School of Chemical Sciences
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University of Illinois at Urbana-Champaign

INSIDE

Illini Entrepreneurs Found Chiron Corporation

In 1980 it didn't exist. Today, Chiron is one of the leading, financially healthy, biotech companies in the nation. Its five businesses — diagnostics, vaccines, oncology, opthalmics and technologies — generated end-user sales of approximately $400 million in 1992.

Most of its earnings are from its second generation blood test for hepatitis C now used worldwide to screen donated blood. Chiron and its partner, Johnson & Johnson, have become the major supplier of these tests to the American Red Cross.

In 1992 Chiron promised its shareholders that it would become profitable in 1993, and has kept its word. Chiron turned a profit in the first quarter of 1993 and is expected to earn a profit of $10-$20 million this year.

They met at the U. of I.

Two of its three co-founders, William Rutter, Chairman, and Edward Penhoet, President and CEO, met at the University of Illinois in 1964 where Rutter was a Professor of Biochemistry (1955-1965) and Penhoet was a beginning graduate student in the same department. Penhoet stayed only one year at the U. of I. before leaving with Rutter for the University of Washington Medical School, where he completed his Ph.D. in biochemistry.

Penhoet describes his experience at Illinois as both "one of the briefest educational experiences of my life" and "one of the most important from an educational point of view." To move from his undergraduate work in biology into biochemistry, Penhoet prepared himself for chemistry qualifying exams by taking "remedial" courses in mathematics and chemistry. He was spared the trials of the chemistry requirements as well as the rigors of winters in Illinois when the offer from the University of Washington came to Rutter in 1965 and the entire laboratory migrated to the northwest.

Rutter's research at this time focused on cell differentiation, one of several lines of inquiry that he followed during his scientific career. One of the attractions of the offer from the University of Washington was that it would permit more interactions with clinicians and researchers in medical fields.

Meanwhile, Penhoet completed his study of aldolase, an enzyme that metabolizes sugar molecules in muscle, brain and liver tissues and received his Ph.D. degree in 1968. After a postdoctoral fellowship at the University of California at San Diego, he received an offer from the University of California at Berkeley where he has been a professor of biochemistry ever since.

Rutter arrived in the Bay Area in 1968 when the University of California/San Francisco (UCSF) asked him to head up the Department of Biochemistry and Biophysics and to build up a large and focused department in genetic structure and genetic function. The task honed his entrepreneurial skills as he recruited some of the brightest genetic researchers in the nation to UCSF.

CHIRON

Despite his success at UCSF and his longtime role as consultant to existing biogenetic companies, Rutter realized that a commercial opportunity was needed to pursue various lines of research that were not adequately funded by the current system.

A company to exploit scientific long shots

A new venture was needed to follow up the scientific "long shots" which

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funding agencies tended to reject as too impractical. Over the winter and early spring of 1981, Penhoet and Rutter, together with the third co-founder Pablo Valenzuela, now research director at Chiron, met to talk about this new entity. All were successful professors at academic institutions, Rutter and Valenzuela at UCSF and Penhoet at Berkeley. In recognition for his scientific contributions, Rutter was elected to the National Academy of Sciences in 1984 and to the American Academy of Arts and Sciences in 1987. In 1991, Penhoet received the first Distinguished Faculty Award in the Life Sciences Department of Molecular and Cell Biology at the University of California in Berkeley.

William Rutter

They agreed that their long-standing interest in infectious disease research for diagnostics and vaccines, and on hormones and enzymes for biopharmaceuticals, was a sufficiently large area to focus a new company. On Easter Sunday, 1981, they wrote their first business plan. They found a venture capital group for backing and incorporated the company on May 28. Their founding and most valuable technology was the hepatitis B vaccine antigen which was completed only weeks before. Chiron's first labs were in operation two months later. Today, the company has about 2000 employees worldwide.

Edward Penhoet

The scientific focus of Chiron Corporation

The company has undergone enormous expansion but its clearly articulated scientific focus has provided a lodestar to guide the expansion process. Two interrelated scientific theories are basic to Chiron's choice of projects. The first stems from Rutter's long standing interest in infectious diseases. Rutter believes that infectious and neoplastic disease are closely related because they are both constrained by the immunological system. Control over both types of diseases can be achieved by strengthening the patient's immunological defenses. For this reason, they purchased Cetus to continue exploitation of Interleukin-2, and are developing betaseron, a type of beta interferon that has shown a dramatic effect in halting deterioration of patients with intermittent multiple sclerosis.

The second theory is that mimic molecules, used primarily in disease prevention, as in vaccines, can also be effective for diagnosis and for treatment. Chiron's hepatitis B vaccine, which was their first major product, is a recombinant mimic that has been on the market for the last 7 years. Today, Chiron has a broad product line in vaccines against hepatitis C, cytomegalovirus, AIDS, and herpes. When administered along with adjuvants, these antigens may prove effective therapeutic agents as well.

Chiron is proving a leading competitor in the race to develop an AIDS vaccine and in preventing transmission of the AIDS virus from mother to child and from patient to healthcare worker. One of the company's recent products is a quantitative viral test system based on a proprietary DNA probe technology. It is the first chemical method using branched DNA. Its trademark is "Quantiplex" because it is based on the plexis of nucleic acid.

Operating in the private sector, Chiron has the freedom to carry out projects that would not be possible in the academic environment. A case in point is the herpes C diagnostic test which needed a long time horizon. As Rutter pointed out, "In the beginning, this might have been called a fishing expedition, but we had the resources to develop more sophisticated methods of catching the fish, and we did."

Scientists at Chiron are encouraged to publish their findings in the scientific literature. Rutter points out that Genentech and Chiron together produce more scientific papers than all the rest of the biotech industry.

The Chiron name and logo reflect its mission:

According to Homer's Iliad, Chiron was the wise and beneficent centaur who tended the wounds of many heroes and taught the healing arts to Asclepius, the first physician, and thus was the mythical creative source of medical knowledge. Chiron Corporation chose its name to reflect its mission: to transform the practice of medicine with its products. Half-man and half-horse, the centaur also is a recombinant organism that symbolizes Chiron's genetic engineering foundation technology.

The centaur also was known for its strength, and time alone will tell whether Chiron will sustain the explosive growth it has shown so far. To date, the optimism and hard work of its founders appear to have been well rewarded. Last year, Rutter and Penhoet were chosen the 1992 Entrepreneur of the Year by Ernst & Young/ Inc. Magazine/Merrill Lynch.

Thank You Alumni and Friends

Thank you for sending us your news and your checks. We are very proud of you and your very significant accomplishments and will continue to make your news our first priority.

With your checks and your help, we will continue to offer a program that gives us great pride.

Three Illini Establish Hi-Tech Instrumentation Company

The growing $40 million SLM Instruments company traces its origins to Gregorio Weber, U. of I. Professor of Biochemistry, whose theories of fluorescence polarization led to the construction of the first advanced spectrofluorometers. In the late '60s, Dick Spencer, then a graduate student in biochemistry, built the original model of one of SLM's core products as part of his Ph.D. thesis. "That thesis and the publications that came along with it was the greatest piece of free advertising that I had," according to Spencer, company founder and now President and CEO.

Soon after Spencer completed his thesis in 1970 and stayed on as a postdoc, George Mitchell joined the lab as another postdoc, having completed his Ph.D. at Harvard. Mitchell's publications brought further publicity and excited researchers in biophysics and biochemistry who envisioned applications of the technology to a variety of scientific problems. The chief of a local hospital's pathology department was one of the first customers, who persuaded Spencer to build a clinical version of a polarization spectrofluorometer.

At this time, no one dreamed of founding a company. Building of the instruments began in the Spencer living room and graduated to the Mitchell basement and garage. The mechanical parts of the instruments were contracted out to Steve Laker, an instrument maker at the School of Chemical Sciences, who eventually became another founder.

The genesis of a market-driven company

In 1973, realizing that they had a potential market niche because there was no commercial instrumentation available to measure the dynamics of fluorescence and fluorescence polarization, the founders incorporated as SLM Instruments Inc., the letters standing for initials of their names, Spencer, Laker, and Mitchell.

Spencer recalled that they never expected to make much money. "We did it because it was fascinating and we got caught up in it. We worked for practically nothing at first." In retrospect, Mitchell recalls that "timing was everything. We hit the market just right. At the time we started, this type of instrument did not exist. We crystallized the whole thing into something that could move very rapidly into a small market niche. We expected to get part of the niche and we got it all, at least in the U.S.A."

Dick Spencer, George Mitchell, and Dave Laker.

In 1975 they moved into leased space, wrote a prospectus, and sold stock from '75-'78. Thereafter, the company's cash flow was sufficient to meet most operating expenses. Those farsighted and fortunate people who bought stock in SLM have been handsomely rewarded with an average annual rate of return of 22.5%.

