UK ChemNews

Department of Chemistry, University of Kentucky, Fall 1994

MESSAGE FORM THE NEW CHAIRPERSON, DON SANDS

On July 1, 1993 Bob Guthrie went on to a well-deserved sabbatical at Oak Ridge National Laboratory, and I succeeded him as chairperson. Bob, as you may recall, chaired the Department from 1983 to 1987; it was Dave Watt's turn from 1987 to 1991, then Bob came back for another two years. I have followed Bob's wise example of agreeing to sit in this office for only two years, so someone else's sentence will begin July 1, 1995.

I came into this office under a cloud of impending budget cuts. The University had already withheld 2 percent of what we were supposed to get, and we were bracing for an additional cut of as much as 6 percent in the budget we were already spending. Fortunately, the Governor found money buried in his backyard, and we were spared the trauma of massive layoffs and termination of programs. Relief over averting what could have happened made the actual decrease of 2 percent seem like a ray of sunshine.

Why would anyone agree to chair a department under such a dismal financial outlook? Psychiatrists have a name for that. But, really, the Department of Chemistry has incredible strength and almost unlimited promise. Stan Smith and I arrived together in 1962, and we have seen many changes. Financial stringencies are nothing new to UK and to this Department, but somehow they have not been allowed to cripple our basic missions. The two years I spent at the National Science Foundation gave me great appreciation of how well the University of Kentucky is managed. In spite of the budget problems, and the departures of good colleagues, and the vagaries of Kentucky politics, this University and this Department have continued to get better! We have outstanding faculty, wonderful staff, and excellent students, and altogether this is a great environment in which to work and study.

Before I consented to chair the Department, I checked with Jim O'Reilly and Bob Kiser and made sure that they would continue in their respective roles of Director of Graduate Studies and Director of General Chemistry. Their acquiescence made the job of chairman seem possible, and their dedication to quality is revealed every day in everything they do.

I failed to elicit a promise of allegiance from our business manager, though, and Larry Scheurich left us in December to help the Chancellor manage his vast resources. Larry, one of our own graduates, had served us for nearly twenty years, and things ran so smoothly under his gentle direction that we just took him for granted. It is reassuring, though, that the Chancellor's affairs will be in such good hands. And we were fortunate in having a capable replacement for Larry on our staff; Debra Shambro had been our computer analyst for three years, and she has been adapting to the business manager's job with the speed of light.

Other staff departures in the past few months were chief storekeeper Ramon Smith and laboratory supervisor Darla Hood (director of freshman labs). Ted Jenkins became our chief storekeeper; Greg Blanchard took over temporarily for Darla, and Francois Botha became the permanent laboratory supervisor in August.

A big relief for me (and for everyone else) is that Nancy Stafford, the Department's housemother, is providing continuity in the musical chairs of the chairman's office. Nancy was recognized recently with a College of Arts and Sciences staff award.

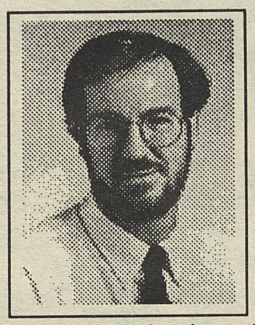
Two faculty members left the University since the last newsletter. Tom Guarr is seeking his fortune in industry, and John Richard was recruited away by another university whose name we shall never mention. We have, though, been able to add five truly outstanding assistant professors to our department. Roger Grev (theoretical chemistry) and Robert Toreki (inorganic) came in Fall 1993. Sylvia Daunert (analytical) moved from a research appointment into a regular faculty position in January 1994. This fall we were joined by Haibin Deng (inorganic) and Robert Grossman (organic).

Other articles in this newsletter describe some of the scholarly accomplishments of the faculty, and we are proud of the contributions these colleagues are making to the science of chemistry. We are equally proud of the high standard of teaching and concern for students exemplified by our faculty. This fall we are offering two experimental sections of general chemistry, incorporating recitation and laboratory experience along with the lectures; if you graduated a long time ago, you will be comforted by this return to the practices of the past. In another project, the Department is cooperating with the other colleges and universities of Kentucky to bring about systemic change in undergraduate chemistry education; this will involve examining just what all the people who take

chemistry courses ought to learn, and restructuring our courses and curriculum for the twenty-first century.

