, Fetters himself is unpretentious: "It is basically to let the work speak for itself."

After several decades in the world of polymers, one might expect that some of the initial spark of interest would fade away. Fetters attributes his enduring interest in his work to opportunities he has had to do research with a variety of colleagues from different organizations. At ExxonMobil, where Fetters now is a senior research associate, he has on several occasions collaborated with outside researchers, mostly academics.

One of his most interesting experiences has been his long-lasting collaboration with the Institute Laue-Langevin in Grenoble, France, which is "the premiere neutron-scattering lab on the planet," Fetters says. "That leads to some of the passion or enthusiasm because it is a marriage of chemistry—my initial training—and physics."

Being part of a giant for-profit organization such as ExxonMobil has not limited Fetters' freedom. "There has been a rather large degree of freedom simply because some of the projects that are technically important have some good science in them," he says. "So in a sense we tend to look for these, and if we can find them, then it allows us to walk on both sides of the street." Fetters derives particular satisfaction from a new type of nucleator for wax in fuel oil. The additive prevents fuel from gelling in very cold weather by altering the size of the wax particles that are formed as the temperature drops. It also averts filter clogging and transmission-line plugging problems. Says Fetters of this discovery, which is now commercialized in Europe, "It's not a huge item of commerce and never will be. But if you have a cold winter in Europe, you need something to keep the diesel fuel flowing."

In addition to this year's ACS award, Fetters has received several honors. This year, he is also the recipient of the High Polymer Physics Prize of the American Physical Society, an award Tobolsky earned a few decades ago. Fetters was the first winner of the Creative Polymer Science Award from the ACS Polymer Division in 1981. In 1996, he was made a fellow of the American Physical Society and was inducted into the Inventors Hall of Fame. Exxon twice gave him its Golden Tiger Award for his scientific and technological contributions to Exxon Corporate Research (now ExxonMobil Corporate Strategic Research).

Tens of millions of dollars in sales for ExxonMobil are generated annually by inventions made by Fetters. Before joining Exxon in 1983, he was a professor of polymer science at the University of Akron from 1967 to 1983. He obtained a Ph.D. degree in chemistry from the University of Akron in 1962. He lives in Annandale, N.J.

Jean-François Tremblay

ACS Award in Polymer Chemistry

Sponsored by ExxonMobil Chemical Co.

The work of **JEAN M. J. FRÉCHET,** professor of chemistry at the University of California, Berkeley, "spans the breadth of synthetic polymer chemistry from establishment of new and very creative synthetic methods to the development of new materials and processes that are of great commercial significance," a colleague remarks.

Fréchet was born in France and graduated as a chemist and chemical engineer from the Institute for Industrial Chemistry & Physics, Lyons, in 1967. In 1971, working under Conrad Schuerch, he received a Ph.D. degree from the State University of New York College of Environmental Sciences & Forestry, Syracuse. In 1987, after 15 years on the faculty of the University of Ottawa, he moved to Cornell University to become professor of chemistry. He took up his present post at UC Berkeley in 1997.

"I am keenly aware of the fact that the 'product' of a university is people rather than publications or patents," Fréchet tells C&EN. "Therefore, in the context of a university, a research target should be designed to encompass both the requirements of significance for the advancement of science and intrinsic educational value. I try to design my research projects in a way that blends the fundamental and the practical."

Fréchet's early work in the 1980s focused on the design and synthesis of polymers for heterogeneous organic synthesis. The numerous methods he developed for the preparation of functional polymers—through phase-transfer catalysis and metalation reactions, for example—are still in use.

In 1979, working with C. Grant Willson at IBM's newly formed microlithography research group, Fréchet developed the chemical amplification concept in resist imaging. In this process, radiation is used to generate a catalyst within a polymer thin film, allowing its facile modification in a subsequent thermal step. The technique has since been commercialized and continues to have a direct impact on the miniaturization of electronic devices.

Fréchet also pioneered the "convergent" approach to globular synthetic polymers, called dendrimers, that owe their shape to their highly branched architecture. The convergent route to

dendrimers, which was developed with postdoctoral associate Craig Hawker, is uniquely versatile, allowing the precise placement of functional groups at any location within the dendrimers. The approach has potential applications in drug delivery, energy harvesting, ion sensing, catalysis, and information storage (C&EN, Nov. 1, 1999, page 27).