Expansion with purchase of AMINCO

In 1982 SLM purchased the American Instrument Company and their new name became SLM/AMINCO®. They expanded their instrument line and became serious competitors to the leaders in the field of high end scientific instrumentation, especially Perkin Elmer and Spex in the United States. The customer list contains virtually all the Fortune 500 companies. As Spencer points out, "Every life science research lab in the universities has our equipment. Since we have strong academic roots, we are especially proud that we can point to about two dozen academic careers that have been built with our products. I don't mean that we made the academic careers. They did that themselves but these people could not have done what they did without our products."

Mitchell recently completed a study of references to SLM equipment in scientific publications over the last ten years. He found 750 references during that period in just two publications, *Biochemistry* and *Biophysical Journal*. As a relatively small, entrepreneurial and innovative company, SLM has been able to add to its product line to keep pace with research requirements. In addition, the company has always employed highly trained scientists to offer technical support.

SLM bought by Milton Roy

In 1990 SLM was acquired by Milton Roy, a company with two major foci, an instrument division located in Rochester, New York, and three pump divisions in other U.S. and European locations. Overnight, Spencer, who had been accustomed to managing a $10 million sophisticated instrument company, became general manager of a $40 million instrument business.

The Milton Roy Analytic Products Division, with production facilities in Rochester, allowed the company to move into the wider field of applications involving less expensive spectrophotometers that measure the concentration and presence of chemical substances in solution. These include the study of enzyme kinetics, drug interactions, anesthetic mechanisms, protophysical properties of molecules, pesticide analysis and solar energy transduction. Some of the less expensive equipment is also used for high school instruction. The larger operation of Milton Roy has provided SLM-AMINCO® with new markets and customers as well as international sales and service offices

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located in Europe, Hong Kong, Singapore, and Tokyo, and service depots throughout the U.S.A.

Purchase by Sunstrand

In 1991, Sunstrand, a Fortune 500 company, bought Milton Roy and SLM with it. The pump businesses of the two companies fitted well together and SLM became a division of a very large billion dollar company.

Spencer finds that as Vice President and General Manager of a division of the larger company, the merger has freed him from a many executive responsibilities. On the other hand, he has had to meet the challenge of meshing the management style of an extremely centralized, hierarchical, bureaucratic organization above with a fast moving, innovative, entrepreneurial organization below.

SIM◐AMINCO®

One important characteristic of SLM is that each of the principals has developed different and complementary talents. For instance, although both Spencer and Mitchell have Ph.D.s in life science disciplines and had planned on academic careers, Mitchell has stayed with his research interests and has become the "scientific guru" of the organization, whereas Spencer has developed executive talents for administration and organizational management. Laker, with his background as a machinist and instrument maker, has moved into model making and engineering production and serves as the company's vice president for mechanical operations.

Between them, they have successhully steered the company through adverse economic circumstances, even though their exports have dropped off as the recession took its toll overseas. Like most other American businesses, SLM has been streamlined to meet the challenges of the current, more competitive environment. Spencer sees the changes as positive in that the company has been able to eliminate excesses and to improve their operations and systems. In order to keep pace with the competition, the company has been struggling to produce an identifiably new product every six months. The pressure is great, but Spencer and Mitchell are confident that SLM, which has been able to produce this enviable record for the last 20 years, will be able to continue this trajectory in the years to come.

A New Building - At Last!

John Hummel

On January 26, 1993 the governor of Illinois announced release of the remaining $56 million for construction of the long awaited Chemical and Life Sciences Laboratory. The new building, which will contain about 100,000 net square feet, will straddle California Street and face Goodwin Avenue. In the artist's rendering (below), the tower at the right will belong to the School of Life Sciences, and the long, lower section facing the front will contain Chemical Science offices and laboratories.

The need for space was recognized as long ago as 1965, when the School of Chemical Sciences requested a second major addition to the Roger Adams Laboratory.

In 1987, the School sent an urgent appeal to the university for a new building, because the problems had been exacerbated in the intervening years, and in 1988 the university officially requested the state to fund a joint Chemical Science/Life Science Laboratory.

Legislative approval in 1989

The projected laboratory was included in former Governor Thompson's Science and Technology initiative in 1989 and won legislative approval, but it was postponed once again because of the state's fiscal woes. Fortunately for us, Governor Edgar was able to lift the construction freeze last January. At our end, preparations were so complete that bids could be let almost immediately and construction has begun. However, the two-year delay has cost us about 20% of the total building budget and took the top floor off the chemical sciences complex.

Although the details are still flexible, current plans call for the research programs traditionally housed in Noyes Lab, especially inorganic, physical and biophysical chemistry, to move to the new building. The project will consolidate faculty and their research groups. It will upgrade rather than increase research space.

A 1989 document, "Need for the New Building", graphically describes the need:

We currently have a space deficit of the order of 70,000 net square feet and, more importantly, a horrendous quality deficit. Almost all of the undergraduate teaching laboratories and about a third of the research labs in the School are housed in buildings that are in the 60- to 90-year-old range.

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Artist's sketch of the new building.

Chemical Engineering Launches ChE 2000 Fund Drive

Under the leadership of John Georges, general chairman, and Charles J. Prizer, campaign director, the ambitious 20 million dollar campaign is well under way. Its purpose is nothing less than to "insure Illinois' continuing presence as a world-class center for teaching, research and service in chemical engineering." To accomplish this far reaching goal, the campaign will help the department to "improve instructional and computing laboratories, enhance interaction between undergraduate students, faculty and graduate assistants, and to renew our ability to carry out research in modern facilities." (campaign case statement).

Charles J. Prizer

As Richard Alkire, department head, points out, the chemical engineering department is housed mainly in the Roger Adams Laboratory, a building that was designed in the 30s, built in the 40s and is totally inadequate to meet the needs of the 90s. For instance, the building has virtually no small, seminar-type rooms. The department has found that students who will be working on research teams need to learn to communicate effectively. Small rooms with video equipment for taping presentations are essential for fulfilling that portion of the curriculum. Small, flexible classrooms are also necessary for intensive tutoring/advising sessions that are fundamental for helping minority students succeed in the curriculum.

Another important goal is to help the department use its facilities more effectively. For example, in the 30s, much student training employed war surplus equipment. The equipment required very large spaces and, therefore, a three-story high bay area was built into the Roger Adams Lab. Today's equipment is small, highly sensitive and usually computer integrated. Therefore, today's research labs need to be far smaller but much more controlled. Air exchange must be carefully calibrated, and dust is simply not acceptable.

Today's employers require students who are trained in an industrial type environment where equipment receives proper attention and safety practices are part of the routine. However, it is virtually impossible to enforce safety standards when instructional labs are an open conduit to the building's receiving area. People walk through the labs to reach other parts of the building, oblivious of safety standards, which lose credibility under those conditions.

One of the most important problems for the chemical engineering department at present is that research requirements have outrun supply lines on utilities. As pointed out by Alkire, "We cannot bring more high quality air into the buildings, nor can we keep out the dust. We have no additional circuits to meet our needs for greater power supplies. We need to remodel to bring in extra power lines, additional air conditioning and utilities, and to bring our laboratory hoods in line with instructional and research needs."

Meeting these needs will result in greater efficiency in training that will benefit current and future students as well as their potential employers. Recruitment and hiring are very expensive. Estimates range from $20,000 to $30,000 to recruit a new Ph.D. Any reduction in these expenses would be welcomed.

For this reason, the drive to raise 20 million dollars has received enthusiastic endorsement by the Resource Development Committee of the department of chemical engineering. In this early stage of the campaign, the active network team has made a large number of contacts, and several proposals for funding are in process.

Campaign Structure

John Georges, CEO of the International Paper Company and a member of the University of Illinois Foundation Board, has assumed general chairmanship of the campaign and Charles Prizer, retired Group Vice President of Rohm & Haas and currently a principal in Prizer and Wilkinson, is in charge of operations. They are assisted by an able Network Team including Allen Broyles of the First National Bank of Chicago, Leonard Cohen of the Loan Guarantee Investment Corporation, Clarke Coldren, retired from Shell Chemical Company, Gilbert Gavlin, retired from Safety Kleen Corporation, Joseph Glas of E.I. du Pont de Nemours and Company, Keith McHenry, retired from Amoco Corporation, and Steven McLin of American First Financial.

The University of Illinois has endorsed the ChE 2000 campaign as a lead program in its forthcoming university-wide capital campaign. The University of Illinois is one of the top ranked research and instructional facilities in the nation, and the chemical engineering department is considered one of its "crown jewels", according to Alkire. Changes in the educational process in chemical engineering have undergone subtle but radical transformation in recent years as outlined in the following statement providing justification for campaign support:

Research equipment is vastly more sophisticated and requires new laboratory configurations; instructional laboratories are completely different; emphasis on communications and teamwork is unparalleled; the diversity of the student population is increasing steadily; and the demand for a safe and healthy educational environment has never been more important.