It is important to us to hear what you are doing, so please stay in touch with the Department. And, if possible, come to visit. A disruptive renovation of the air-handling system, still underway, has added six chimneys to the building, giving the appearance of a steamship departing from the Port of Lexington. Inside, you will find a remodeled library, a computer lab containing more than 40 state-of-the-art computers for everyone's use, and lots of activity.

NEW FACULTY



Roger Grev. Following his graduation from the University of Minnesota at Morris, Roger left for California where he received the Ph.D. with Professor H. F. Schaefer, noted theoretical chemist at Berkeley. When Professor Schaefer moved to the University of Georgia, Roger moved with him as a postdoctoral fellow. Roger came to U.K. in August 1993 as Assistant Professor, and is continuing research in theoretical chemistry. His interests include ab initio quantum mechanical studies, theoretical thermochemistry, silicon and germanium chemistry, natural orbital based multi-reference configuration interaction methods, chemical bonding models, and core correlation effects. Roger's productivity may be gauged by the forty-four research publications of which he is author, by the fact that he is Assistant Editor of The Journal of Computational Chemistry, and by the fact that he (and his wife of eight years, Donna Toft) are the parents of son, Casey, age 4 and daughter Celie (pronounced Selegue), age 2.

Robert Toreki. Rob joined our faculty in June, 1993 as an Assistant Professor. His research career started at Cornell University, where he earned an A.B., magna cum laude, in 1987, the year in which his bachelor's thesis with Professor Peter Wolczanski was published in the Journal of the American Chemical Society. He earned the Ph.D. with Professor Richard Schrock at M.I.T. in 1991 working on rhenium-based olefin metathesis catalysts. He was a National Science Foundation postdoctoral fellow with Professor Kenneth Poeppelmeier at Northwestern University, where he worked on superconducting materials, before joining the faculty at U.K. His current research is centered on the study of three-dimensional inorganic and organometallic framework polymers. Rob brings exceptional strength in the area of materials science to the department.

Sylvia Daunert. Sylvia was appointed Assistant Professor of Chemistry at UK in January, 1994. She was awarded the Pharm.D. degree in 1982 from the University of Barcelona, the M.S. degree in Medicinal Chemistry from the University of Michigan in 1985

and the Ph.D. in BioAnalytical Chemistry from the University of Barcelona in 1991. She came to Lexington in 1986 with her husband, Leonidas Bachas, and served as Research Associate, Research Fellow and Assistant Research Professor until her current appointment. They are the parents of Stephanie, 5, and Philip, 3. Sylvia is a member of the executive committees of two national ACS committees, the Younger Chemists Committee and the International Activities Committee. She is the author of almost thirty research publications. In 1992 her research was recognized by the Juan Abello Pascual Award in Biochemistry from the Spanish Royal Academy of Doctors and the Van Slyke Society Research Award. Her research group, already at five, is using recombinant DNA technology to develop new bioanalytical techniques.

Haibin Deng. Haibin joined our faculty in the fall of 1994. Following his undergraduate education at Fudan University in Shanghai, he joined Professor Sheldon Shore's research group at Ohio State University, where he earned the Ph.D. in 1991 with an award-winning dissertation on lanthanide heterometallic complexes. At Cornell University where he was a Postdoctoral Fellow, he worked with Professors Roald Hoffmann and Frank DiSalvo. The breadth of his education and experience in inorganic chemistry is reflected in his research interests: solid state materials, organometallic chemistry and molecular orbital calculations.

Robert B. Grossman. Bob joined our faculty in the fall of 1994. Bob graduated magna cum laude from Princeton in 1987. He earned the Ph.D. from M.I.T. in 1992 on an NSF Fellowship. His dissertation under Professor Stephen Buchwald was titled "Organic Synthesis via Group 4 Metallocene Complexes". He was a NATO Postdoctoral Fellow with Professor Steven Ley at Cambridge University working on the total synthesis of azadirachtin. His interest in synthetic methodology will be continued at UK as he works on developing novel reagents (with and without metals) and new reactions.