In 1992, Fréchet, in collaboration with research associate Frantisek Svec, developed a novel monolithic macroporous separation medium containing both large channels for mass transfer and small pores for separation chemistry.

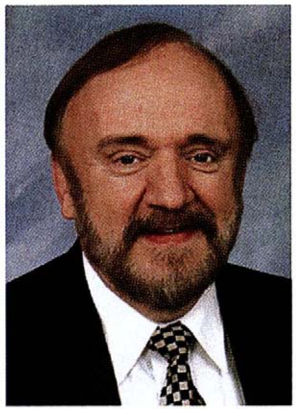
"I am very proud of our recent work on monolithic separation media," Fréchet says. "This novel alternative to beads offers great promise for high-throughput analytical work, the development of microfluidic and chip-based systems, flow-through reactors, supported catalysts, and other applications."

Fréchet's research has been reported in some 500 publications. The practical technological applications of his work have been documented in about 50 patents.

Fréchet received the ACS Award in Applied Polymer Science in 1996 and two awards sponsored by the ACS Division of Polymeric Materials: Science & Engineering—the Arthur K. Doolittle Award in 1986 and the Award for Cooperative Research in Polymer Science & Engineering in 1994. Fréchet is a consultant in organic and polymer chemistry for several major corporations and is a member of editorial advisory boards for several journals, including *Angewandte Chemie,* the *Journal of Polymer Science,* and *Macromolecules.*

"Very few research scientists have managed to operate at the forefront of materials work in so many areas," a colleague comments. "He is certainly one of the most creative and productive polymer scientists in the world."

Michael Freemantle



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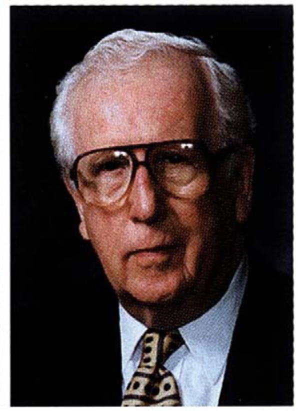


Gehrke

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

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

HARRY L. FRISCH is an idea man—anyone with 517 published papers to his credit must be. His scientific curiosity and varied interests have taken him across several disciplines, and his thoughts have inspired and guided others in their work as well.

According to a colleague, "He is not only instantly interested in any topic that arises, but he also has the uncanny knack of suggesting in a few words the most promising direction to pursue. It is mind-boggling to imagine how many hundreds of other papers have as their genesis a discussion with Harry Frisch."

Frisch, currently Distinguished Professor of Chemistry and professor of physics at the State University of New York, Albany (SUNY Albany), has come a long way. Born in Austria, he began his career in chemistry at the Polytechnic Institute of Brooklyn in Brooklyn, N.Y., where he served as a research associate while working on his Ph.D. degree. He left Brooklyn in 1952 to pursue a postdoctoral fellowship at Syracuse University, Syracuse, N.Y., and then an assistant professorship at the University of Southern California, Los Angeles, before trying his hand in industry in 1956.

Frisch spent just over a decade on the technical staff of the Bell Telephone Laboratories in Murray Hill, N.J. He returned in 1967 to academia as a professor of chemistry at SUNY Albany, where he has remained since. During his tenure, he has served the university in a number of significant roles: director of the Center for Biological Macromolecules, chairman of the chemistry department, associate dean of the College of Arts & Sciences, dean of the science and mathematics division, and long-standing senior fellow with the school's Institute for the Study of Defects in Solids.

In addition to serving as either an editor or a member of the editorial board for nearly a dozen scientific journals, Frisch has traveled widely as a visiting lecturer and professor at several universities and has been a consultant to several research organizations.

The bulk of Frisch's research has been focused on the physical chemistry of liquids, but he has made considerable contributions in the areas of polymer science, solid-state, and statistical physics as well. His "scaled particle theory" has been applied outside of fundamental liquids theory, proving to be valuable in biological research and various technology venues.