The 20 million sought in the campaign will be a sound investment, one that will repay itself many times over. The department is encouraged by the enthusiasm of alumni and industrial corporations and Alkire expects to lead the department into a future era that is as illustrious as its past. The confidence of donors will be amply repaid by the excellent programs that will continue to be generated by this outstanding department.

For further information about the campaign, contact one of the following:

Richard C. Alkire, Head
Department of Chemical Engineering
600 S. Mathews Avenue
Urbana, IL 61801
Tel: 217-333-3641

Charles J. Prizer, Director
ChE 2000 Campaign
614 Chestnut Street
Moorestown, NJ 08057
Tel: 609-235-5599

Symposium Marks Ted Brown's Retirement

Ted Brown

After 40 years of service to the University of Illinois, Professor Ted Brown will retire in October, 1993. Ted has been not only an internationally recognized scientist but also an outstanding administrator.

In 1980 he began a six-year tenure as Vice Chancellor for Research. In 1985, he was selected as the first Director of the Beckman Institute for Science and Technology, a position he has held ever since.

A symposium on August 21 was organized by the chemistry department to recognize Ted's contributions to the Department of Chemistry and to the University of Illinois. Speakers at the symposium included members of both Ted's "academic alumni" as well as his "industrial alumni." Current plans for his"retirement" include a continuing and increasing involvement in research after his administrative responsibilities have been set aside.

Faculty Honors

Theodore L. Brown, Professor of Chemistry, Director of the Beckman Institute and U. of I. Vice-Chancellor for Academic Affairs, received the 1993 ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry.

Walter Klemperer, Professor of Chemistry, has been named a University Scholar, the highest award of the University of Illinois.

Professor Klemperer also received a Humboldt Research Award from the Alexander von Humboldt Foundation.

Paul Lauterbur, Professor of Chemistry and of Medical Information Science received the 1992 International Society of Magnetic Resonance Award.

Peter Beak, Professor of Chemistry received a 1993 Cope Scholar Award in recognition for outstanding contributions to research in inorganic chemistry.

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Bailar Students Organize Fellowship Drive

John C. Bailar, 1904-1991, has left his university and his profession an important legacy. As his student, Daryl H. Busch, remarked at Bailar's memorial service, "My image of John Bailar was as a man bigger than most men — a sort of Samson of Science who opened great doors of opportunity through which many of us scurried onward to fulfilling careers in chemistry."

John C. Bailar

Throughout his lengthy career, Bailar received many honors for his scientific accomplishments: the Priestley Medal (1964), the ACS Award for Distinguished Service in Advancement of Inorganic Chemistry (1972), the ACS Award in Chemical Education (1961) and the Werner Gold Medal (1966) which he received in honor of the 100th anniversary of the birth of Alfred Werner, the "Father of Coordination Chemistry."

Clayton Callis

Although his career had many facets, John Bailar's first love was teaching, and his primary concern was the welfare of students. His colleague, Ted Brown, recalls that Bailar "had a way of bringing out the best in each of the students who came his way. John was a patient man but demanded in the end that the result was one of high quality. He always looked to educating the students beyond mere chemistry. He was concerned that the whole person be educated." Bailar personally knew hundreds of students and delighted in their professional success. His endless repertoire of stories about the "Bailarites" was a delight to his many colleagues and friends.

The Bailar fellowships

To honor his legacy, Bailar's former students decided to establish a program of fellowships for chemistry graduate students. These fellowships will take the form of financial supplements to selected students while they are fulfilling their teaching obligations as graduate assistants. These fellowships will help the U. of I. chemistry department to attract outstanding applicants and to offer many benefits to those who enter department programs. The supplements will ease the financial strain of graduate student living. The designation of Bailar Fellow should find a place of honor in the recipient's resume and help to launch a young chemist's professional career. In addition, our undergraduate students will be indirect beneficiaries, because they will receive instruction from outstanding graduate students that the program will bring to the U. of I.

The fund drive

Clayton Callis '48, retired Director of Research and Development for the Monsanto Company, has agreed to chair the campaign and has organized a committee of former Bailar students and U. of I. faculty to contact Bailarites for contributions to the campaign. Because Bailar was a personal friend and mentor to many graduate students of inorganic chemistry in addition to his advisees, and to countless undergraduates, as director of general chemistry and of the chemistry placement office, the committee will solicit the larger chemistry community as well.

The campaign will run for three years, so that contributors will have ample time to set up an effective giving plan including various forms of contributions, such as appreciated stocks, and company matching grants. The campaign committee has set a goal of $250,000 which, at the currently anticipated rate of $2,500 annually, should fund five Bailar Fellows each year.

For further information on the campaign, contact one of the following:

Dr. Clayton Callis Campaign Chair
2 Holiday Lane
St. Louis, MO 63131
Tel: 314-872-8842
Fax: 314-569-3712

Ellen Handler
University of Illinois contact
103 Noyes Lab
505 S. Mathews
Urbana, IL 61801
Tel: 217-333-6083
Fax: 217-333-3120.

Beak Develops Mechanistic and Synthetic Applications of Endocyclic Reactions

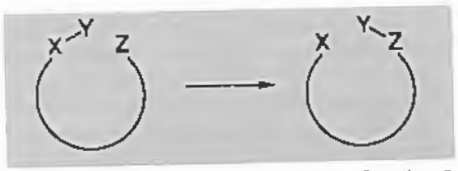
Peter Beak

Peter Beak won a Cope Award in 1993 for a lifetime of contributions to organic chemistry. He has studied tautomeric equilibria, reaction intermediates, and synthetic methodology. The focus of his research is on the discovery and development of new reactions and the determination of principles which control structure and reactivity.

A recent series of studies focuses on endocyclic reactions to address fundamental issues regarding chemical transition states and to develop new strategies for efficient asymmetric synthesis. An endocyclic reaction can be described as a reaction which occurs within the confines of an endocyclic ring. Consider, for example, a reaction in which the atom Y undergoes a change in covalent bonding from atom X to atom Z, as shown in equation 1.

Equation 1

If X and Z are bonded to one another, as shown in equation 2, and the reaction can occur within one molecule, it is intramolecular. If the tether bonding X and Z is short, (e.g. a 6-membered ring) an intramolecular reaction is possible only if the X-Y-Z-bond angle in the transition state is small enough for the confines of an endocyclic ring.



Equation 2

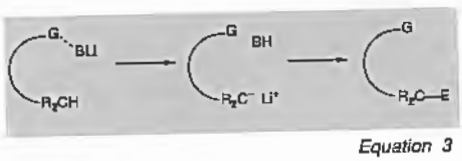
If the required bond angle is large, a long tether (e.g. a 14-membered ring) would be necessary for an intramolecular reaction to occur. If the bonding tether is restrictive, the reaction process would require two molecules in a stepwise sequence and would be intermolecular. An evaluation of the molecular weights of the isotopic products produced by the reactions of the double-labeled reactants would indicate the type of reaction that had occurred. An intermolecular reaction would produce a statistical distribution of isotopic products of different molecular weights than an intramolecular reaction.

Beak and his students have conducted studies to determine whether the reaction in which Y is transferred between the bonding sites has a geometrical dependence by varying the length of the tether between X and Z and determining if the reaction is intramolecular or intermolecular. They term this approach the endocyclic restriction test and have used it to evaluate the angles involved in transition structures for oxygen, nitrogen, and bromine transfers. In each case it was found that the reaction proceeded in an intermolecular mode when the tether between groups undergoing reaction was short. When the tether was long, the reaction proceeded in an intramolecular mode.

Specifically, their results showed that intramolecular transfers of oxygen, nitrogen, and bromine did not occur within the endocyclic confines of a small (e.g. 6-membered) ring but did occur when the endocyclic ring was larger (e.g. 14-membered). These results show that the transfer of these atoms has a geometric dependence. These experiments are consistent with a transition structure in which X,Y, and Z are effectively linear. This work has provided the first determinations of the geometries of transfers for oxygen, nitrogen, and bromine.

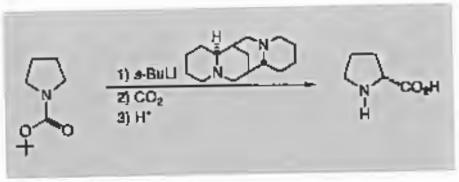
The endocyclic restriction test is quite general and can be applied to the study of any element that can be transferred in a chemical reaction. It has the further advantage that it is independent of the stereostructure of the atom of the group undergoing transfer. Therefore, it should be widely applicable to reactions occurring in nature as well as those restricted to the laboratory setting. Currently, the Beak group is investigating transfers of chlorine, sulfur and phosphorus.

In applying endocyclic reactions to asymmetric synthesis, Beak investigates a complex between a molecule containing carbon and hydrogen (R_2CH), an organolithium base (BLi), and a functional group G. An endocyclic transfer of hydrogen is suggested to give an organolithium intermediate which, in turn, can react with a carbon electrophile (E) to provide a carbon-carbon bond. The process is shown in equation (3).



