University of Illinois at Urbana-Champaign

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Alumni Newsletter

School of Chemical Sciences

Heckert Will Be Du Pont's Next Chairman

Richard E. Heckert, Ph.D. 1949 (organic chemistry), has been chosen as deputy chairman by the Du Pont company, to succeed as chairman in May of 1986. He will occupy one of the most important industrial posts of any Illinois alumnus in any field.

The 61-year old Dr. Heckert, an active participant in the recent Campaign for Illinois, has been a vice chairman of the giant chemicals and energy company since 1981, co-directing the Conoco petroleum and coal operations. As chairman, he will assume operating responsibility for all Du Pont units and consolidated subsidiaries.

The veteran research chemist and plant manager now has the difficult task of trying to restore Du Pont's competitive position in the face of weaker demand, strong foreign competition and a cumbersome corporate structure. But Heckert told the New York Times last summer "we don't have to turn the battleship around. What we have to do is navigate the waters that we're in and get our company fully working in all respects, in terms of cost reductions, quality improvement and customer orientation."

Dr. Heckert's industrial management experience comes from running such huge departments as fabrics and plastics. The Wall Street Journal reported last August that he is expected to continue Du Pont's push away from these traditional businesses toward life sciences and the more lucrative specialty niches such as electronic chemicals. "We feel we are on the right track, but what we aren't pleased with is our current performance levels," Dr. Heckert said, "we have to make changes that are necessary to perform as least as well as major industry competitors." Dr. Heckert has already initiated a program to train managers to respond better to markets and customers.

Heckert began graduate studies in organic chemistry with Professor Snyder at Illinois after World War II when he worked as an army technician at the Oak Ridge, Tennessee, atomic energy facility. He joined Du Pont at the experimental station laboratories near Wilmington, Delaware, shortly after completing his doctoral degree. From working as a research chemist, Heckert moved into research management primarily in the development of cellophane and Mylar polyester film. Over the years, he became closely associated with the marketing of Du Pont and has been in the company's top management for 12 years.

Du Pont insiders consider Heckert a seasoned manager. One company director said of him "He's a man of the soil. The organization is in love with him," and another commented "in the event of a storm, he's the best storm protection we've got."

"Success Breeds Success"

"Faculty at the University of Illinois at Urbana-Champaign say their university is on a roll," writes Philip H. Abelson in the November editorial of *Science* magazine.*

His article cited the combination of large-scale support the university has received during the past year. The Urbana campus last year became one of four National Centers for Supercomputing Applications, receiving support of $43 million over five years from the National Science Foundation. The center will develop supercomputers with novel architectures and operating systems. In addition, chemistry alumnus Arnold O. Beckman and his wife Mabel have given the university $40 million for a building to house the Beckman Institute to foster interdisciplinary research. The institute is scheduled for completion in 1988.

State support of these and other centers, including additions to the Digital Computer Laboratory, a Microelectronics Center and a Center for Supercomputing Research and Development, amounts to about $50 million, and more support has been pledged.

Abelson says that although other universities have often failed in their efforts at interdisciplinary research, Illinois has a good record in these activities, and that future opportunities in research will require an interdisciplinary approach. He concludes "finally, there is the morale factor. When you are on a roll, success breeds success."

It is a momentum that the School of Chemical Sciences fully intends to share.

* *from "Computers and Interdisciplinary Research", Abelson, P.H., Vol. 230, p. 893, 22 Nov. 1985.*

The Faculty

Zumdahl Directs General Chemistry

Dr. Steven Zumdahl

Dr. Steven Zumdahl last fall succeeded Professor Gil Haight as director of the general chemistry program at Illinois. Zumdahl, who has acted as associate director since 1978, is responsible for courses 100-110 and oversees the way "beginning" chemistry is taught at the University of Illinois.

Dr. Zumdahl, whose first love is teaching freshman chemistry, says that students entering initial university chemistry courses are often grappling with the most challenging course they have ever faced. When you catch students at this time of their lives, Zumdahl says "you really have their attention."

As a teacher, he has two goals — first, to teach chemistry and, second, to help students to become better problem-solvers. In a new book *Chemistry*, which was five years in the making, Steven Zumdahl presents an exciting new approach to general chemistry. Carefully integrating descriptive chemistry with chemical principles, Zumdahl's writing demonstrates chemistry's impact on everyday life and attempts to foster skills students will use throughout their lives. Zumdahl has earned many honors for his teaching at Illinois — in 1981, the Campus Teaching Award and the Undergraduate Teaching Award (Alpha Lambda Delta), in 1979 and 1984, the School of Chemical Sciences Teaching Award, and in 1985, the College of Liberal Arts and Sciences Award for Distinguished Teaching.

Dr. Zumdahl plans to make significant changes in the use of computer instruction for general chemistry especially in the laboratories. He hopes to establish a large learning center where the Plato system and the new computer-controlled videodisc technology will enhance the quality of instruction and, particularly, improve student understanding of their work in the labs.

Zumdahl earned his Ph.D. here with Dr. Russell Drago in 1968 and taught on the inorganic faculty at the University of Colorado before returning to Illinois.

Honors to Hanratty

Thomas J. Hanratty, professor of chemical engineering, will receive the Ernest W. Thiele Award for 1986 from the Chicago Section of the American Institute of Chemical Engineers. The award, which is to be presented at the April 1986 meeting, carries a plaque and a $1,000 honorarium. The two previous recipients were Dr. Ernest Thiele, best known for the McCabe-Thiele diagram and for his work in catalyst activity, and Dr. Donald B. Broughton, of Universal Oil Products, who died last year.

Dr. Hanratty was also selected as the 1986 Lacey Lecturer by the California Institute of Technology. The lectureship, which honors the late Caltech chemical engineer, Professor William N. Lacey, is one of the most prestigious in the field. Professor Hanratty will give two lectures at the institute this winter.

Professor Hanratty has taught at Illinois since 1953 and holds the Shell Distinguished Chair in Chemical Engineering. His major research is in the area of fluid dynamics.