He is also renowned for his work—both theoretical and experimental—in the preparation and characterization of interpenetrating polymer networks and related materials, as well as for his development of the concept of topological chemistry.

The Hildebrand Award is not his first ACS award. The Rubber Division and the Petroleum Research Fund have honored his work, as have several other scientific organizations.

Frisch received an A.B. degree in chemistry from Williams College, Williamstown, Mass., in 1947 and a Ph.D. degree in physical chemistry from the Polytechnic Institute of Brooklyn in 1952.

Kevin MacDermott

ACS Award in Chromatography

Sponsored by Supelco

What do cancer research and the search for extraterrestrial life have in common? Both fields of study take advantage of **CHARLES W. GEHRKE**'s advances in chromatography methods.

Gehrke received a Ph.D. degree in biochemistry from Ohio State Universi-

ty, Columbus, in 1947 and joined the College of Agriculture at the University of Missouri, Columbia, in 1949. He became the director of the Experiment Station Chemical Laboratories at the university in 1954, where he stayed until he retired in 1987.

During a 15-year research program at the station, Gehrke was first to automate chemical methods for the feed and fertilizer industry. He developed eight analysis methods that were peer reviewed and approved by the Association of Official Analytical Chemists (AOAC). His automated methods allowed the state laboratories to make 40 to 120 chemical determinations per hour. Gehrke was awarded the AOAC Harvey W. Wiley Award in 1971 and served as president of the organization in 1983.

In the 1950s and '60s, Gehrke's attention turned to the building blocks of proteins, and he developed methods for analyzing amino acids with gas-liquid chromatography.

As a result of his leading work with amino acids, Gehrke became a member of a group chosen by the National Aeronautics & Space Administration to search for organic compounds in the lunar samples from the Apollo missions. The research introduced new techniques for working with very small samples, and the group concluded that the lunar samples did not contain amino acids.

Gehrke expanded his study of gene-protein interactions with his use of quantitative reversed-phase high-performance liquid chromatography (HPLC) of the major and modified nucleosides in RNA, DNA, and physiological fluids. His research made it possible to resolve 65 nucleosides in a single analysis. Gehrke went on to predict the chromatographic parameters that are required for separation of the widely diverse modified nucleosides. His methods led to his and other studies of DNA methylation and transfer-RNA and messenger-RNA modification.

In the early 1970s, Gehrke and his colleagues worked on the National Cancer Institute's Biological Markers Program to develop the first high-resolution quantitative gas chromatography and liquid chromatography methods to detect polyamines in physiological fluids. His HPLC methods for protein-bound neutral sugars were part of the National Institutes of Health search for markers for breast cancer.

More recently, NASA invited Gehrke back, this time to the moon. He was asked to bring together a multidisciplinary team of scientists to work on a Lunar-Based Chemical Analytical Laboratory for life sciences research. The base was thought to be a stepping stone for further space exploration and involved scientists from the European, French, and Japanese space agencies.

The space agencies came together in 1993 for the International Conference on Space Exploration & the Future of Humans in Space in Dijon, France. Gehrke was the U.S. cochairman of the conference and planned discussions on procedural techniques for the search for life molecules in Mars meteorites and returned Mars samples.

Gehrke's colleague, Robert L. Wixom, emeritus professor of biochemistry at the University of Missouri, calls him a leader in advances in separations sciences: "He is always vigorous, thorough, and precise in his work." In 1999, Gehrke received the ACS Award in Separations Science & Technology. Gehrke has worked with more than 60 graduate students, many of whom still keep in touch from across the country. Gehrke and Wixom are editing a forthcoming book, "Chromatography—A Century of Discovery 1900–2000: The Bridge to the Sciences/Technology."

Melody Voith

ACS Award for Nuclear Chemistry

Sponsored by Gordon & Breach Publishing Group

On a summer day in 1945, 10-year-old **RICHARD L. HAHN** was riding the subway in New York City while a nearby commuter read the *New York Times.* It was a day Hahn will never forget.

"I saw the front page of the paper, and the headline announced the dropping of the first atomic bomb over Japan," Hahn recalls. "That was the very moment I became interested in nuclear science, and I've been interested ever since."