YATES WINS MULTIPLE HONORS

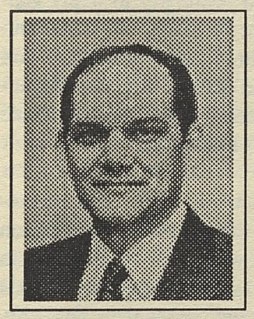
Steve Yates was featured in the last ChemNews for his activities outside the Department. Steve has now won the equivalent of the Triple Crown on the UK campus. In 1992 he was the recipient of the Chancellor's Award for Outstanding Teaching, which carries a permanent salary increase of $3000 per annum, and a University Research Professorship, which provided a year's research

leave. Last year the faculty of the College of Arts and Sciences elected him Distinguished Professor of the College for 1993-94. This honor, the highest professional recognition offered by the College, is bestowed on the basis of three criteria: unusually effective teaching, outstanding scholarship, and service to the University and profession. Steve delivered the Distinguished Professor Lecture on "Nuclear Shapes: From the Mundane to the Exotic" in February 1994 and will take the semester's research leave that comes with the award in the spring semester of 1995. The list of Distinguished Professors goes back to 1944 and includes Lyle Dawson and Bill Ehmann of this Department.

At the University commencement in May, Steve received the 1994 William B. Sturgill Award from President Wethington. This $2000 prize annually recognizes the member of the faculty who has made the most outstanding contributions to graduate education at UK.

Steve Yates has now won all the top prizes on campus in teaching, research and all around excellence. The Chemistry Department is proud to claim this outstanding teacher-scholar.

JIM HOLLER, GREAT TEACHER



The UK Alumni Association each year selects two or three faculty members from the Lexington Campus as Great Teachers. Jim Holler of the chemistry faculty was named a Great Teacher in the spring of 1993. This award derives its prestige from the fact that it is the oldest award on campus and the only one based on nominations by students. The winners are selected by a committee of students and members of the Alumni Association. Jim joins the group of previous award winners from the department, perhaps the most of any department of campus: Dave Watt (1991), Paul Sears (1980), and Joe Wilson (1975).

Jim's strengths as a master teacher are many. He is author or co-author of six textbooks on analytical chemistry. The first, "Experiments in Electronics, Instrumentation, and Microcomputers, by Holler, Avery, Crouch, and Enke, appeared in 1982 and was based on laboratory experiments developed at UK. In 1988, Holler joined Doug Skoog of Stanford University and Don West of San Jose State University to update their classic text for undergraduate analytical chemistry: "Fundamentals of Analytical Chemistry", fifth (1988) and sixth (1992) editions, and "Analytical Chemistry: An Introduction", fifth (1990) and sixth (1994) editions. Favorable reviews and adoptions by more than five hundred colleges and universities across the country testify to the effectiveness of the books. Jim is the sole author of his latest text "Mathcad Applications for Analytical Chemistry", which was published in May of 1994.

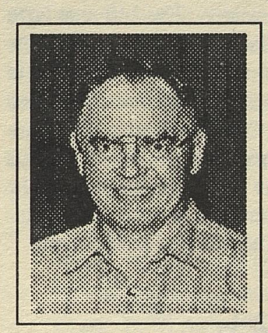
Jim has been instrumental in introducing computer and video technology into the large lecture classes. His request to the Dean brought us a large-screen video projector and a computer for use in the large lecture hall, room 139. The equipment is used to project demonstrations, video tape and video disk images, and computer graphics so that all students can see them. Jim played a major role in the establishment of the library's computer lab in room 148 of the Chemistry-Physics Building.

Jim has inaugurated several new courses in the department. Chemical Instrumentation, CHE 524, a laboratory course designed to teach chemical instrumentation, electronics, and computers, was set up by Jim and has become a popular staple in our course offerings. He has taught this course as a short course at several ACS national meetings as well as at the Pittsburgh Conference. The response to his special topics course for high school teachers, CHE 602, has been enthusiastic.

In the classroom, Jim's greatness becomes apparent. He makes special efforts to reduce the impersonal nature of his large lecture classes in general chemistry by requiring a brief personal appointment with each student after the first examination in the course. Often during the first one or two class meetings in a course, he will ask the students to step before a video camcorder, tell their name, where they are from, and something about themselves. Throughout the semester, he regularly views the tape to learn the students' names and to recall any special circumstances that they may have. Jim's classroom manner is characterized by humor, great competency, and caring. An undergraduate columnist in the Kentucky Kernel had the following to say about his experience in Holler's General Chemistry course. "Professor Holler ... may be the best professor I have ever had. He took a difficult subject and explained it in a way that was easier to understand — and he made learning fun."