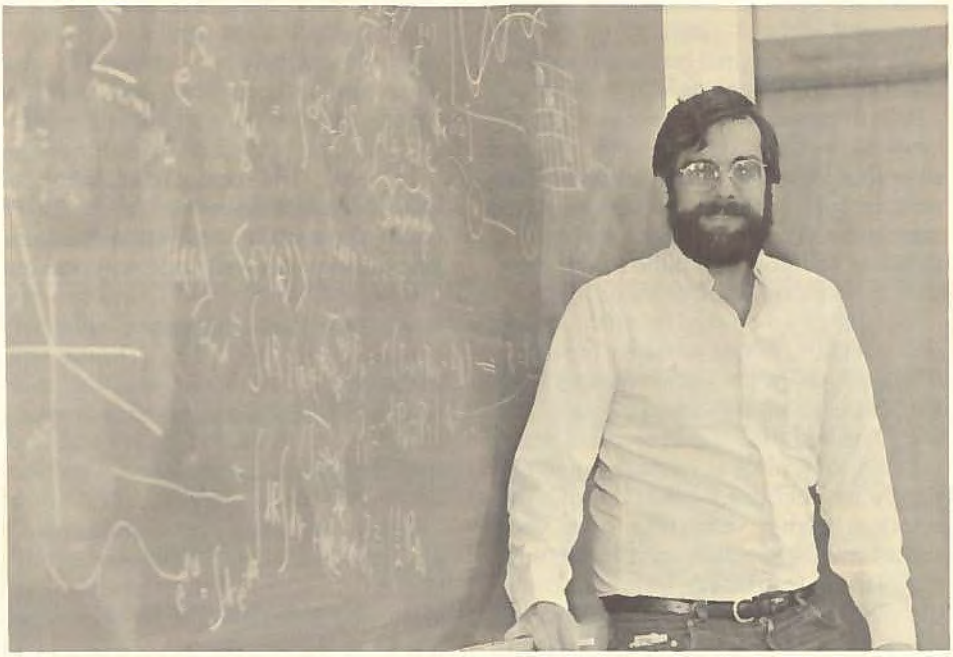
Department of Energy Award to Drickamer

Harry Drickamer, professor of chemical engineering, chemistry and physics, won recognition last year from the Department of Energy for his research on 'The Pressure Tuning of Electronic Energy Levels.' His paper was the winner in the category of Sustained Outstanding Research in Materials Chemistry in the Department of Energy's 1985 Materials Sciences Research Competition.

This annual competition identifies individual laboratory scientists who have conducted outstanding research and provides collective recognition by the Department of Energy community, as well as $40,000 for lab equipment. Professor Drickamer was one of only two individuals to receive the award (the other six were given to research groups) and the only recipient not at a national laboratory.

Dr. Drickamer, pioneer and leader in high pressure science, holds eleven major national awards, including the Buckley Solid State Physics Prize, the Langmuir Award in Chemical Physics, the Michelson-Morley Award and the first P.W. Bridgman Award for high pressure science. He is a member of the National Academy of Sciences and the National Academy of Engineering, and a fellow of the American Academy of Arts and Sciences.

Wolynes Wins National Recognition



Professor Peter Wolynes *photography. . . Larry Kanfer*

Peter G. Wolynes, professor of physical chemistry, is the 1986 winner of the American Chemical Society Award in Pure Chemistry. The $3,000 award, sponsored by Alpha Chi Sigma Fraternity, will be presented next April at the Society's 191st National Meeting in New York City.

Dr. Wolynes is being honored for his research on the role of the molecular environment in the rates of chemical reactions. "He has developed new computer techniques for visualizing and simulating quantum mechanical processes and a new theory of molecular motion in electrolyte solutions," the society said.

Wolynes' work leading to a molecular theory of ionic mobility was the first microscopic calculation of a transport property in a fluid with strong electrical forces. He has made important contributions to the dynamics and mobility of molecules in complex liquids, rates and mechanisms of reactions in solution, and quantum dynamics in the liquid state. A colleague says of him "Wolynes has an uncanny instinct for finding problems that are important and manageable, and a remarkable ability to take a fresh point of view."

Professor Wolynes attended Indiana University where he received his A.B. in 1971, and his A.M. in chemistry in 1972. He earned a Ph.D. from Harvard University in 1976. Following postdoctoral work at MIT, Wolynes taught at Harvard before joining the Illinois faculty in 1980.

Wolynes is a member of the American Chemical Society, American Physical Society and the American Association for the Advancement of Science.

Hendrickson Promotes Science Cooperation

David Hendrickson, professor of inorganic chemistry, has been awarded a Japan Society for the Promotion of Science Fellowship. The fellowship helps scientists to conduct cooperative research projects in universities and industries and aims to promote international cooperation in science.

Dr. Hendrickson plans to visit Japan for six weeks in November and December of 1986. Lectures will be given at various universities in Tokyo and at major universities throughout Japan such as Osaka, Kyoto and Kyushu University.

Dr. Hendrickson received his Ph.D. from Berkeley in 1969 and joined the Illinois faculty in 1970. He has been a Sloan Fellow and a Dreyfus Fellow. Hendrickson's studies include the fundamental nature of electron transfer between transition metal ion sites in electron-transfer proteins.

Alumni Professors Chosen

Two faculty members in the School of Chemical Sciences, Richard C. Alkire and Charles A. Eckert have been named 'alumni professors' in chemical engineering. They were selected by campus administration as the first two recipients of an award program established and supported by alumni of the department.

The professorships were created through a special campaign, headed by alumnus Jack Thomas, senior vice-president of Eastman Kodak, to attract and retain top-class faculty in the face of dwindling federal and state support. The goal of the campaign is to raise $1 million in gifts and pledges over 10 years.

Richard Alkire, professor of chemical engineering, is currently president of The Electrochemical Society. Last year, he received the Professional Progress Award of the American Institute of Chemical Engineers for research activities which have broadened the field of chemical engineering. Alkire was also the 1985 winner of the Carl Wagner Award from The Electrochemical Society, honoring research and leadership in electrochemical engineering. He is a member of the National Materials Advisory Board.

Charles Eckert is professor and head of chemical engineering at Illinois. He is a member of the National Academy of Engineering which cited him for "outstanding contributions leading to the selection of liquid metals and supercritical fluids as solvents in chemical reactors." Dr. Eckert won the 1977 Ipatieff Prize of the American Chemical Society for exceptional work in the field of catalysis or high pressure.