Most recently, Hahn's interests led to his involvement with construction of the high-profile Sudbury Neutrino Observatory (SNO), near Sudbury, Ontario. The observatory, located 6,800 feet underground, began operations last summer and is designed to detect neutrino interactions as they occur in real time. Hahn played a substantial role in designing the chemical aspects of the neutrino detector, which contains 1,000 tons of pure heavy water, D_2O, in a 12-meter-wide transparent acrylic plastic vessel, surrounded by 7,000 tons of purified light water, which acts as shielding.

Hahn also played a major role in designing and operating the international GALLEX Solar Neutrino Experiment, which operated a neutrino detector containing 30 tons of gallium in a 100-ton aqueous target at the Gran Sasso National Laboratory in Assergi, Italy. According to Hahn, the experiment, which ended in 1997, led scientists to a deeper understanding of how the sun produces energy, as well as an understanding of the properties of neutrinos.

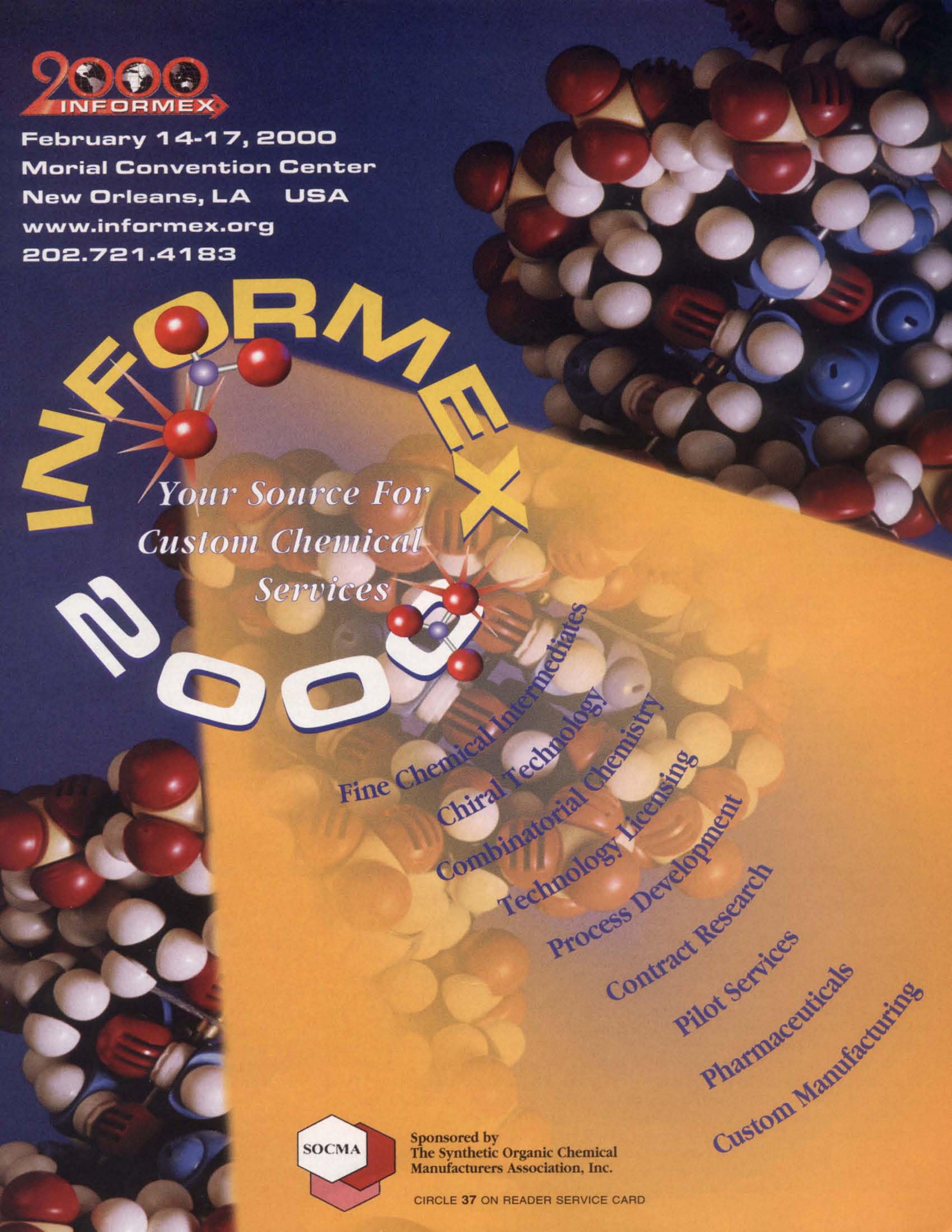
The results for GALLEX and the world's four other solar neutrino detectors have provided strong hints that the neutrino has a significant new property: nonzero mass. This potential for "new science" beyond current physics theories has generated great interest about neutrinos in the scientific community.