RETIREMENTS

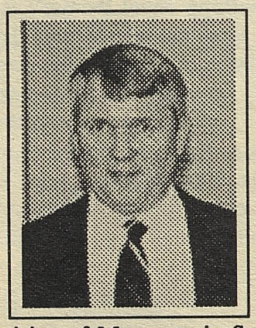
With the retirement of John Patterson, Audrey Companion and Claude Dungan in May of 1993, the department lost almost 70 years of experience at the university.



John Patterson came to U.K. in 1954 after doctoral and post-doctoral work at Northwestern University. He was promoted to full Professor in 1967. In his almost forty years at U.K. he published 75 papers dealing with the chemistry of nitro and heterocyclic compounds, high temperature reactions of organic molecules, and photochemical reactions in solution. Seventeen students received graduate degrees under his supervision in that period. John was a popular teacher in the basic organic courses; thousands enjoyed studying CHE 230, 232 and 236 with him. Most of John's students didn't know that he lived in the fast lane. His interest in fast cars, motor-

cycles and small airplanes continues from high school days to the present. Much of his time in retirement is devoted to restoring and flying old planes. He also does some gardening, an indication that he may no longer be living quite as close to the edge as he once did.

In 1975 **Audrey Companion** moved to U.K. from Chicago where she had taught at Illinois Institute of Technology for fifteen years. She earned B.S., M.S. and Ph.D. degrees and was a postdoctoral fellow with Professor R. G. Parr at the Carnegie Institute of Technology (now Carnegie Mellon University). A full Professor since 1976, Audrey has published almost 50 papers dealing with theoretical chemistry in the solid state. Her book, "Chemical Bonding" , which was issued in a second edition by McGraw Hill in 1979 and translated to three languages, won an award for its record sales. In 1988 she won the ACS Stone Award sponsored by the North-Carolina-Piedmont Section in recognition of outstanding achievement in chemistry. Although retired, Audrey is still actively involved in research with students and visiting scientists. Her two snauzers appreciate the increased attention they get now that she no longer must meet classes.



Claude Dungan, research analyst, retired in May, 1993 after twelve years of service to the department in two separate installments. Claude was raised in Pennsylvania and majored in agriculture at Pennsylvania State University. After working for two years with a small manufacturing company in Pittsburgh, he joined the Monsanto Company in Dayton in 1959. In 1960 he moved to the Central Research Division of Monsanto in St. Louis, where he worked as an NMR spectroscopist with Dr. John Van Wazer. During that fruitful period he published several papers and co-authored two books. His Kentucky heritage brought him back to central Kentucky in 1969 to join the Chemistry Department as full-time research analyst and part-time farmer. He was in charge first of the Mass Spectrometry Center, and then of the NMR center. The 240-acre farm finally squeezed out chemistry and Claude returned to full-time farming in 1974. Chemistry was glad to get him back again in 1986, when he returned to the NMR center. Parkinson's disease finally led to his retirement in 1993. Claude's wealth of knowledge, his gentle firmness and his patience with all who needed his help are missed. He has returned to the home that he built on the family farm. In June of 1993 his outstanding service to the University was recognized with an A&S Outstanding Staff Award.

OBITUARIES

Ellis V. Brown, 83, Professor Emeritus, died in May of 1992. In 1959, Ellis became Professor and Director of General Chemistry at U.K., where he worked until his retirement in 1975. His academic research led to well over 100 publications. He is perhaps best known for his work on the structure-activity relationships in carcinogenic azo dyes, but he also did significant work on the mechanisms of the Willgerodt and Meisenheimer reactions. He was a fellow of the American Association for the Advancement of Science and the New York Academy of Sciences.

A native of Montreal and a 1930 graduate of the University of Illinois, Ellis received a Ph.D. in organic chemistry at Iowa State in 1936. After one year as an instructor at Iowa State, he joined Charles Pfizer & Co. as a research chemist and group leader. While at Pfizer, he played an important role in the structural studies and commercial development of penicillin. His work at Pfizer also resulted in a number of patents related to glucose and riboflavin derivatives. In 1947, Brown left Pfizer to serve as Associate Professor at Fordham University, New York City, until 1953, when he became Professor and Head of the Chemistry Department at Seton Hall University, South Orange, N.J. Survivors include his wife, the former Dorothy Cheek of Nicholasville; three daughters and a son, a sister, and five grandchildren.