Leonard in Hall of Fame

Nelson J. Leonard, R.C. Fuson Professor of Chemistry and Biochemistry, was recently elected to the hall of fame at his old high school in Mount Vernon, New York. Leonard was cited for his achievements as a researcher, teacher and consultant, particularly for introducing new families of chemical reactions used widely by industry and for devising new ways of testing chemical structures and reaction mechanisms.

Professor Leonard joins a distinguished company in the Mount Vernon High School Hall of Fame which includes comedian Art Carney, writer E.B. White, M.C. Dick Clark and actress Susan Harris.

Illinois Inventors

Allan S. Hay

Discovery and Commercialization of Noryl[R] Resins

Allan S. Hay was born in Edmonton, Alberta, Canada, and received B.Sc. and M.Sc. degrees in chemistry from the University of Alberta before entering graduate school at the University of Illinois. From 1955 to 1968, Hay was a chemist at General Electric Research and Development Center, Schenectady, New York. During this time, his work was recognized when GE received an I-R 100 Award of Industrial Research Magazine in 1965 and the Kirkpatrick Chemical Engineering Achievement Merit Award in 1967. Since 1968, Dr. Hay has been manager of the Chemical Laboratory at the Center. We recall, in earlier days, his excellence at competitive bridge and curling.

When I arrived at General Electric Research Laboratory early in 1955 with a fresh Ph.D., I was essentially given free rein to work on whatever I chose. The corporation had made a commitment to further involvment in chemical products and was building up an R & D effort to support this thrust. GE had for many years manufactured phenolic resins as well as insulating materials, varnishes, etc., and about ten years earlier had gone into the silicone business. Phthalic acids were the raw materials for our Glyptal resins as well as a new polyester wire enamel, Alkanex[R], which was in the final stages of development, so we began exploring for new processes, i.e., oxidation reactions, for their manufacture. At the University of Illinois I had worked with Nelson Leonard on the oxidation of heterocyclics, such as quinolizidine, with mercuric acetate as the preferred oxidizing agent. This was an excellent reaction but suffered from one major disadvantage, that is, the requirement of massive amounts of the oxidizing agent. Catalytic oxidation of organic materials, with oxygen, appeared by contrast to be a very attractive chemical reaction.

A very simple synthesis of azobenzene obtained by catalytic oxidation of aniline that had recently been described by Terent'ev and Mogilyanskii in a Russian journal drew our attention. The reaction took place at room temperature simply by blowing oxygen through a pryidine solution of aniline in the presence of cuprous chloride as catalyst.

We began to study the oxidation of phenols with various numbers of substituents blocking the active sites. When we oxidized 2,6-dimethylphenol we were suprised to find that an exothermic reaction took place at room temperature simply by bubbling oxygen through the reaction mixture and that in a very short time the reaction mixture became too viscous to stir. We soon found out that a highly specific reaction (1) had taken place, resulting in oxidative removal of two hydrogen atoms to give a linear, high molecular weight polyphenylene oxide as product, which was soon christened PPO[R] resin.

(1)

2,6-DIMETHYLPHENOL PPO

We had discovered a new method of synthesizing high molecular weight polymers which we called polymerization by oxidative coupling. We began immediately to make somewhat larger quantities of PPO resin in order to learn more about its properties. The polymer has a very high glass temperature (208 deg. C) and when molded or cast it is a tough, ductile material. It was recognized that a polymer of this structure would probably not be useable for extended periods of time at temperatures near its glass temperature because of oxidation of the methyl groups. But the very high glass temperature would be expected to lead to exceptional dimensional stability at lower temperatures, and from the structure we could predict that it would have excellent hydrolytic stability. The monomer for this polymer, 2,6-dimethylphenol, was available only in small quantities in an impure form as a coal tar by-product.

In 1960, the commercialization of LEXAN polycarbonate which had been in development in our Pittsfield, Mass., laboratories was well underway and our Chemical Development Operation was now looking for the next candidate for commercialization. The choice was PPO, which by this time was well characterized and had an attractive property profile. In 1961, a Ph.D. chemical engineer, Jack Welch, a student of Professor James Westwater at the University of Illinois, was hired and soon became a key player in the development. (Jack Welch is now Chairman of the Board and Chief Executive Officer of the General Electric Company!) A miniplant was soon in operation. A major hurdle to commercialization of PPO was the unavailability of the monomer, therefore an effort was mounted to find an attractive synthesis. Dr. Stephen Hamilton made the key discovery of a "hot tube" reaction which produced the monomer in high yield simply by passing phenol and methanol over a magnesium oxide catalyst at 400 deg. C.

(2)

PHENOL METHANOL 2,6-DIMETHYLPHENOL

With a monomer process in hand, a separate business unit, named Polymer Products Operation, was established and commercialization proceeded apace. A commercial plant was announced in 1965.

When PPO was introduced into the marketplace, problems arose that were traced to the very high temperatures necessary for processing because of the extreme glass temperature of PPO. At the elevated processing temperatures reached during extrusion and molding, degradation occurred due to oxidation of the polymer by oxygen. The problems were serious enough to put the fledgling business in jeopardy. But, fortunately, it

had been found that PPO, rather remarkably, was completely miscible with polystyrene, a large volume commodity resin. Therefore, by blending the two polymers, one could obtain a new composition that had a glass temperature in between that of PPO (208 deg. C) and polystyrene (100 deg. C).

This meant that we had the capability of maintaining many of the useful properties of PPO — excellent hydrolytic stability, dimensional stability, excellent electrical properties — while lowering the heat distortion temperature but still maintaining it high enough for most of the applications being pursued. In addition, we obtained dramatically improved processability and substantially lower cost.

At this point, a business decision was made by Dr. Jack Welch, to introduce modified PPO resins which were given the name NORYL® resins. The resins were projected to fill a market niche between the engineering plastics known at the time and the commodity resins. Today, Noryl resin is one of the largest volume engineering thermoplastics.