Before becoming interested in neutrinos, Hahn had already established himself as a prominent nuclear chemist. His areas of research have included the mechanisms of nuclear reactions induced by accelerated charged particles from protons to heavy ions up to uranium, charged-particle activation analysis, nuclear spectroscopy, discovery and characterization of new nuclides, solution chemistry of lanthanides and actinides, fission studies, and searches for superheavy elements.

In total, Hahn has published more than 100 articles on these and other subjects, as well as numerous articles in the World Book Encyclopedia aimed at students in grades seven through 12.

A native of New York City, Hahn studied nuclear chemistry at Columbia University, where he received a Ph.D. degree in 1960. He left university life in 1960, taking a research associate position at Brookhaven National Laboratory, Upton, N.Y. After leaving Brookhaven in 1962, Hahn joined the Oak Ridge National Laboratory in Tennessee, where he worked until 1987, serving in many positions, one of which was director of the Transuranium Research Laboratory from 1974 to 1984. In 1987, he returned to Brookhaven, where he continues his work today as a senior chemist.

As a visiting scientist, Hahn has worked in France, Germany, Italy, and



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Canada. He is an active member of several professional organizations and served as chairman of the American Chemical Society's Division of Nuclear Chemistry & Technology in 1980.

Among his other honors, Hahn was named a scholar in residence in 1983 by Southwestern University, Georgetown, Texas, and received the Radiation Industry Award of the American Nuclear Society in 1977 for his research on charged-particle activation analysis.

Ronald Rogers

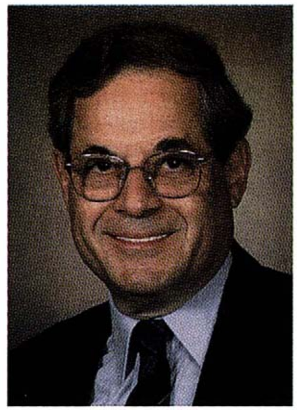
George A. Olah Award in Hydrocarbon or Petroleum Chemistry

Heterogeneous catalysis on the surfaces of zeolites and other solid-acid catalysts lies at the center of most petroleum-refining chemistry and much of petrochemical conversion chemistry. Understanding the fundamental steps that govern those and related processes is the focus of the research of **JAMES F. HAW,** who is the Ray R. Irani Chairman of Occidental Petroleum Corp. Professor of Chemistry at the University of Southern California (USC), Los Angeles.

Elegant investigations of hydrocarbon reactions on solid-acid surfaces have earned Haw admiration and respect from fellow catalysis researchers. One catalysis expert asserts that Haw's incisive experiments have "beautifully extended nuclear magnetic resonance (NMR) spectroscopy to species adsorbed on catalyst surfaces." That colleague adds that Haw's experiments span a wide range of temperatures, organic species, and solid acids. "And his catalysis insights reflect a deep understanding of organic and physical chemistry."

Among many other scientific contributions, Haw is credited with demonstrating the strengths and limitations of widely accepted analogies between solution-phase and solid-phase acid chemistry. As one zeolite specialist explains, Haw convincingly proved that the key intermediates in certain acid-catalyzed hydrocarbon conversions on solids are species such as alkoxides rather than carbenium ions, as was commonly believed.