Rodney E. Black, 76, Professor Emeritus, died in February of 1993. Rodney, earned the B.S. degree from Oklahoma State University in 1938, and M.S. (1940) and Ph.D. (1942) degrees from the University of Wisconsin. He worked as a research chemist for Allied Chemical and Dye Corporation and Phillips Petroleum Company before entering the teaching profession at Morningside College in Sioux City, Iowa in 1947. He came to U.K. as Associate Professor in 1951. Trained as a physical chemist, Rodney taught physical and general chemistry to many generations of students until his retirement in 1981. To some students, among them the best, he was a stimulus to work to their full potential. His curiosity about the world around him was boundless. In retirement he often attended seminars and prowled the library. His daughter, Rhodora, lives in Lexington.

William A. O'Brien died in September, 1993. Bill was retired from two jobs. He retired from the Celanese Corporation after working for them for 26 years as a chemist specializing in microscopy and quality control. From 1975 until he retired again in 1985, he was the department's computer specialist. His wife, Anne, resides in Lexington.

EHMANN, HERTY MEDALIST

In Atlanta on May 12 Bill Ehmann delivered the award lecture and received the 1994 gold Herty Medal of the Georgia Section of the ACS. The Herty Medal gives "public recognition to the work and service of outstanding chemists who have contributed to their chosen field". "All men and women in academic, governmental or industrial laboratories in VA, WV, KY, TN, MS, LA, AL, GA, FL, NC, and SC are eligible." Charles Herty was chairman of the chemistry department at the University of North Carolina, first president of the ACS, editor of the Journal of Industrial and Engineering Chemis-

try, president of the Synthetic Chemical Manufacturers Association and was involved with F. P. Garvin in founding the National Institutes of Health.

Ehmann, a native of Madison, Wis., received bachelor's and master's degrees from the University of Wisconsin and a doctorate from the Carnegie Institute of Technology. He came to UK in 1958. In the 1960s, Ehmann was one of the first people to get lunar samples to study. In more recent years, Ehmann's research has focused on the possible relationships between trace elements and disease, particularly Alzheimer's disease. He is studying the relationship of dental amalgam exposure, brain mercury levels and Alzheimer's disease pathology in a group of nuns who are members of Sisters of Notre Dame. *(Excerpted from the Lexington Herald-Leader.)*

FACULTY PROFILES

Dr. Carolyn P. Brock

received the B.A. in chemistry from Wellesley College and the Ph.D. from Northwestern University with Professor James Ibers. She joined the faculty of the University of Kentucky as Assistant Professor in 1972 and is now full Professor in the Department of Chemistry. She has held visiting faculty positions at the Swiss Federal Institute of Technology in Zurich and at Northwestern University and several leadership positions in the American Crystallographic Association and the U.S. National Committee for Crystallography. Carol has been chosen to receive a Wellesley Alumnae Achievement Award. She thus becomes a member of a very distinguished group of Wellesley alumnae whose achievements warrant high honor and recognition.

Since arriving at the University of Kentucky twenty-two years ago, Carol Brock's research has focused on questions involving the arrangements of molecules in crystals. How do molecules organize themselves to form crystals? How does the molecular symmetry influence the symmetry of the crystal? To what extent can the crystalline environment affect the observed geometry of molecules? Can the arrangements of molecules in crystals be predicted? Can crystals be sucessfully designed? The main techniques used to investigate these questions have been single-crystal X-ray diffraction, semi-empirical energy calculations, and manipulations of crystallographic databases.

Carol began by investigating instances in which the crystalline environment apparently stabilizes a molecular conformation, or even a linkage isomer, that would not be found in substantial concentrations in solution. Most information about molecular geometry has come from crystal-structure determinations, but how reliable is that information if the crystalline environment can influence molecular structure? A number of different lines of reasoning lead to the conclusion that favorable intermolecular interactions in a crystal can provide up to *ca.* 20 kJ/mol to offset the energy required to hold a molecule in an unfavorable conformation. If ions or intermolecular hydrogen bonds are present the energy available can be even greater. Cases of stabilization in a crystal of a higher-energy molecular conformation are usually obvious; *e.g.*, Ph_5Sb is found to have square-pyramidal geometry while a number of other Ar_5M, M=P, As, Sb molecules have the expected trigonal-bipyramidal geometry.[1] But Carol demonstrated that crystal-packing effects can sometimes be systematic.[2] Biphenyl derivatives with H atoms in all four *ortho* positions are expected to be twisted (as they are in solution and in the gas phase) because the H...H repulsions are more important than the conjugation energy, but biphenyl fragments are much more likely to be planar or nearly planar in the crystal than would be expected on the basis of energy considerations.