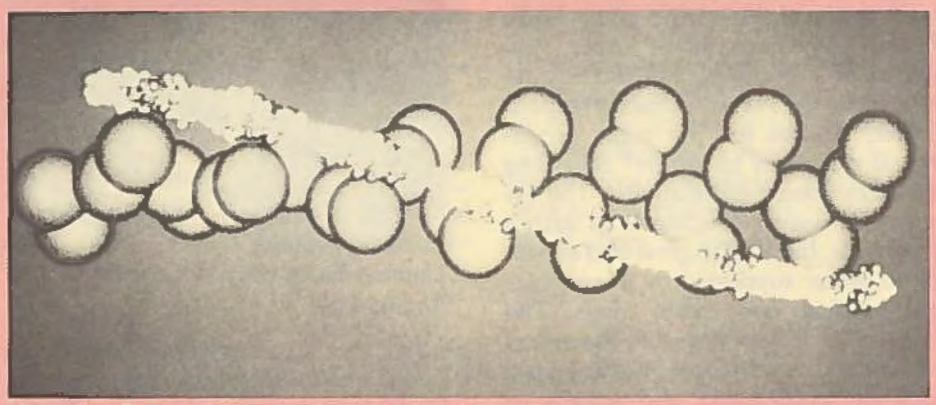
New Moves in Molecular Graphics

The Molecular Graphics Facility in Noyes Lab is a new step in collaboration and innovation in the School of Chemical Sciences. The facility maintains a computer graphics workstation, one of only a few such systems on university campuses, and is managed jointly by the School of Life Sciences and the School of Chemical Sciences. The workstation provides high-resolution real-time color graphics, giving chemists, biochemists and biophysicists the opportunity to manipulate molecular images to study the known three-dimensional structures of molecules.

Robert Scott, assistant professor of inorganic chemistry, was responsible for the workstation acquisition with George Phillips, assistant professor of biochemistry and biophysics.

Dr. Scott says there is now a wealth of information available on the three-dimensional structure of biomolecules, that is, molecules in human, animal and plant tissues, which scientists from all disciplines can use to create powerful visual images for help in the interpretation of experimental data. Structures of over 45,000 small molecules and 150 proteins and tRNAs have been solved, with more appearing each month, but the structures are often extremely complex. In many cases, sophisticated computer graphics programs are the only way to make sense of these structures and extract useful information from them.

The system centers on the Silicon Graphics IRIS 2400 workstation which is networked to the School of Chemical Sciences' VAX 11/780 computer. In five to ten years of computer graphics advances, the system is the latest on the market. It is faster than its predecessors, and almost as powerful as the VAX computer. The IRIS has three megabytes of memory and 72 megabytes of hard disc storage and was selected for its resolution, its speed and the diversity of applications software available. The system is capable of fast 'stand-alone' molecular graphics, using a patented 'geometry engine' parallel processor which allows the manipulations of structures in real time with no detectable delays.



A molecular structure on the screen

A three-dimensional structure on the screen can be rotated at will in any direction, rather than simply turned like a drawing on its side. For each atom of the molecule, the computer forms a colored sphere and shades it as if there were a light source right in front of it, producing an image very much like a photograph of a three-dimensional object. Through the Midas program, one of two macromolecular graphics programs in use at Illinois, users can see every atom in a protein molecule, through a procedure known as "depth-cueing" (atoms in front are brighter than those behind) giving a realistic three-dimensional image.

Scott explains that it has always been difficult to use molecular structural information without the ability to visualize it. With molecular graphics, researchers can easily picture structural details and even, in principle, look at the dynamics of the structures they study.

In raising support for a molecular graphics facility, Scott and Phillips based their strategy on the immediate purchase of a relatively small-scale workstation in order to give users a chance to learn what such a system could do for their individual research projects. As such, they had to raise funds internally. With initial individual contributions totalling $20,000, Scott and Phillips were able to have funds matched by biomedical research and the research board at the University of Illinois. The complete system cost almost $70,000.

Equipment arrived in Noyes Lab last July and the facility was officially opened on October 1st. Users of the workstation have interests that span the fields of chemistry, biochemistry, biophysics and biology. At present, it is used by seven or eight small groups, but supporters hope eventually to turn it into a regular school service facility, with its own part-time operator/programmer. Professor Scott explains that the IRIS 2400 has a system of 'graphics primitives' which make it particularly easy for users to develop specialized software as they become familiar with the computer. Once individuals start to build up their own software, "usage will really take off," he says.

Profile — Thomas Phipps, Physical Chemist

Thomas Erwin Phipps, Senior, was, for almost five decades, the experimentalist par excellence in physical chemistry at Illinois. This modest philosopher-scientist, who was 90 this year, still lives in Urbana and makes occasional visits to his office at 166 Noyes Lab.

Dr. Phipps and his son, Thomas Erwin Junior, set up their own laboratory five years ago in the basement of his home on Busey Avenue. Phipps Junior, who trained as a physicist and recently retired from the Naval Surface Weapons Center, wanted to "put some experimental questions to nature" regarding Einstein's theory of relativity. The experiments were inconclusive on such a small scale, but the lab grew into a theoretical center supported by a computer and housing two family dogs. The younger Dr. Phipps turned to theoretical matters and is currently finishing up a book on mathematics and physics — "deviant approaches and opinions." It's a book of "heresies," he says, which questions fundamental physics and offers alternative thinking on mathematical themes in physical description.

"proceeding by approximations"

Father and son are a close and long-running partnership whose approach to the physical world is cautious and exacting, respectful and full of awe. They describe it as "proceeding by approximations" — at no stage of human thought should we expect a final understanding, but simply the best approximation to the truth. Some scientists, Dr. Phipps thinks, tend to leap too far ahead with revolutionary theories when we're sometimes not yet sure of the basics. Is there an influence of detector motion on the propagation of light quanta? These are the kinds of questions the Phipps team ponders.

Thomas Erwin Phipps, Senior, was born in east Tennessee in 1895. His family moved to Indian territory in what is now Oklahoma in 1903, then to Texas and to Austin where Phipps attended high school and graduated with the class of 1912. His father, Joshua, was a minister of the Southern Presbyterian Church who had spent several years during the 1880s in Greece (a magnificent

Thomas Erwin Phipps, Senior, August 1984

'kilim' rug he acquired in Thessalonica hangs on one wall of the dining room in Dr. Phipps' house in Urbana). To the local congregation there, Joshua was accustomed to preach in Greek, says Phipps, "probably in classical Greek, as did St. Paul. I've often wondered if they understood him."