Attesting to the high level of Haw's laboratory dexterity and ingenuity, a researcher with whom Haw collaborated in the late 1980s describes a particularly challenging experiment that Haw conducted skillfully: "He had to somehow adsorb ^{13}C-labeled propene onto a zeolite at a temperature well below the onset of reaction and then transfer this sample into a sealed magic-angle spinning NMR sample rotor without exposing the sample to air, heat, or moisture at any step. The fact that he succeeded in this task and then turned the procedure into a routine experimental technique is clear evidence that Haw is one of the leading innovators in experimental NMR." The publication that resulted from that work has been widely cited in the literature, the colleague adds.



Hahn

Haw

Haw says that, as an assistant professor, he had the good fortune to stumble upon a project that introduced him to the problem of understanding propene reactions on zeolite catalysts. "I was completely caught up in the problem, and I still haven't let go," he says.

Asked about the goal of his research program, Haw responds that his investigations aim to uncover the elementary steps of the reaction mechanisms that direct the methanol-to-olefins and methanol-to-gasoline processes. Worldwide petroleum production is expected to peak and then begin declining early in this century, Haw says, while at the same time global demand for hydrocarbons is predicted to increase.

"We hope to develop a fundamental, undergraduate-textbook-level understanding of how methanol, a readily available C_1 feedstock, can be converted to hydrocarbons on solid-acid catalysts," Haw explains. "The next step is to use that basic chemistry knowledge to develop better materials and processes for producing hydrocarbons."

The 45-year-old Haw tells C&EN that his fascination with science can be traced back to his childhood—with the launch of *Sputnik* and the excitement of space exploration. "When I was a child, stores were filled with books on science and rockets. It was very exciting." Haw adds that, as an undergraduate student, he found chemistry's challenge particularly appealing.

Haw earned a B.S. degree in chemistry from Old Dominion University, Norfolk, Va., in 1977 and a master's degree in 1979 from the University of North Carolina, Chapel Hill. He received a Ph.D. degree in 1982 from Virginia Polytechnic Institute & State University, Blacksburg.

In 1984, Haw joined the chemistry faculty at Texas A&M University, College Station, as an assistant professor and was promoted to professor in 1992. In September 1998, Haw moved to Los Angeles, where he is a professor of chemistry at USC's Loker Hydrocarbon Institute and department of chemistry.