Equation 3

In recent work, Beak and his students have shown that when the organolithium reagent is complexed with a chiral ligand, the carbon-carbon bond which is formed is produced with high enantioselectivity. For example, as shown below, the reaction of the symmetrical 5-membered heterocyclic Boc-pyrrolidine with sec-butyl lithium/sparteine, followed by reaction with carbon dioxide, produces the amino acid R-proline, in high yield and with high enantioselectivity.



This enantiomer is the mirror image of the naturally occurring isomer and the chiral ligand is readily recovered. Beak's laboratory is exploring other carbon-carbon bond formations of organometallic reagents with chiral ligands. Their applications of endocyclic reactions for direct asymmetric synthesis have yielded products that are 99.5% enantiopure. This line of work provides a new and direct methodology for the synthesis of many compounds in asymmetric form and has considerable practical as well as theoretic significance.

By investigating endocyclic reactions in a variety of contexts, Beak and his students have advanced the understanding and uses of reaction chemistry in two areas. They have shown that the endocyclic restriction test can provide decisive experiments which can settle fundamental issues of reaction geometry for a wide variety of atom or group transfers. They have devised new, efficient methods for asymmetric synthesis of carbon-carbon bonds.

In addition to his teaching and research at the University of Illinois, Beak is also a senior editor of the *Journal of Organic Chemistry* and a member of the editorial board of *Organic Reactions*. He has been a Fellow of the A.P. Sloan Foundation, the J.S. Guggenheim Foundation, and the American Association for the Advancement of Science. In announcing the recent Cope award, the *C&EN* author summarized Beak's work as follows: "His findings have deepened (our) understanding of organic chemistry and opened new fields for investigation."

WE SALUTE ILLINI

Edwin Krebs

Rudolph Marcus

Albert Babb

Edwin Krebs Wins Nobel Prize

Since 1948 a member of the faculty of the University of Washington in Seattle, Professor Krebs, who received his BS from the U. of I. in '40, shared the 1992 Nobel Prize in Medicine with his long time collaborator, Edmond Fisher. He received the Prize for elucidating the fundamental biochemical mechanism whereby cells regulate their metabolism by reversible chemical changes, specifically phosphorylation, in signaling molecules and enzymes.

According to Professor Switzer, Head of the Biochemistry Department, "the process was originally thought to be restricted to regulation of sugar metabolism. Now it is clear that (these processes) are widely found and crucial throughout the living world."

Dr. Krebs is not only a U. of I. graduate but also an Urbana native. He attended Urbana high school and has enjoyed his visits to our community when he gave the Doisy Lecture in 1980 and when he received the LAS Alumni Achievement Award in 1992. His work has garnered many honors including two Guggenheim Fellowships, the Albert Lasker Award for Basic Medical Research in 1989 and the Robert A. Welch Award in 1991. In 1971, he was elected to the American Academy of Arts and Sciences and in 1973 to the National Academy of Sciences. Though long eligible for retirement, Professor Krebs has no such intention and plans to continue his investigations to meet the scientific challenges that keep him interested.

Rudolph Marcus Nobel Laureate

While a faculty member in our chemistry department from 1964-1978, Marcus worked on the theory of electron-transfer reactions in chemical systems, for which he won the Chemistry Nobel Prize in 1992. According to *C&EN*, Marcus was among the first to realize that the barrier to electron transfer arose from differences in nuclear configurations of the reactants and products of the electron-transfer reaction. He developed a quantitative model that relates these differences to electron-transfer rates.

According to the Academy, Marcus's theory has important consequences for all areas of chemistry. "It describes and makes predictions concerning such widely differing phenomena as the fixation of light energy by green plants, photochemical production of fuel, chemiluminescence, ('cold light'), the conductivity of electrically conducting polymers, corrosion, the methodology of electrochemical synthesis and analysis and more."

The Arthur A. Noyes Professor of Chemistry at California Institute of Technology since 1978, Marcus has won innumerable honors and awards. He was elected to the National Academy of Sciences in 1970 and became a fellow of the American Academy of Arts and Sciences in 1973. He won the Irving Langmuir Award in 1978, the Wolf Prize in 1985, the Peter Debye Award in 1988 and the National Medal of Science in 1989.

Albert L. Babb '51 Winner of Alumni Achievement Award

Professor of Nuclear Engineering and Chemical Engineering at the University of Washington since 1952, Professor Babb, a student of Professor Harry Drickamer, is best known for the design of the first portable kidney dialysis machine which has served as the prototype for all the individual dialysis machines in use world-wide. After the original model was retired from clinical service, it was displayed in the Baxter-Travenol museum in Chicago and is currently on display in Seattle's Museum of History and Industry on the occasion of the celebration of 30 years of dialysis in Seattle.

In the biomedical field, Professor Babb has also done significant research on sickle cell anemia and developed a technique for detecting cystic fibrosis. He played a key role in developing cosmetically acceptable infusion pumps for diabetics. Dr. Babb is fond of quoting Herbert Hoover, who said, "The job of the engineer is to clothe the bare bones of science with life, and comfort and hope."

Dr. Babb was elected to the National Academy of Engineering in '72 and to the Institute of Medicine of the National Academy of Sciences in '81. The citation on Dr. Babb's Alumni Award concluded with the following: "We salute Dr. Babb's contributions to science and humanity. We are proud to present him with the 1993 Alumni Achievement Award."

WINNERS . . .

Fred Basolo

Robert Parry

Jiri Jonas

Fred Basolo '43 Receives AIC's Gold Medal

Dr. Fred Basolo, Morrison Professor of Chemistry at Northwestern University, received the 1993 Gold Medal, the American Institute of Chemists' highest award. A student of Professor John C. Bailar, Professor Basolo has pioneered the study of inorganic reaction mechanisms, specifically the mechanisms of substituted reactions of octahedral and square-planar coordination complexes.

He is a member of the National Academy of Sciences and a Fellow of the American Academy of Arts and Sciences. He was president of the American Chemical Society, received the Bailar Medal Award (1972), the ACS Award for Research in Inorganic Chemistry (1965) and the ACS Award for Distinguished Service in Inorganic Chemistry (1975).

Robert W. Parry '46 Wins 1993 Priestley Medal

Dr. Robert Parry, Distinguished Professor of Chemistry at the University of Utah, received the Priestley Medal for his "broad, positive influence...in chemical education, ACS governance, and as a spokesman for chemistry" (*C&EN*, May 25, p. 21). A student of John C. Bailar, Parry expanded the viewpoint of coordination chemistry to nonmetals.

He was the founding editor of Inorganic Chemistry and president of the American Chemical Society in 1982. Parry was recipient of the first ACS Award for Distinguished Service in Inorganic Chemistry in 1965. In addition, he also received the ACS Award in Chemical Education in 1977 and the Manufacturing Chemists Award in 1972.

Jonas New Director of the Beckman Institute

Jiri Jonas, Professor of Chemistry and Director of the School of Chemical Sciences, became the new director of the Beckman Institute, following the retirement of Ted Brown. Professor Jonas is known for his groundbreaking studies of liquids under extreme conditions of high pressure and high temperature. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

His plans for the Beckman are to build on the institute's strengths of collaborative research. "The Beckman Institute has been firmly established as a unique research center," he said. "My long-term goal is simply to make it the top institute in the world."

Wolynes and Sligar first Lycan Professors

The School of Chemical Science is proud to announce the first two Lycan Professorships. The professorships were a gift of Dr. William H. Lycan Ph.D. '29 and his wife, the late Janet Lycan B.S. '26.

The first Lycan Professor of Chemistry is Dr. Peter G. Wolynes, a distinguished professor of Chemistry, Biophysics and Physics whose fundamental research interests focus on the dynamic theory of chemical processes in condensed matter, ranging over all states of matter.

Dr. Wolynes was elected to the National Academy of Sciences in 1991. He is a fellow of the American Academy of Arts and Sciences and a permanent member of the Center for Advanced Study at the University of Illinois. In 1986 he received the American Chemical Society award in Pure Chemistry, and in 1988 the Fresenius Award of Phi Lambda Upsilon. In 1988 he received a D.Sc. (hon.) from Indiana University, his Alma Mater.

The first Lycan Professor of Biochemistry is Stephen G. Sligar, Professor of Biochemistry, Chemistry, Physiology and Biophysics and Beckman Institute Professor. He also carries appointments at the Materials Research Laboratory at the University of Illinois and at the Frontier Research Program, Bioelectronic Materials and Nanostructures, RIKEN Institute in Tokyo.

His primary research interests are in the mechanisms of protein folding and stability, macromolecular recognition, enzyme cooperativity and the development of artificial blood substitutes, direct study of protein dynamics, development of biomolecular devices and molecular mechanisms of electron transport and dioxyen metabolism.