As a boy, Thomas Phipps took four years of Latin under Fannie Ottley at Austin High School, followed by two years of Latin and two of Greek under Daniel Penick, Edwin Fay, George Calhoun and William Battle at the University of Texas. He "came to chemistry," he says, "after total immersion in the classics." At Texas, Phipps first met seriously with chemistry through his introduction to Professor Eugene Paul Schoch. It was principally this acquaintance which convinced him that he would be a chemist. In a later appreciation of E.P. Schoch, Dr. Phipps wrote "Schoch was an explosion of grace and good humor. He was hard on himself: he wrote and re-wrote his laboratory manual, determined as he was to make the lowliest freshman aware of the importance and beauty of chemistry."

From 1912 to 1915, Phipps studied physical chemistry under Eugene Schoch and helped improve equipment at the Texas labs. In 1916, with Schoch as his research director, he wrote a master's thesis on the electrochemical separation of copper, bismuth, and antimony. In three years, he had earned both B.S. and M.S. degrees. When the World War I armistice was signed in November, 1918, Phipps was in the Field Artillery Replacement Depot in Camp Jackson, South Carolina. On his return to Austin, he was recommended by Schoch for graduate study at Berkeley under Gilbert Newton Lewis. He did his thesis work under George Gibson, and, in 1921, graduated from Berkeley with a Ph.D. degree in physical chemistry.

"I came to chemistry after total immersion in the classics"

At an invitation from Professor Rodebush, head of physical chemistry at Illinois, Phipps came directly to Urbana where room was made for him in the physical division. His research in the 1920s concerned molecular beams and resulted in work which won him a Guggenheim fellowship to study with the world-famous Otto Stern in Hamburg, Germany.

In 1930, Dr. Phipps took with him to Germany his wife Eleanor (a resident of Goldsboro, North Carolina, whom he married in 1923) and his five-year old son, Thomas. Experiments in Hamburg were conducted in a second-floor room of a little yellow-brick laboratory that the Rockefeller Foundation had built for Stern. Here Phipps studied, and later published, research on the process of space quantization. He often worked around the clock and, many nights, would listen to the Nazi youth marching in the streets. He once asked the night watchman why they were out marching and the man told him "Sie wollen meine Stellung haben" ("they want my job"). Phipps remembers his time in Hamburg with pleasure, in spite of the weather; he quotes a German proverb "in Hamburg regnet es in jedem Wetter" (in Hamburg, it rains regardless of the weather).

Phipps returned to Illinois to teach physical chemistry at a time when Roger Adams headed a department dominated by organic chemists with large coteries of graduate students. Not many students were attracted to physical chemistry then, Phipps says, and with his kind of projects, he couldn't really have handled many students. To him, chemistry was a manual art, and his

"hands-on" approach meant that he and his students constructed much of their own experimental equipment, and did their own glassblowing. Studies of the physical properties of various materials were, and remain, a fascination to Tom Phipps. He would carry out detailed work, for instance on measuring the density of decaborane, with such precision and accuracy (to several decimal points) that he became known as "five-point Phipps."

Colleagues recall that, for many years, Dr. Phipps was the gentleman-academician of the department, well known to students of physical chemistry who frequently visited the office where Phipps worked under a green-shaded incandescent lamp, and where he was so generous with his time and knowledge. Professor Phipps kept a lab notebook in which he recorded each day's work, his achievements, plans, thoughts, lists of suppliers and purchases and the names of people who worked with him. They included Ralph Seifert, David Turnbull, John Michalek, Robert Leslie, Walter Klabunde, Alfred Dixon and others. Arnold Beckman (doing research on a master's degree in chemistry about 1922) also worked in the physical chemistry area on the first floor of Noyes Lab.

In 1945, Glenn Seaborg was working with a group of chemists and physicists studying the physical properties of plutonium in the Metallurgical Laboratory at the University of Chicago. Thorfin Hogness, working under Seaborg, asked Tom Phipps to join them and help in measuring the vapor pressure of plutonium at high temperatures. As part of a team directed by O.C. Simpson, Phipps worked with scientists from universities nationwide, some of whom had had high-vacuum experience at the University of Illinois. He was told only that knowledge of the vapor pressure of plutonium at high temperatures was necessary in the design of an atomic bomb. Phipps was given 5.5 mg. of plutonium — the maximum amount available for the study — and had first to find a way to clean it. Seaborg called in Jasaitis, a watchmaker and repairer from California whose trained dexterity allowed him to handle very small objects. Working in the inert atmosphere of a dry box, Jasaitis cleaned the "crud" from the plutonium and transferred it to a tantalum container and then into a vacuum apparatus. Changing the temperature in the vacuum and measuring the radioactivity through a Geiger counter, the group working with Phipps was able to determine how vapor pressure would develop at high temperatures. Three papers carried the results of this work, namely:

"the fine grainedness of matter"

'Vapor Pressure of Liquid Plutonium,' with G.W. Sears, R.L. Seifert and O.C. Simpson, and in the May, 1950, issue of the *Journal of Chemical Physics* — 'The Volatility of Plutonium Dioxide,' written with G.W. Sears and O.C. Simpson, and 'The Vapor Pressure of Plutonium Halides,' with G.W. Sears, R.L. Seifert and O.C. Simpson. They form part of an achievement that Phipps considers some of his best work.

On his return to Illinois, Phipps continued to teach full-time until his wife's illness and death in 1967.

Through his many years of teaching, research and study, something that has continued to impress Thomas Phipps is what he refers to as "the fine grainedness of matter — I don't know what else to call it." He describes animatedly the incredible number of molecules contained in a glass of water — more than there are glasses of water in all the oceans. It is the complexity of matter, even in the tiniest gnat or virus, Phipps believes, that is important for the man in the street to understand. This love of the natural world — both living and non-living materials — distinguishes Thomas Phipps in everything he does. Asked about his religion, Phipps is evasive but characteristically humble — "I don't claim to know first causes," he says.