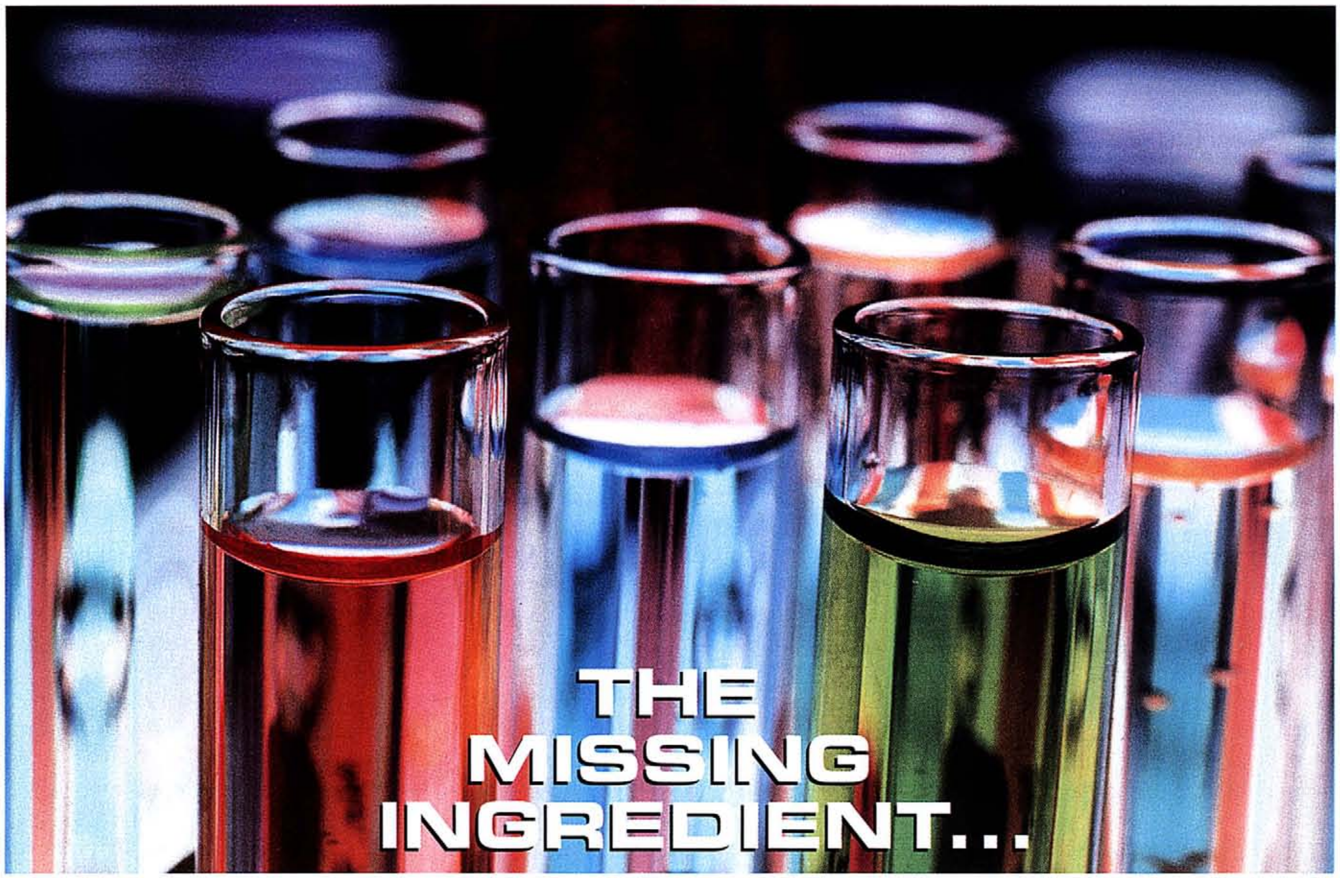
Mitch Jacoby

ACS Award in Separations Science & Technology

Sponsored by IBC Advanced Technologies Inc. and Millipore Corp.

E. PHILIP HORWITZ can trace his fascination with chemical separation science back to his high-school chemistry class and reading about recovery of gold from seawater. And that interest in separations led him a long way. For 38 years as a scientist in the chemistry division at Argonne National Laboratory, Horwitz was involved in a number of aspects of liquid-liquid extraction and ion-exchange chromatography applied to the separation of radioactive isotopes.

Throughout the 1960s and '70s, Horwitz's work focused on adapting liquid-liquid extraction to extraction chromatographic systems. He decided to take this research track because many of his responsibilities involved the separation of macro quantities of transplutonium elements from neutron-irradiated targets. Operations such as these involved heavily shielded hot cells and glove boxes. Under these circumstances, separations are more easily carried out by using chromatography rather



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than batch liquid-liquid extraction. Horwitz recognized that higher selectivity and more efficient separations could be accomplished with liquid-liquid extraction systems if one could achieve efficient column behavior. "This is particularly true when one is faced with the problem of separating transplutonium elements whose chemical properties differ very little from one element to another," he says.

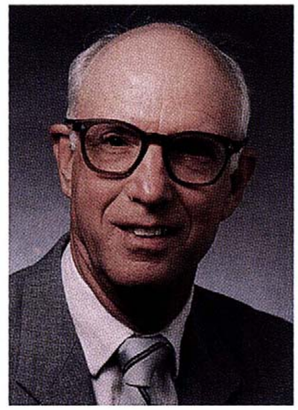
And Horwitz has published a number of papers describing principles, dynamics, and application of extraction chromatography to the separation of actinides and fission products. Several of these systems have been used by actinide chemists from around the world for purifying radioactive isotopes. One of his most noteworthy applications of the extraction chromatographic technique was in the preparation of ultrapure ^{242}Cm in multicurie quantities for use as the alpha-particle source in the instrument that performed the first elemental analysis of the lunar surface.

Throughout the 1980s and '90s, Horwitz's research involved the development of highly efficient processes for the treatment of high-level radioactive liquid waste. These studies led to the creation of the transuranium extraction (TRUEX) and strontium extraction (STEX) processes. Highly successful TRUEX and STEX process demonstrations have been carried out on a variety of high-level radioactive defense waste and transuranium waste solutions.