Materials Research in the School of Chemical Sciences

Harry Drickamer

by H.G. Drickamer

The activity of chemists and chemical engineers, both nationwide and at Illinois in the general area of materials research, has been increasing rapidly in recent years after a somewhat belated start. When I first joined the faculty at Illinois in 1946, my research concerned the properties of compressed liquids and dense gases - first primarily light scattering and diffusion and thermal diffusion using radioactive tracers, then molecular spectra.

In the early 1950's I obtained a copy of *Modern Theory of Solids* by Fred Seitz and determined that with pressure one could find out a great deal about electronic, atomic and molecular properties of solids. To the considerable dismay of my colleagues in chemical engineering and chemistry, I decided to pursue this area. I remember Worth Rodebush telling me that "It's too bad solid state isn't part of chemistry because it would be interesting." He was correctly warning me that I should expect little interest in this work from chemists or chemical engineers.

Fred Seitz had come to this campus and had brought in John Bardeen and a group of younger solid state physicists, but they could well have been operating on another planet as far as I was concerned.

Then, one afternoon, as I was coming up from the lab to my office, there was a tall gentleman knocking on my door. He introduced himself as Fred Seitz and said he had heard I was doing some interesting high pressure optical studies on color centers in alkali halides and on transition metal ions in solids, and could I take a few minutes to tell him about it. We had what was for me a very intense and exciting discussion, and he asked me over to give a Solid State Seminar in Physics.

This was the beginning of a series of stimulating interactions, mostly of an informal nature. It also typified Seitz's ecumenical approach to solid state science. No matter what one's background or department, he was glad to integrate anyone doing interesting work into the solid state community.

Recent Research on Materials

In the late 1950's, Seitz sold the idea of federally supported Materials Research Laboratories (MRL) on a national scale. In the first decade or so, the participation of chemists in MRL or in independent materials research was minimal. The overriding reason was a lack of interest on the part of chemists in materials synthesis and properties. In addition, within MRL there was some feeling that since chemists had not been interested "at the creation" there was no reason to include them later.

Within the past decade or so, the participation of chemists in materials research here at Illinois has expanded and broadened considerably both within and outside of MRL. A few examples of research initiated in the past decade or so include: the study of sol-gel processes for glass manufacture, surface science studies both as regards catalytic activity and etching of polymers on semiconductors as well as other properties of semiconductor surfaces, the nature of the lubrication process as indicated by the behavior of liquids in confined geometrics studied by NMR relaxation, the mechanism and control of corrosion, ceramic fabrication, and the synthesis of organometallic polymers.

Chemists and chemical engineers in the USA generally, and at the University of Illinois in particular have come rather late to materials research. A very large fraction of what has been done over the past four decades in solid state physics could have been done as well, in some cases, better, in physical or other branches of chemistry. Even now, there are many areas in which the participation by chemists and chemical engineers, both at Illinois and nationally, is limited.

Based on the rate of increase in the interest shown by chemists and chemical engineers in materials research, it is reasonable to hope that, both nationally and at Illinois, there will be a greatly enlarged participation in these areas which have both theoretical and practical importance.

Building *continued from page 4*

More space is needed for instruments, higher ventilations standards have to be met, much better temperature and humidity control is required and more extensive and reliable utility distribution systems are needed in order to provide a teaching and research environment that is in tune with today's needs.

Planning the building

The enormous task of planning the chemical science portion of the new building fell to Professor John Hummel, then associate director of the School. Over two years ago Hummel began meeting with faculty to draw up "wish lists" and to fit them into the architects' plans. He became "the guru of people and space."

The intricate infrastructure of the building became his masterpiece. He knows where every receptacle, gas and drain pipe is located and how every door opens. As someone on the building committee remarked, "Hummel knew so much about the building that it was hard to argue with him" and few did.

Because the new building will provide some breathing room, remodeling of older facilities will be far more efficient. Without extra space, remodeling can be done only in small steps and requires an inordinate length of time before a given project can be completed. Once the research programs move to the new building, the teaching labs and service programs will expand. The chemistry library will grow significantly. The library alone estimates that it needs four times its current space.

The target date for the move to the new building is Fall 1995. We hope that many of you will come to see the new laboratory for which we have waited so long and will share our joy at its completion. You may not be able to drive on California Street from campus to Goodwin Avenue, because the new building will bar the way, but you will still be able to browse in the Horizon bookstore which has found a new home, even closer to the quad.

Who were our professional ancestors?

Vera Mainz

Gregory Girolami

Professor Gregory Girolami and his wife, Vera Mainz, asked that question when both were graduate students at Berkeley. Their common advisor, Richard Andersen, related many interesting stories about his advisor, Geoffrey Coates, which began their search to follow the trail backwards in time.

Their efforts have now resulted in a University of Illinois Chemical Genealogy, which covers not only their own family tree, but also those of all of the current faculty members in the Department of Chemistry. The Chemical Genealogy brings up to date an earlier effort by Virginia Bartow, a professor at the U. of I. who constructed a similar genealogy to teach a history of chemistry course.

More than a family tree

Bartow's 1939 article in the *Journal of Chemical Education* was one of the first, modern chemistry genealogies. Over the years, other universities have attempted similar projects, but the lines of descent are often quite contradictory. The principles used to establish ancestry in other genealogies were rarely articulated and even more rarely documented.

One of the contributions of the new University of Illinois genealogy is that the family trees are accompanied by a manuscript. The introduction lays out clearly the principles and procedures used in establishing the lines of descent. The manuscript also supplies references to books and articles for each person who appears in the genealogy. In addition to the bare bones information documenting descent, the manuscript includes interesting anecdotes about some of the more colorful chemists who appear in the trees.

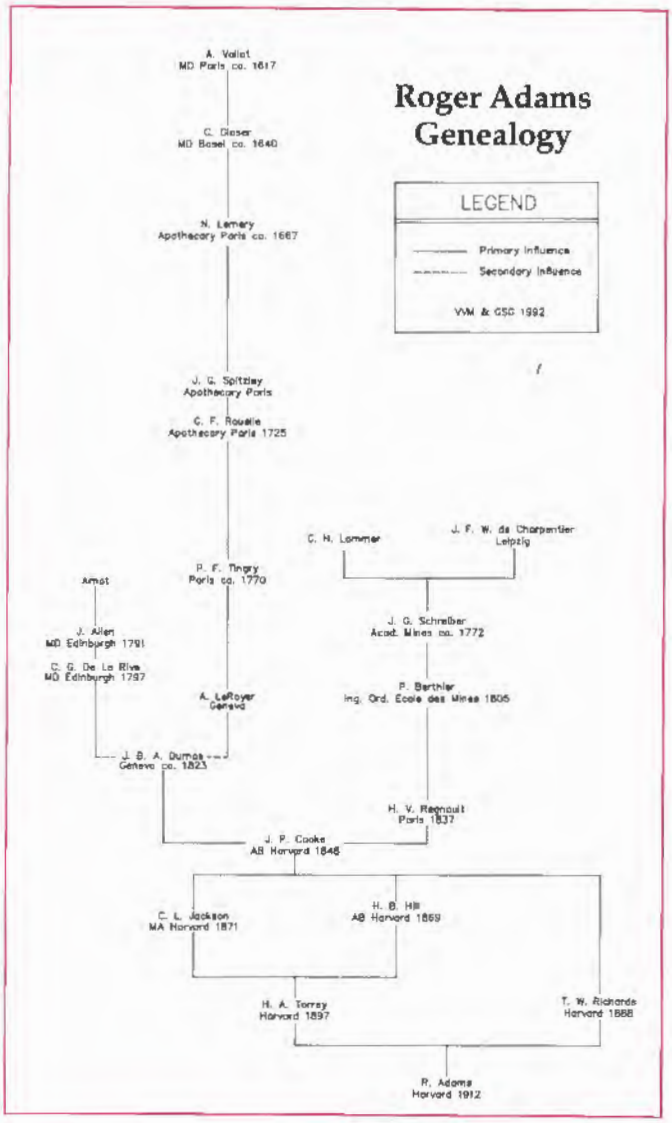
After evaluating various alternative schemes, Girolami and Mainz decided to trace ancestry through "the research advisor for the highest, non-honorary, degree." Where more than one mentor existed, the trees include a primary and a secondary line of descent. In general, these connections could be clearly established for the last 100 years.

Prior to that time, some of the lines are more difficult to trace. In the late 1800s, the predominant career path for American chemists was to obtain their undergraduate degrees in the United States. They would then migrate abroad, often studying and working in two or three European laboratories to complete their education before returning to the United States as professors in American chemistry departments.

Further back in history, the lines become even harder to trace. Eventually, the lines trace back to other fields, especially to medicine and pharmacy. The lengthiest lines of descent among U. of I. chemists trace back to the fifteenth century to the University of Padua and its famous School of Medicine.