In Memoriam

William Rose

Biochemistry pioneer, William Rose, died on September 25, 1985, at the age of 98.

Rose, winner of the National Medal of Science for his ground-breaking research in nutrition, was an emeritus professor of biochemistry at Illinois, where he taught from 1922 to 1955. In 1934, Rose discovered threonine, the ninth essential amino acid for human nutrition. The discovery led to the identification of other essential amino acids and "laid the foundation for all modern nutritional studies relating to proteins and amino acids," says Lowell Hager, head of biochemistry at Illinois.

Rose is remembered by former students, colleagues and friends as a wonderful, enthusiastic teacher who possessed a great mind and a great spirit. He was "a remarkable gentleman," said Larry Faulkner, head of the chemistry department, "you've heard that phrase 'gentleman and a scholar' — it characterized Rose better than anyone I've met." Herb Carter, a student of Rose's, and former head of the School of Chemical Sciences, said of Will Rose "his body was getting poor in shape but his mind was as sharp as ever. He had a spirit that defied any kind of physical limitation."

Professor Rose had a loyal family of former students, now professionals in in-

dustry and academia, who corresponded regularly and visited him in Champaign right up until his death. In 1975, on Rose's 88th birthday, a former student Donald Warner had written a poetic tribute to his teacher. In writing to thank him, Dr. Rose (an avid bird-watcher) told Warner, "really, I feel quite well despite the years. I don't see quite as well, nor hear quite as well as formerly, and walking is much more laborious, all of which limit somewhat my birding activities. However, on the whole I have been wonderfully blessed!"

Reverend Malcolm Nygren, who conducted funeral services for Rose on September 28th, was a long-time friend. He remembers William Rose as a gentle man of genius. "I cannot do justice to him. He was not just brilliant, he was great. In a college town, there are lots of brilliant people, but great people are rare."

In Memoriam *continued*

Thomas Baron

Illinois alumnus and former faculty is remembered by Professor Thomas Hanratty

Tom Baron, alumnus and former faculty of the Department of Chemical Engineering at Illinois, died on May 20, 1985. Tom was a unique individual who made important contributions to the profession of chemical engineering, as a teacher, researcher and president of Shell Development Company. Those who knew him will remember his dramatic and challenging teaching and the warmth of his personality.

Tom Baron was born in Budapest, Hungary, on February 15, 1921. He immigrated to the United States in 1939, attented DePaul University, and later the University of Illinois, where he received his B.S. degree in 1943. He served a term in the armed forces during the war and returned to Illinois to earn a Ph.D. in 1948 when he joined the chemical engineering faculty here.

Tom's five years as a graduate student and faculty member here were productive ones which gave him rapid visibility through his research contributions to the design of chemical reactors and to fluid mechanics. A paper on Momentum, Mass and Heat Transfer in Free Jets, which he published with L.G. Alexander during this period was recognized with the Allan P. Colburn Award of the American Institute of Chemical Engineers. In 1951, Tom accepted a position with Mott Souder's highly respected Chemical Engineering Group at Shell Development Company, in Emeryville.

His talents were quickly recognized at Shell where he succeeded Souders as head of the research group in 1956, and later took charge of Research and Development at the Synthetic Rubber Division in California. In 1965, Tom moved to Houston, Texas as vice president of Shell Development's Exploration and Production Division. He was named president of Shell Development Company in 1967.

During these years, Tom returned often to the Illinois campus as a recruiter and speaker. He was always welcome, but his visit with his wife, Margie, in 1967, to receive a College of Engineering Alumni Honor Award was particularly enjoyed.

Tom received the Professional Progress Award of the American Institute of Chemical Engineers in 1971. He was elected a fellow of the AIChE in 1973 and a member of the National Academy of Engineering in 1977. In 1983, along with Harry Drickamer and Jim Westwater, he was named one of the 30 eminent chemical engineers honored by the AIChE during its Diamond Jubilee Year.

Perhaps the most appropriate testimony to Tom's contributions as president of Shell Development came from Klaus L. Mai, the man who succeeded him in 1981: "Tom was . . . a people manager. He often said that he devoted 90 percent of his time not to budget or programs, but to people. He shaped people's lives; there was not a staff member who did not know Tom firsthand. All benefitted from his counsel. And could Tom communicate — from particle physics to Wagner's Ring, from abstract mathematics to linguistics, from chess to modern arts, from thermodynamics to the source of noble red vintages. This is the Tom we remember."

The Alumni

AIChE Fellows

In 1985, six chemical engineering alumni from Illinois were elected fellows of the American Institute of Chemical Engineers in recognition of their professional and engineering achievements. George F. Scheele, Ph.D. 1962, associate professor of chemical engineering at Cornell University, is a former student of Professor Thomas Hanratty. Scheele was cited for his contributions to engineering education and to fluid mechanics research. Other Illinois alumni included Robert H. Schwaar, B.S. 1952, a process economics consultant at SRI International, Toy R. Reid, B.S. 1947, executive vice president and general manager, Eastman Chemicals Division, Eastman Kodak Company, and Yih-Yun Hsu, Ph.D. 1958, a professor in the Department of Chemical and Nuclear Engineering, University of Maryland. Also elected were David S. Hacker, B.S. 1949, staff research engineer at Amoco Chemicals Corporation and Keith W. McHenry, Jr., B.S. 1951, vice president of research and development at Amoco Oil Company and the new 1986 chairman of Chemical Engineering's Resource Development Committee.