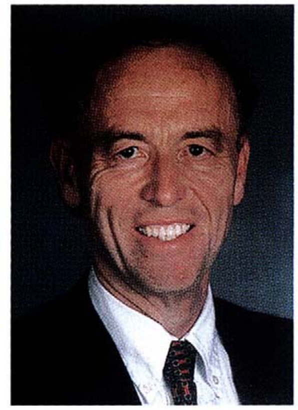
Many liquid-liquid processes that were developed by Horwitz and his coworkers for the treatment of radioactive waste have been adapted to the extraction chromatography for use in the preconcentration and determination of radionuclides in environmental and bioassay samples. These new extraction chromatographic resins were so successful that a new company, Eichrom Industries, was founded to market and manufacture them.

Horwitz has authored or coauthored more than 200 articles in 37 peer-reviewed journals. In addition, he has 33 patents, 27 of which involve inventions related to separation processes in nuclear technology. He has received 11 awards for this work, including the University of Chicago Distinguished Performance Award, the Department of Energy Distinguished Associate Award, the Glenn T. Seaborg Actinide Separations Award, and three R&D 100 awards. He has also served as coeditor and as editor-in-chief of the international journal *Solvent Extraction & Ion Exchange.*

Horwitz received a B.S. degree from the University of Cincinnati in 1953 and M.S. and Ph.D. degrees from the University of Illinois, Urbana-Champaign, in 1955 and 1957. He began his professional career at Dow Chemical, Midland, Mich., before joining Argonne National Lab, near Chicago, in 1959. While there, he rose to the position of senior scientist and was for 24 years group leader of the chemical separations group in the chemistry division.



Horwitz



Hunt

He left Argonne in 1998 to set up PG Research Foundation, which funds new programs in separations science and technology. Horwitz is also senior consulting scientist for Eichrom Industries, Darien, Ill., and holds a visiting faculty position in the department of radiology at the University of Chicago Hospital.

Linda Raber

Frank H. Field & Joe L. Franklin Award for Outstanding Achievement in Mass Spectrometry

Mass spectrometry has become a powerful tool for identifying proteins at extremely low levels. Much of the credit for that use goes to **DONALD F. HUNT,** professor of chemistry and pathology at the University of Virginia, Charlottesville, who has played a leading role "in bringing techniques of protein mass spectrometry into universal use among protein chemists and biochemists," according to one colleague. "He has been a major influence in convincing individuals without a classical mass spectrometry background that they, too, could—and should—apply these techniques to their problems."

Another colleague notes that many of Hunt's papers have been published in biological journals. He asserts that "this is to [Hunt's] credit, because it attests to the importance of his work to real-life issues."

Hunt and his coworkers at Virginia have been pioneers in the use of mass spectrometry for peptide and protein sequencing. They have focused on developing new methods and instrumentation for characterizing peptides and proteins in complex mixtures at the femtomole and attomole levels.

Not content simply to develop techniques, Hunt has applied them to significant biological problems. For example, he identified peptides associated with the major histocompatibility complex (MHC)—long considered an intractable problem by immunologists. One immunologist says, "His work has opened the way for development of new insights into how the immune system deals with cancer and virus-infected cells and with normal cells that are targets for certain autoimmune disorders."

Hunt received a B.S. degree in chemistry from the University of Massachusetts, Amherst, in 1962 and a Ph.D. degree, also from the University of Massachusetts, in organic chemistry in 1967. He joined the faculty at the University of Virginia as an assistant professor in 1968 and was promoted to associate professor in 1973 and professor in 1978. He received a John Simon Guggenheim Fellowship in 1981–82. In 1993, he was promoted to the rank of university professor with appointments in both chemistry and pathology.

Hunt is the author or coauthor of more than 200 peer-reviewed articles. He has received a number of other awards, including the ACS Carolina-Piedmont Section's Charles H. Stone Award in 1990, the ACS Analytical Chemistry Division's Award in Chemical Instrumentation in 1997, the Pehr Edman Award in 1992, and the Distinguished Contribution Award from the American Society for Mass Spectrometry in 1994. In 1996, he was named the first recipient of the Christian B. Anfinsen Award from the Protein Society.

Celia Henry