An example

A simplified genealogy of Roger Adams can serve as an illustration. Virtually only the primary influences are shown. The line begins with his own Ph.D. advisor, Harvard chemist Henry Torrey. Adams also studied under Latham Clark and Nobel laureate Theodore Richards.



The line eventually runs back to Nicolas Lemery, apothecary in Paris ca. 1667, and before that to Christophle Glaser, an MD in Basel ca. 1640, and ends with Antoine Vallot, an MD in Paris ca. 1617.

An AutoCad program yields very clear drawings of the family trees which can be reduced and magnified without loss of clarity.

Early in the project, Girolami and Mainz decided to compile their information into a database to provide flexibility and make it accessible to other researchers. They used dBASEIV for DOS based computers and Hypercard for the Macintosh type.

The project was completed just in time for the 100th anniversary celebration of the chemistry library. The coincidence was fitting because the excellent resources of the library had been one of the primary sources of the information. The entire chart, approximately six feet long in small type, stretches across one wall in the library and can be seen as background in the accompanying photos. Any U. of I. alum whose highest degree was completed under the supervision of one of our faculty can obtain a personal genealogy by contacting Dr. Vera Mainz of our chemistry department.

Faculty *continued from page 6*

Martin Gruebele, Professor of Chemistry, received a Camille and Henry Dreyfus New Faculty Award for 1992. This program provides external support to faculty of exceptional promise as they begin their first academic appointment.

Jonathan Sweedler, Professor of Chemistry, was awarded a David and Lucile Packard Fellowship in 1992. The award carries significant research support for a five year period.

Professor Sweedler also received a 1992 Young Investigator Award (NYI) from the National Science Foundation.

Professor Sweedler was named a Beckman Fellow in the U. of I. Center for Advanced Study.

Peter Orlean, Professor of Biochemistry, received a Junior Faculty Research Award from the American Cancer Society. The award carries multi-year research support.

Kenneth S. Suslick, Professor of Chemistry, has been elected a Fellow of the American Association for the Advancement of Science for his research on the chemical effects of high-intensity ultrasound.

Steven Zimmerman, Professor of Chemistry, received an Alfred P. Sloan Research Fellowship in 1992.

Andrew A. Gewirth, Professor of Chemistry, received an Alfred P. Sloan Research Fellowship in 1993.

Andrzej Wieckowski, Professor of Chemistry, has received the prize for Outstanding Scientific Accomplishment from the U.S. Department of Energy's Division of Materials Science.

Douglas Lauffenburger, Professor of Chemical Engineering, has received the 1993 AIChE Food, Pharmaceutical and Bioengineering Division Award.

Nancy Makri, Professor of Chemistry, was named a Beckman Fellow in the U. of I. Center for Advanced Study.

Steven Zumdahl, Professor of Chemistry and Associate Head of the Chemistry Department, won the Outstanding Teacher of Freshmen Award from Alpha Lambda Delta, a freshman academic honor society.

In Memoriam

Ellis Vincent Brown, B.S. '30 (Chemistry) died in May, 1992. Dr. Brown was professor emeritus of the University of Kentucky until his retirement in 1975. He is best known for his work on the structure-activity relationships in carcinogenic azo dyes and on the mechanisms of the Willgerodt and Meisenheimer reactions.

Elsie "Tucker" Kirkpatrick Farrand, A.B. '22 (Chemistry) died November, 1991. Early in her career she taught chemistry, physics and math at Clinton High School. After 1948 she became adviser to Chi Omega sorority at Carnegie-Mellon University and national chapter visitor from California to Maine.

J. Theodore Gleick, PE, B.S. '23 (Chemistry) died in March, 1992. Mr. Gleick retired from the Dole Vale Company in 1964.

Marie Graska, B.S. '87 (Chemistry) died in July, 1992. At the time of her death she was employed at Applied Analytical in Wilmington, NC, as a chemist in pharmaceutical service and sales.

George Dewitt Graves, Ph.D. '23 (Chemistry with Adams) died in February, 1993. Dr. Graves had been a research chemist at Du Pont Co. in Wilmington from 1927 until his retirement. In the 1940s, he received an honorary D.Sc. degree for his work in the development of nylon.

Kathryn Hartman, M.S. '40 (Chemistry) died in April, 1992. She worked as a science teacher for many years and as a textbook editor.

Robert Holley, B.S. '42 (Chemistry) died in February, 1993. Dr. Holley, who earned his Ph.D. in organic chemistry from Cornell University in 1947, was an Urbana native who won the Nobel Prize for Medicine and Physiology in 1968 for research on RNA. Since 1966 Dr. Tolley had been a Fellow and Professor at the Salk Institute for Biological Studies. Among his numerous honors were the Lasker Award in 1965 and a National Academy of Sciences award in molecular biology in 1967.

Evan C. Horning, Ph.D. '40 (Chemistry with Fuson) died in May, 1993. Dr. Horning was a pioneer in the fields of gas chromatographic and gas chromatographic-mass spectrometric analysis of steroids, alkaloids, drugs and other important compounds. From 1950-61 he was chief of the Laboratory of Chemistry of Natural Products at the National Heart Institute of the National Institutes of Health.

Ernel D. Ihnen, Ph.D. '60 (Chemistry with Vestling) died in June, 1992. He was a biochemist with Merck and Co. in Danville, PA, and in Rahway, NJ, until his retirement in 1988.

Charlotte Johnson, B.S. '36 (Chemistry) died in July, 1992. She was the owner and operator of the Assistance Secretarial Service of Flint, Michigan, and a reading tutor for the Mott Adult Education program.

Reid Milner, M.S. '25 (Chemistry) died in February, 1992. From 1948 until his retirement in 1971 he was Professor of Food Science at the University of Illinois. His research was mainly in the chemistry of natural products, especially the analytical and microchemical procedures by which they could be studied. He was a Fellow of the American Association for the Advancement of Science and in 1947 he was President of the American Oil Chemists Society.

Louis J. Seppi, B.S. '41 (Chemistry) died in April, 1992. In 1974 he retired as plant manager of Eco-Lab in Roscoe, IL.

Harold J. Shelp, B.S. '23 (Chemical Engineering) died August, 1992. Mr. Shelp was superintendent of the Jobbins Manufacturing Company of Aurora for 25 years.

Ernest Volwiler, Ph.D. '18 (Chemistry with Adams) died in October, 1992. He was Professor Adams' first Ph.D. student. Dr. Volwiler spent his entire career with Abbott Laboratories where he retired in 1959 as chairman of the board. In the 1930s, he formulated nembutal and sodium pentothal, both considered breakthroughs in anesthetic medicine and still used today. During World War II Dr. Volwiler also directed the production of sulfa drugs and penicillin. Dr. Volwiler was President of the American Chemical Society in 1950 and received its Priestley Medal in 1958. In 1960 he received the Gold Medal of the AIC. He was inducted into the National Inventors' Hall of Fame in 1985.

Madelyn Womack, Ph.D. '35 (Chemistry with Rose) died in December, 1991. Dr. Womack, joined the Department of Agriculture in 1947 and remained until her retirement in 1979. In 1982, she was named a Fellow of the American Institute of Nutrition.

Alumni News

'20 **Arnold Beckman,** M.S. '23 (Chemistry) has received the 1992 Bower Award for Science and Business from the Franklin Institute of Philadelphia. The award, which was established as part of the Benjamin Franklin National Memorial Awards program, is presented annually to an American executive who has demonstrated outstanding leadership in business or industry.

Walter N. Day, B.S. '28 (Chemistry), retired laboratory manager at the Norco Refinery of Shell Oil Company, has spent his retirement traveling worldwide on cargo ships.

'30 **LaMoyne D. Bearden,** B.S. '36 (Chemistry) retired from the division of Photographic Chemicals of Eastman Kodak Company in 1976.

Edwin T. Mertz, Ph.D. '35 (Biochemistry with Rose) is professor emeritus in the Department of Agronomy at Purdue University.

Xing Yi Quyi, (Shing Ji Yee) Ph.D. '36 (Chemistry) met Irving Tannenbaum in Beijing during Professor Tannenbaum's recent lecture trip to China. According to Professor Tannenbaum, Dr. Xing is the author of several textbooks used in organic chemistry courses in universities throughout China.

Glenn E. Ullyot, Ph.D. '38 (Chemistry with Fuson), has received an honorary D.Sc. degree from Philadelphia College of Pharmacy and Science. Dr. Ullyot is retired director of scientific liaison at Smith Kline & French Laboratories. He is being recognized for his pioneering efforts in advancing the discipline of medicinal chemistry and for his role in the discovery and development of major new pharmacotherapeutic agents.

'40 **Minor J. Coon,** Ph.D. '46 (Biochemistry with Rose), the Victor C. Vaughan Distinguished University Professor of Biological Chemistry at the University of Michigan, has been appointed Foreign Adjunct Professor at the Karolinska Institute in Stockholm for a six-year term.