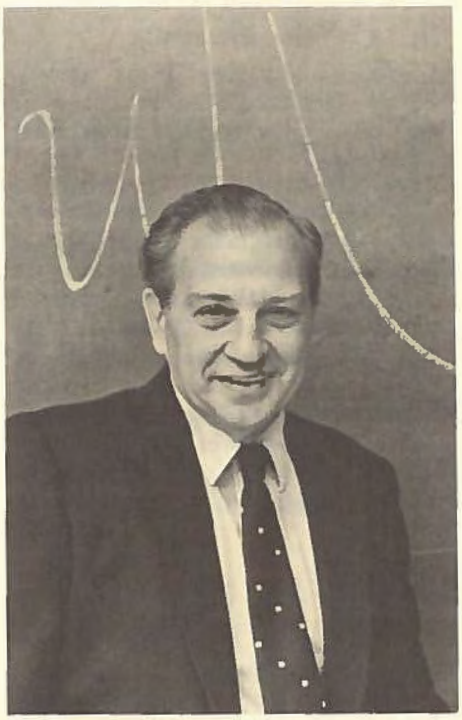
Sinfelt Honored

John H. Sinfelt, Ph.D. 1954 (chemical engineering), was named a Distinguished Alumnus of Pennsylvania State University in June, 1985. The award is the highest honor the university bestows on an individual and is equivalent to honorary degrees given by other institutions. Sinfelt is senior scientific engineer of the Exxon Corporation and the inventor of bimetallic cluster catalysts used commercially in petroleum refining. He holds 45 patents.

Alumni Social — New York City

Illinois alumni attending the spring national meeting of the American Chemical Society will meet for the traditional SCS social hour in New York City this year. The meeting will be held from Sunday, April 13 to Friday, April 18, 1986. Arrangements for the time and place of the social will be finalized in the next few weeks. For more information, contact: Sara Arndt, 103 Noyes Lab, 505 South Mathews, Urbana, IL 61801, or phone: 217-333-6083.

Wolf Prize to Rudy Marcus



Professor Rudolph Marcus

Former chemistry professor at Illinois, Rudolph A. Marcus, received last year's Wolf Prize in chemistry for a career of outstanding research in chemical kinetics. The award is given each year by the Israel-based Wolf Foundation and carries a $100,000 prize for contributions in each of six disciplines — agriculture, chemistry, medicine, physics, mathematics and the arts.

Marcus, who is Arthur A. Noyes Professor of Chemistry at California Institute of Technology, has made contributions to chemical theory which have influenced experimental chemists in all fields. He is best known for development of the RRKM theory — named after its pioneers, Rice, Ramspberger, Kassel and Marcus — and other theories of unimolecular and electron transfer reactions. Developed in the 1950s, RRKM theory has proved flexible enough to remain relevant through three decades of advances in quantum mechanical calculations. It is, however, a goal of many chemists to "beat" RRKM theory which, in its treatment of energy redistribution in a molecule, essentially disregards the possibility of laser specific chemistry. Marcus himself is part of an effort to disprove the theory by designing molecules in which energy can be trapped in a specific bond long enough for a reaction involving that bond to occur before the energy redistributes throughout the molecule.

Recent work by Professor Marcus has concentrated on extending concepts used in electron transfer theory to atomic and other transfer processes, advancing semiclassical treatments of reaction dynamics, investigating chaos and probing electron transfer in biological molecules.

Canadian-born Marcus received degrees from McGill University and taught at the Polytechnic Institute of Brooklyn and the University of Illinois before joining the Caltech faculty in 1978.

Herbert S. Gutowsky, professor of chemistry at Illinois, won the Wolf Prize for 1983-84.

ACS Awards to Alumni

Corwin H. Hansch, B.S. 1940, is the 1986 winner of the first American Chemical Society Award for Research at Undergraduate Institutions.

The $3,000 award, sponsored by Research Corporation, will be presented at the Society's 191st national meeting next April in New York City. As part of the award, Pomona College will also receive a $3,000 grant.

Dr. Hansch, a professor of chemistry, is being honored for his contributions to the use of computers in drug design. Equations he developed have been applied to optimizing new anticancer and antiviral drugs, antibiotics, insecticides and herbicides. Hansch has a Ph.D. from New York University.

Gary Hieftje, Ph.D. 1969, received the American Chemical Society's Division of Analytical Chemistry Award in Chemical Instrumentation at the society's national meeting last year. The award honors achievement in the origination or improvement of analytical methods through instrumentation.

Hieftje has been an innovator of new techniques applied to fundamental atomic spectroscopy, using knowledge and methods from related fields such as information theory, computer technology and laser physics. A professor of chemistry at Indiana University, Hieftje also serves on the editorial boards of several major analytical chemistry journals and is this year's chairman of the ACS Division of Analytical Chemistry.

James S. Fritz, Ph.D. 1948, of Iowa State University, was the 1985 winner of the American Chemical Society's Award in Analytical Chemistry.

The $3,000 award, sponsored by Fisher Scientific Company, honors Fritz' contributions to research in analytical chemistry, particularly chromatography and organic analyses. He developed some of the first analytical procedures for finding trace organic impurities in drinking water and his work has had significant impact on both the steam-electric power industry and the regulatory activity of the U.S. Environmental Protection Agency.

Fritz has taught at Iowa State University since 1951. He is the author or co-author of over 180 scientific papers and has written a number of books, including *Quantitative Analytical Chemistry*, a major education textbook, now in its fourth edition.

Robert M. Adams, Ph.D. 1950 (chemical engineering), is the winner of the 1986 Earle B. Barnes Award for Leadership in Chemical Research Management, given by the American Chemical Society and sponsored by the Dow Chemical Company. As vice president of research and development at 3M, Adams' commitment to new product development and the entrepreneurial spirit has established the company's international reputation for innovation.

As part of his reorganization, Adams created four major technological sectors and a basic research group led by vice presidents with strong technical backgrounds reporting directly to the executive vice presidents. A committee of these vice presidents and other staff members, chaired by Adams, coordinates the research effort through group participation. Advancement is based on contribution or talent, or openings available, and is compensated accordingly.

Adams was the 1985 Honorary Chairman of the Department of Chemical Engineering Annual Development Fund. He retired from 3M at the end of last year.

Alumni News

Many alumni have responded to our request for news and not all can be included each time. If your name, or a colleague's does not appear in this issue, please look for them in the summer '86 Alumni Newsletter.

1921

Rudolph Stokes Nelson, M.S. 1921 (chemistry), was a chemistry professor until 1928, when he joined the Hoover Company as an engineer. He became a lawyer in 1939 and worked as senior patent counsel for Union Carbide Corporation until 1962. Nelson is a fellow of the American Association for the Advancement of Science.

1931

E. Paul Samsel, M.S. 1931 (organic chemistry), is retired from the Dow Chemical Company, where he was involved in polymer analysis, polymer identification and cellulose research. He now lives in Minneapolis.