As crystallographic databases were developed it became possible to address more general questions of crystal packing. There has been a long-standing belief, quoted in some organic textbooks, that racemic compounds (*e.g.*, D,L-alanine) are denser and more stable (larger DH_{sub}) than their chiral counterparts (*e.g.*, L-alanine). An examination[3] of 129 matched chiral/racemic pairs retrieved from the Cambridge Structural Database led to the conclusion that this rule, while true, has no predictive power; rather, it is a consequence of the circumstances necessary for isolation of both members of the pair. If a specific compound does *not* follow the rule, then the racemic compound will not be isolable, and the compound will not be found on the list of pairs.

Recently Carol and her group discovered that monoalcohols C_nH_mOH are *much* more likely to crystallize in high-symmetry (especially trigonal and tetragonal) space groups than are molecules in general.[4] This unexpected result is a direct consequence of the geometric relationships between O atoms that are necessary for hydrogen-bond formation. Because space-groups without inversion centers are much more common in high-symmetry groups, this result suggests an approach for increasing the probability of discovering molecular nonlinear optical (NLO) materials.

The effect of molecular symmetry on crystal packing is another question under investigation in Carol's group. The symmetries of molecular crystals are usually low while the symmetries of inorganic solids and metals are usually high. This difference may not, however, reflect any basic difference in the rules that govern crystal packing in the two kinds of solids, but may rather be a consequence of the symmetries of the constituent molecules and ions. Most molecules are asymmetric while most inorganic materials are composed of at least moderately symmetric ions. Moreover, molecular solids composed of very regular molecules like adamantane, cubane, dodecahedrane, and Buckminsterfullerene crystallize in trigonal, tetragonal, or cubic groups while complex inorganic materials often crystallize in low-symmetry groups. Carol has addressed these types of questions in a review article on space-group frequencies.[5]

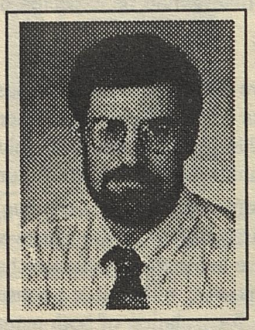
1 C. P. Brock, "Lattice Energy Calculations for $(C_6H_5)_5M.1/2C_6H_{12}$, M=P, As, and Sb: Towards an Understanding of Crystal Packing in the Pentaphenyl Group V Compounds", *Acta Cryst.* **1977**, *A33*, 898-902.

2 C. P. Brock and R. P. Minton, "Systematic Effects of Crystal-Packing Forces: Biphenyl Fragments with H Atoms in All Four Ortho Positions", *J. Am. Chem. Soc.* **1989**, *111*, 4586-4593.

[3] C. P. Brock, W. B. Schweizer and J. D. Dunitz, "On the Validity of Wallach's Rule: On the Density and Stability of Racemic Crystals Compared with Their Chiral Counterparts", *J. Am. Chem. Soc.* **1991**, *113*, 9811-9820.

[4] C. P. Brock and L. L. Duncan, "Anomalous Space-Group Frequencies for Monoalcohols C_nH_mOH", submitted to *Chem. Mater.* (special issue on organic solid-state chemistry).

[5] C. P. Brock and J. D. Dunitz, "Towards a Grammar of Crystal Packing", submitted to *Chem. Mater.* (special issue on organic solid-state chemistry).



Dr. J. David Robertson was appointed Assistant Professor in the Department of Chemistry at UK in 1989. He was educated at the University of Missouri (B.S. 1982) and the University of Maryland (Ph.D. with Professor W. B. Walters, 1986). He was a postdoctoral fellow at the Lawrence Berkeley Laboratory from 1987-89. The Chemistry Department was delighted to learn of his promotion to Associate Professor with tenure in May, 1994.

Dave's research is focused on the development of radionuclear methods of analysis and the subsequent application of these techniques, in a multidisciplinary fashion, to fundamental problems in a variety of areas. The common theme that links research projects in areas as diverse as materials science, environmental chemistry, mining engineering, and pharmacology is the use of the unique properties of the nucleus to investigate problems that frequently cannot be addressed in any other way.