Peter Kovacic, Ph.D. '46 (Chemistry with Snyder) has joined the faculty of Austin College as the Visiting Cecil Green Professor of Chemistry.

William F. Loranger, Ph.D. '47 (Chemistry with Clark) retired from Xerox Medical Systems in 1984. He specialized in X-ray diffraction and applied X-rays.

Lyle Woods, B.S. '44 (Chemistry) has retired from ADM Arkady, in Oalathe, Kansas, a subsidiary of the Archer Daniels Midland Company.

'50 **William "Bill" Currier,** Ph.D. '54 (Chemistry with Audrieth) retired in 1983 from the International Mineral and Chemical Corporation.

William D. Emmons, Ph.D. '51 (Chemistry with Fuson) received the 1993 Earle B. Barnes Award for Leadership in Chemical Research Management from the ACS. At the time of his retirement in 1989, he was group director of research for polymers, resins, and monomers, the largest business group of Rohm & Haas.

Fabian T. Fang, Ph.D. '54 (Chemistry with Fuson) is professor of chemistry at California State University in Bakersfield, CA. He was the first chair of the department, and since 1988 has also been Director of the Center of International Education at the university.

Sheldon Friedlander, Ph.D. '54 (Chemical Engineering with Drickamer) was elected to the National Academy of Engineering. Dr. Friedlander is with the National Bureau of Tech and Standards.

Gordon E. Hartzell, Ph.D. '58 (Chemistry with Marvel) is the new chairman of the Committee E-5 on Fire Standards. Dr. Hartzell is a private consultant on fire sciences.

E. Phillip Horwitz, Ph.D. '57 (Chemistry with Moeller) has been awarded the 1992 Glenn T. Seaborg Actinide Separations Award by the Actinide Separations Conference. He is a senior chemist at Argonne National Laboratory.

Lun Hsiao (Xiao Lun) Ph.D. '51 (Chemistry with Duffield) is chairman of the Isotope Section of the Institute for Atomic Energy in Beijing. He met with Professor Irving Tannenbaum during the latter's recent trip to China.

Avron B. Magram, B.S. '56 (Chemistry) has been appointed General Manager of the Plastics Additives and Specialty Lubricants Group of Huls America, Inc.

Walter L. Robb, Ph.D. '51 (Chemical Engineering with Drickamer) has just retired as Vice President for Research and Development for General Electric Company.

Irving R. Tannenbaum, Ph.D. '51 (Chemistry with Wall) recently gave a lecture tour of six Chinese universities sponsored by the Chinese Chemical Society. He is professor at West Los Angeles College in Culver City, CA.

Donald E. Woessner, Ph.D. '57 (Chemistry with Gutowsky) has received the 1991 Southwest Regional Award of the ACS. He is a Senior Research Associate with the Mobil Research and Development Corporation in Dallas, TX. The award recognizes his theoretical and experimental contributions in nuclear magnetic resonance that have had applications in chemistry, mineralogy, biology, and magnetic resonance imaging.

'60 **Ellen Bollmeier,** B.S. '69 (Chemistry) has a dental practice in O'Fallon, IL. She received her doctorate of medical dentistry from Southern Illinois University School of Dentistry.

Jack C. Chang, Ph.D. '66 (Chemistry with Laitinen) was the 1992 Malcolm E. Pruitt Award winner for the Council for Chemical Research, Inc. Dr. Chang is Director, Corporate Research Laboratories of Eastman Kodak Company.

Thomas Z. Fahidy, Ph.D. '65 (Chemical Engineering with Perlmutter) is Associate Dean of Graduate Studies and Research, Faculty of Engineering, University of Waterloo, Waterloo, CANADA and acting editor of the *Canadian Journal of Chemical Engineering.*

Edward F. Johnson, Ph.D. '69 (Chemistry with Coates) is principle scientist at Raychem Corporation in Menlo Park, CA.

Diana Mackie, B.S. '68 (Chemistry) is Vice President, Corporate Development and Planning for Smith Kline Beecham Company, located in England.

J.P. Walters, Ph.D. '64 (Chemistry with Malmstadt) won the 1993 Award for Excellence in Teaching given by the Division of Analytical Chemistry of the ACS. Dr. Walters teaches at St. Olaf College in Northfield, MN.

Rasma D. Yaffa, M.S. '67 (Chemistry) has been promoted to chairperson of the Chemistry/Earth Science Department at Miami Dade Community College in Miami, FL.

'70 **Blaine H. Byers,** Ph.D. '75 (Chemistry with Brown) was recently promoted to Director of R & D at Miles, Inc. Consumer Household Products.

James L Chao, M.S. '76 (Chemistry) is advisory scientist in the materials engineering laboratory of IBM Corporation in Research Triangle Park, NC. He received his Ph.D. from the University of California/Berkeley in 1980. He was recently promoted to Adjunct Associate Professor of Chemistry at Duke University.

Dale E. Fits, Ph.D. '75 (Chemistry with Marcus) was promoted to the senior staff position of research associate in the formation evaluation section of the Exxon Production Research Company in Houston, TX.

Patricia Boyle Guthrie, B.S. '77 (Biochemistry) is a hazardous materials coordinator for the Commonwealth Edison Company in Bourbonnais, IL.

Deb **Kocsis,** B.S. '77 (Chemistry) has been promoted to project leader in the Foam Products Research Department at Dow Chemical in Granville.

James R. MacMurdo, B.S. '75 (Chemistry) has been named Vice President, Section Affairs of the American Society of Quality Control. He is manager of connector quality assurance for Ideal Industries, Inc., in Sycamore, IL.

William R. Near, B.S. '74 (Chemistry) has been appointed manager of market development by Tioga Coatings Corporation, a subsidiary of Tioga International, Inc., of Calumet City.

Richard Ohlendorf, B.S. '72 (Chemistry) is an opthamologist and a founder of the Illinois Valley Eye Institute. The Institute is the first in the area to provide in-office laser surgery for treatment of retinal problems associated with diabetes.

Gary Robert Pineliness, B.S. '77 (Chemistry) is a partner in Cardiology Associates in Highland Park, IL. He received his MD at the Pritzker School in Chicago and completed a fellowship in internal medicine and cardiology at the Mayo Clinic in Rochester, MN.

Brian Richardson, Ph.D. '72 (Chemistry with Gutowsky) was promoted to Chief Scientific Officer of the Forensic Laboratories of the Royal Canadian Mounted Police.

James E. Roberts, B.S. '77 (Chemistry) has been promoted to associate professor of chemistry at Lehigh University in Bethlehem, PA. Professor Roberts earned his Ph.D. at Northwestern University and completed a postdoc at M.I.T.

Nancy L. Sasavage, B.S. '75 (Biochemistry) is the new editor of *Clinical Chemistry News,* a monthly news publication of the American Association for Clinical Chemistry, Inc. Dr. Sasavage received her Ph.D. in biochemistry from Michigan State University.

Michael A. Sass, B.S. '78 (Chemistry) has attained board certification in Cytopathology. He received his MD degree from the University of Illinois and completed a residency in Anatomic and Clinical Pathology at the Cleveland Clinic Foundation.

Mark A. Seifrid, B.S. '75 (Chemistry) has been named assistant professor of New Testament Interpretation at Southern Baptist Theological Seminary in Louisville, KY. Professor Seifrid earned a Ph.D. from Princeton Theological Seminary.

Barbara Unger, B.S. '73 (Chemistry) received the Gold Award at Hybritech Inc. research and development. Ms. Unger is research manager for the imaging and therapeutics research and development division.

Peter Wolff, B.S. '76 (Chemistry) received his MD from Northwestern University in 1980. Dr. Wolff is board certified in general surgery and a Fellow of the American College of Surgeons.

'80 **Hatem M. Al-Mosa,** B.S. '84 (Chemical Engineering) is a senior plant engineer for Amoco Sharjah Oil Co. in Houston, TX, where he has worked for the last seven years.

Daniel C. Alsmeyer, B.S. '85 (Chemical Engineering) completed a Ph.D. in chemistry from Ohio State University in 1992. He is an advanced research chemist with Eastman Chemical Company in Kingsport, TN.

Andrew S. Aronson, B.S. '89 (Chemical Engineering) is a process engineer with Griffith Laboratories in Alsip, IL.

Kurt Carlsen, B.S. '82 (Chemical Engineering) is regional manager of applied technology in Merchant Gases at Liquid Air in King of Prussia, PA.

Kevin Cleary, B.S. '82 (Chemistry) was appointed to the medical staff of Resurrection Medical Center in Park Ridge, IL. He received his MD degree in 1986 from the U. of I. College of Medicine and completed a residency at Lutheran General Hospital.

Mike Diebold, B.S. '83 (Chemistry) is a senior chemist working on catalyst synthesis and characterization in the Du Pont Corporate Catalysis Center. He received a Ph.D from Texas A & M and completed a postdoc in Cambridge, ENGLAND.