1935

Dr. Harold J. Read, M.S. 1935 (chemistry), was recently selected to be an Honorary Member of The Electrochemical Society, a distinction held by only 22 of the 6,000-members. Active in metallurgy at Penn State for many years, Harold was president of The Electrochemical Society in 1966.

1941

Leallyn B. Clapp, Ph.D. 1941 (inorganic chemistry), is an emeritus professor of chemistry from Brown University, Providence, Rhode Island. He still teaches as a visiting professor in the North East.

1946

Albert S. Humphrey, B.S. 1946 (chemical engineering), was the subject of a recent article in London's *Financial Times* as the initiator of a new business development technique called Team Action Management. The approach is described as "a systematic, structured technique for sitting managers round a table to diagnose problems, prescribe remedies, and provide budgeted plans to carry out the treatment." Humphrey reports that his company, Business Planning and Development, has an all-time high sales record for 1984.

1949

Jesse C.H. Hwa, Ph.D. 1949 (organic chemistry), is corporate project director at Stauffer Chemical Company, Westport, Connecticut, and is president of the Chinese American Chemical Society.

1951

Robert C. Springborn, B.S. 1951 (chemistry), earned a Ph.D. at Cornell University and later held several industrial positions, including technical director of Borg Warner Chemical, and vice president of the Chemical Group at W.R. Grace. In 1972, he founded the Springborn Group, a multi-national contract research and consulting business which has become recognized as one of the world's leaders in testing, inspection and applied technology for industrial and consumer products, with laboratories in the U.S. and abroad.

Karl F. Heumann, Ph.D. 1951 (organic chemistry), is the recipient of a 1985 medal for scientific communication from the Council of Biology Editors. Heumann retired this year from a career of editing and publishing with the Federation of American Societies for Experimental Biology. He lives in Bethesda, Maryland.

Edward F. Elslager, Ph.D. 1951 (organic chemistry), is vice president of chemotherapy in the pharmaceutical research division of Warner-Lambert/Parke-Davis Pharmaceutical Research, in Ann Arbor, Michigan. He recently received special recognition from the International Society of Heterocyclic Chemistry for his dedication and contributions to the society since its inception in 1968.

1957

Gary W. Griffin, Ph.D. 1957 (chemistry), professor of chemistry at the University of New Orleans, has been named a Boyd Professor, the highest honor that can be accorded a faculty member in the Louisiana State University System. He is cited for his "innovative and significant contributions in the field of photochemistry and other related areas."

Paul Weller, Ph.D. 1957 (chemistry), is the unanimous choice of Framingham State College trustees for the school's new chairman. Weller comes from a position as provost at California State Polytechnic where he was previously vice president for academic affairs. Weller entered academic administration in 1965. As a research chemist, he studied the electrical properties of certain man-made metals and has authored several textbooks.

1958

Roberto Lee, B.S. 1958 (chemical engineering), is engineering group consultant for Monsanto Company in St. Louis, Missouri. He was recently elected a director of the American Institute of Chemical Engineers to serve a three-year term on the society's governing council. Lee specializes in process design and reaction engineering.

1959

Alexander D. Argoudelis, Ph.D. 1959 (chemistry), has received the W.E. Upjohn Award of the Upjohn Company. Argoudelis, senior scientist of infectious diseases research, was cited for his participation in "all scientific aspects of the discovery and development of the lincomycins, clindamycins, and spectinomycins." The company said "his numerous scientific publications are models for antibiotic isolation and characterization."

The Upjohn awards have been given annually since 1938; Argoudelis is one of 55 winners this year. The Upjohn Company is a research-based producer of pharmaceutical and agricultural products.

1960

Kenneth B. Keating, Ph.D. 1960, was recently promoted to research fellow in the Engineering Research and Development Division at Du Pont. Keating, a former student of Professor Harry Drickamer, works in electrochemical engineering, electroplating and ad-

vanced reaction processes. His newest innovations at Du Pont concern laser-induced reactions. Keating says laser energy can be concentrated on a minute area, reducing the chance for extraneous reactions that often occur at the walls of conventional reactors.

Keating's contributions to research at Du Pont include the development of an environmentally safe, large-scale experimental facility for evaluating electrochemical reactions.

1961

Jack Ehrmantraut, B.S. 1961 (chemistry), is the director of research and development, agricultural products, at Dow Chemical Company, Midland, Michigan.

D.R. Hartter, B.S. 1961 (chemistry), has been named director, research and commercial development, for the industrial chemicals division of Air Products and Chemicals, Inc., Allentown, Pennsylvania. Harrter earned his Ph.D. in physical organic chemistry from the University of California, Berkeley.

1965

John T. Lowe, Ph.D. 1965 (physical chemistry), is director of research at the Du Pont Savannah River Laboratory in Aiken, South Carolina. The lab is a Department of Energy site operated by Du Pont.

William J. Ward, Ph.D. 1965 (chemical engineering), last year received one of General Electric's highest awards to employees — the Coolidge Fellowship Award — for outstanding and sustained contributions to scientific research or engineering. Ward was cited specifically for his pioneering achievements in membrane science and for his work on chemical process catalysis. Dr. Ward is a past recipient of the Colburn Award of the AIChE; he holds 26 patents and is the author or co-author of 18 technical publications. Ward lives in Schenectady.

1966

Richard S. Treptow, Ph.D. 1966 (inorganic chemistry), is a professor of chemistry at Chicago State University, Illinois. He was recently elected to a fourth term as chairman of the department of physical sciences at Chicago State.

1973

Timothy R. Brumleve, B.S. 1973 (Ph.D. analytical chemistry, University of North Carolina), has been director of research and development at the Anderson Physics Laboratory, Urbana, Illinois, since 1980. The lab prepares ultra-dry metals, halide salts, amalgams and high-purity inorganic chemicals, primarily for discharge lamps, electrochemistry and fundamental research.

Randy Guschl, Ph.D. 1973 (inorganic chemistry), has been promoted to program manager for chemical processes in environmental technology at Du Pont's Savannah River Lab., Aiken, South Carolina.

KEEP IN TOUCH

Return to: Sara Arndt, Editor
SCS Alumni Newsletter
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