The majority of his work is centered around ion beam analysis (IBA). In "high-energy" ion beam analysis, the atomic and nuclear reactions that occur when a mega-electron-volt ion beam strikes a target are utilized to perform both material composition and spatial distribution studies. The IBA facility that he has developed at the UK Van de Graaff accelerator laboratory is capable of performing simultaneous particle-induced X-ray (PIXE) and gamma-ray emission (PIGE) analysis, Rutherford backscattering spectroscopy (RBS), and nuclear reaction analyses. The special features of these techniques include their speed, sensitivity, and versatility. Often, one or more of the IBA techniques can be used to fully characterize a sample in a single, short irradiation. Moreover, the measurements can frequently be conducted instrumentally; the sample can be introduced to the beam and analyzed without any chemical pretreatment or matrix reductions. Robertson is currently using the IBA system at UK to:

Investigate the trace-element content of the bone tissue of Alzheimer's disease (AD) patients. One hypothesis regarding the etiology of AD is that trace-elements act as neurotoxins in the pathogenesis of the disease. For obvious reasons, the majority of research in this area is focused on trace elements in the central nervous system tissues. The evidence from these studies is, however, often conflicting and no firm conclusion regarding this hypothesis has been reached. In order to further understanding of the role of trace elements in dementing disorders, he is studying the trace-element composition of bone tissue from AD patients. Because bone tissue acts as a "repository" for many of the trace elements that have been implicated in AD, these analyses provide information on the long-term trace-element status of an individual. Preliminary results from 16 control and 15 AD patients indicate that Mg, P, Zn, Br, Rb, and Sr may be imbalanced in the bone tissue of AD subjects.

Investigate the environmental impact of the by-product from the Coolside dry flue gas desulfurization process for removal of SO_2 from coal fired power plant emissions. The Coolside technology is an attractive option as it can be readily implemented as a retrofit to existing power plants. However, before the process can be employed commercially, the environmental impact of the disposal of Coolside waste must be assessed. As part of this assessment, the Robertson group is studying both the chemical composition and field and laboratory leaching properties of the Coolside solid waste.

Investigate high-temperature reactions on graphite substrates. Heated graphite substrates are used in numerous disciplines including analytical chemistry, combustion chemistry, and catalysis. The nature and extent of reactions on the surface of heated graphite substrates are, however, not fully understood. For example, graphite furnace atomic absorption spectrometry (GF-AAS) is one of the most commonly used techniques for ultra-trace elemental analysis. This technique is, however, often plagued by various matrix interferences. These interferences are generally minimized by the addition of matrix modifiers such as ascorbic acid, nickel, palladium, and ammonium hydrogen phosphate. While these matrix modifiers greatly improve the detection limits, the chemistry involved in the signal enhancement process is unclear. Prior investigations into the gas phase chemistry above the substrate in GF-AAS have emphasized the need to focus research efforts on the graphite surface in order to understand the processes responsible for the atomization and interference phenomena. He is using RBS to investigate, *in situ*, these reactions on pyrolytically coated graphite substrates. These measurements are providing us with information about the stoichiometry of the compounds formed, the interaction between the substrate and the surface compounds, and the mobility of the compounds on the surface of the substrate as a function of temperature.

Examine the interaction of molecular oxygen with thin C_{60} films using a resonant alpha scattering reaction to measure the concentration profile of oxygen in the fullerene films. The group has observed that C_{60} films that are exposed to about 1 atm. of O_2 for 1 h in the *absence* of light will only form a thin surface oxygen containing layer whereas, when C_{60} samples are irradiated for 1 h with either a 488 nm Ar ion laser or Xe lamp in the presence of 1 atm. of O_2, oxygen is found to be uniformly distributed throughout the entire film. This oxygen uptake is found to be both power dependent and re-

versible. Moreover, all of the experimental evidence to date indicates that the interaction does not result in the formation of a new chemical species but rather in molecular oxygen being physisorbed in the octahedral sites of the fullerene lattice. In order to understand further this intriguing phenomena, Dave is planning to investigate the wavelength and temperature dependence of the oxygen uptake and to explore the interaction of other gases with fullerene films.

In addition to the IBA work, Dave has employed radionuclear techniques to develop a new method for (1) determining the absorption rates of transdermal drug (TDD) systems and (2) measuring airflow rates in abandoned mines and other inaccessible mine workings. Traditionally, the absorption rates of TDD systems are determined *in vivo* by radiotracer labelling techniques or are estimated *in vitro* using excised skin and a diffusion cell. He has recently demonstrated that X-ray fluorescence can be used as a simple, noninvasive technique to measure the absorption rates of transdermal compounds *in vivo*. This new system is currently being used to investigate the effect of penetration enhancers on transdermal absorption and to follow the release of proteins from subdermal implants.