Donald Estes, Ph.D. '82 (Chemistry with Secrest) has been appointed Assistant Professor of Chemistry at Wilson College in Chambersburg, PA.

Nat Finney, B.S. '88 (Chemistry) in currently in his fifth year of graduate studies at Cal Tech.

Tom Fitzsimmons, B.S. '87 (Chemical Engineering) is currently in his third year of part-time law school at Loyola University in Chicago. He has been appointed an associate with Fauske and Associates, Inc. in Burr Ridge, IL.

John L. Fox, B.S. '83 (Biochemistry) completed his MD degree at Johns Hopkins Medical School in 1989. He also completed a pediatric residency at Johns Hopkins Hospital in Baltimore, MD. He will be spending the next two years in Indian Health Service on Rocky Boy Agency in MT.

Kira M. Glover, M.S. '86 (Chemistry) has been appointed Vice Consul in Stuttgart, GERMANY. She is working for the U.S. State Department at the American Consulate.

Clifford L. Gunter, B.S. '81 (Chemistry) has joined the law firm of Querrey & Harrow, Ltd. in Chicago, IL. He received his J.D. degree from Loyola University School of Law in 1988.

William Hammack, Ph.D. '88 (Chemical Engineering with Drickamer) won the 1992 Exxon Fellowship Award in Solid State Chemistry given by the Division of Inorganic Chemistry of the ACS. Dr. Hammack is currently at Carnegie-Mellon University.

Heidi Hartman, A.B. '84 (Biochemistry) is an environmental scientist at Argonne Laboratories.

Robert A. Haupt, B.S. '83 (Chemistry) is a development chemist with Dyno Polymers (Minnesota) Inc. He graduated with an M.S. in Forest Products from Mississippi State University in 1992.

Curt Hicks, B.S. '80 (Biochemistry) has been appointed program director at Community Response, an Oak Park-based AIDS service agency. He obtained a master's degree in social work from George Williams College in Downers Grove in 1985.

Robert A. Hines, B.S. '85 (Chemical Engineering) is currently in a management rotation program at H.B. Fuller Company in St. Paul, MN. In 1992, he completed an MSM (MBA) degree at Purdue University.

Kevin E. Howard, Ph.D. '88 (Chemistry with Rauchfuss) was promoted to project leader at Dow Chemical Company. In 1992 he received a Special Recognition Award for work in aluminum nitride surface chemistry.

Gregory Knudson, B.S. '82 (Chemistry) has joined a medical practice in Ohio. He received an MD degree from the University of Illinois and served a six-year residency at the University of Illinois Hospital and Medical Center in Chicago.

Philip J. Koerner, Jr. Ph.D. '88 (Chemistry with Nieman) is a research chemist in R & D at Du Pont.

David Loffredo, B.S. '84 (Chemistry) is a chemist at Argonne Laboratory in Lemont, IL.

Peter J. Ludovice, B.S. '84 (Chemical Engineering) has been appointed Assistant Professor in the School of Chemical Engineering of the Georgia Institute of Technology.

Brian J. Mork, Ph.D. '88 (Chemistry with Scheeline) is with the air force in Spokane, WA.

Milan Mrksich, B.S. '89 (Chemistry) is in his fourth year of graduate work at Cal Tech. He has accepted a postdoc position at Harvard University.

Janice L. Musfeldt, B.S. '87 (Chemical Engineering) is completing a postdoc in the Department de Physique at the Universite de Sherbrooke in Sherbrooke, Quebec, CANADA.

Kevin T. Pohlschmidt, B.S. '87 (Chemistry) is a senior sales rep in the Performance Chemicals group of BASF Corp.

Navy Lt. Anne M. Roper, B.S. '83 (Biochemistry) recently returned aboard the salvage ship USS Hoist from a five-month deployment to the Mediterranean Sea.

Janet Ruhl, B.S. '87 (Chemistry) received a Ph.D. from the University of Delaware in 1992 and is working for Du Pont Ag Products.

Laura Saelinger, B.S. '85 (Biochemistry) received her M.D. degree in 1989. She completed a residency in Internal Medicine at University Hospitals/Case Western Reserve in Cleveland and has been appointed to the faculty of the University of Chicago. She is assistant professor of clinical medicine.

Patricia Tiernan, B.S. '83 (Chemistry) has opened a medical practice in obstetrics and gynecology in the Bourbonnais MedCentre. She took her MD at the University of Illinois in Chicago and completed a residency at the University of Illinois in Chicago.

Mark A. Tracy, B.S. '86 (Chemical Engineering) reports that he received a Ph.D. in chemistry in 1992 from Stanford University. He is a research scientist and project leader with Enzytech Controlled Release Therapeutics of Cambridge, MA.

Hans Hoffman Truong, B.S. '88 (Biochemistry) received an MD degree from the Pritzker School of Medicine at the University of Chicago. He is a resident in radiology with the University of Texas at Houston.

Steven Paul White, Ph.D. '88 (Biochemistry with Phillips) is a senior scientist at DNX of Princeton, New Jersey, a biotechnology company specializing in transgenic animals.

Ellen E. Yerger (formerly Heininger) M.S. '84 (Chemistry) is currently a postdoc at Penn State University, investigating natural levels of resistance to a nuclear polyhedrosis virus by gypsy moths.

'90 C.A. Bye, Ph.D. '93 (Chemistry with Scheeline) was one of the authors of a paper that won the 1992 W.F. Meggers Award from the Society for Applied Spectroscopy. She is presently a postdoc at Indiana University.

Tamara Haseley, B.S. '90 (Chemistry) graduated from St. Francis Hospital Center School of Medical Technology in Beech Grove, IN.

Carol Lamberson, Ph.D. '91 (Chemistry with Zimmerman) is working at Sandoz Pharmaceutical Company where she is helping to start up a new oncology research program. She completed an NIH postdoc at Brown University.

Mary M. Lee, B.S. '92 (Chemical Engineering) is a project engineer with International Paper Company in Vicksburg, MS.

Cheryl L. Quinn, Ph.D. '91 (Biochemistry with Switzer) received the 1993 Anne A. Johnson Work Award for outstanding scholarship and research by a woman graduate student in biochemistry. Dr. Quinn is currently a postdoc in the Molecular Immunology Group in the Institute of Molecular Medicine at Oxford University.

Rebecca Rynders, Ph.D. '93 (Chemical Engineering with Alkire) is working for Air Products in Allentown, PA.

S.W. Rynders, Ph.D. '91 (Chemistry with Bohn) was senior author on a paper that won the 1992 W.F. Meggers Award, given by the Society for Applied Spectroscopy. He is now with Air Products in Allentown, PA.

Kurt Schultz, Ph.D. '92 (Chemistry with Rauchfuss) is working with Intel in Oregon.

KEEP IN TOUCH

Return to: Ellen Handler
SCS Alumni Newsletter
103 Noyes Laboratory
505 S. Mathews
Urbana, IL 61801

■ If you know someone who would like the newsletter and is not receiving it, please send address.

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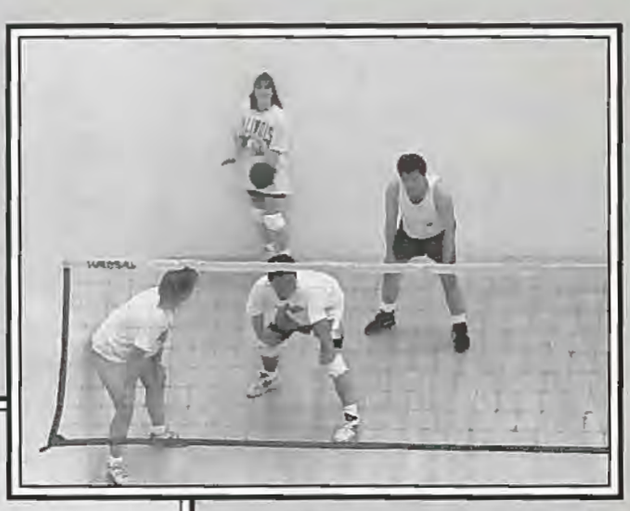
Student Affairs

The AIChE "wallyballers" have been playing about once a week all spring. There are sufficient enthusiasts for about two teams but the group is fluid and only a fraction turn out for each game.

There is no captain, and an open invitation has been extended to anyone who wants to play regardless of level of experience. To get a good game, the members switch sides until the talent is evenly distributed. Walleyball at AIChE is synonymous with non-competitive evenings of fun.



Play Ball

Taking a Break

◀ Left to Right.
Top: Steve Murphy, Jamie Long. Middle: Chad Hines, Eric Sweeney, Dan Kanemori, Ryan Wiggans, Melissa Stangeland, Angie Grygiek. Bottom: Dan Nielsen, Marsha Demers.

SCS Alumni Newsletter
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