There are currently over 100 underground fires in abandoned mines in the U.S. Prior to any remedial action to control or extinguish a fire, underground conditions must be evaluated so that the most effective control method can be utilized. Robertson has developed a radioactive tracer method to measure airflow in inaccessible workings. The measurements utilize ^{133}Xe and a portable, large-area xenon proportional counter that he designed. The advantages of the radioactive tracer, compared to the traditional SF_6 tracer, are the much lower cost of the "in-field" detector and the ability to perform repetitive injections with the radioactive gas without increasing the background concentration of the tracer. The system has already been tested in the ventilation laboratory at UK and will soon be field tested at the U.S. Bureau of Mines experimental mine facility in Bruceton, Pennsylvania.

Dr. D. Allan Butterfield received the B.A. in Chemistry from the University of Maine and the Ph.D. from Duke University. He was an N.I.H. Postdoctoral Fellow at Duke before he joined the U.K. faculty in 1975. In 1980-81 he held a University of Kentucky Research Professorship. He is currently a member of the editorial board of the Journal of Membrane Sciences. The following article was written by Jeff Worley for the summer/fall 1994 issue of "Odyssey," the magazine of University of Kentucky research, and is reprinted with permission.

Scientific breakthrough. This phase is almost surely guaranteed to make a scientist cringe under its weightiness, its unequivocal claim. And Allan Butterfield, a professor of chemistry and head of the Center for Membrane Sciences at the University of Kentucky, knows this isn't a phrase to be tossed off lightly.

"A group of us here in the last few months have made some very exciting discoveries about how brain cells are killed in the process of Alzheimer's disease," says Butterfield. "This is a breakthrough in the understanding of the disease." This dehumanizing disorder is, according to NIH Director T. Franklin Williams, "by far the most threatening epidemic we have in our nation."

The result of a team effort at UK, the "molecular shrapnel model" of brain cell death in Alzheimer's disease will for the first time, Butterfield says, permit a rational approach to therapy in this disorder. This model, he emphasizes, was developed through a multidisciplinary approach. The UK researchers involved include John Carney, an associate professor of pharmacology, Mark Mattson, a neurobiologist and associate professor at the Sanders-Brown Center on Aging, and two graduate students whose Ph.D. dissertations are focused on this research -- Kenneth Hensley and Marni Harris.

The UK group's findings, which were published last April in the *Proceedings of the National Academy of Sciences*, hold significance for the millions of Americans projected to be stricken with Alzheimer's in the decades to come. By the turn of the century, it is estimated that five million Americans will be diagnosed with the disease; by the year 2050, the number of older Americans with Alzheimer's is expected to be between 7.5 million and 14.3 million, depending on the rate of population growth. There are now approximately four million Americans with the disorder. Alzheimer's is the nation's fourth leading cause of death, accounting for some 100,000 deaths annually. Only heart disease, cancer and stroke claim more lives.

Although the cause, or, more likely, causes of Alzheimer's haven't yet been pinpointed, the disease has two unique physical features, always found together -- abnormalities in the brain called plaques (clumps of beta-amyloid protein outside brain cells) and neurofibrillary tangles (shriveled strands resembling bundles of straw inside damaged neurons). These two features have constituted a nagging mystery that has impeded the search for what triggers Alzheimer's, because researchers haven't been able to determine whether the plaques and tangles cause the disease or are simply its byproducts. In recent years, Butterfield says, much Alzheimer's research has focused on the beta-amyloid protein, a peptide (a series of amino acids) that is the core block of the plaques.

"The odd thing about this peptide," says Butterfield in explaining his thinking process that led to the group's shrapnel model, "is that no matter what you try to do to dissolve it, you can't do it. As a chemist and a membrane scientist, I asked myself, `How can you account for this?' The only answer I could come up with is that the peptide was forming covalent bonds -- very strong chemical associations. `And how are covalent bonds formed?' I asked. The answer that occurred to me is by peptide free radical reactions."

Free radicals, Butterfield explains, are molecules with one or more unpaired electrons, an imbalance that causes them to be extremely unstable. "Nature abhors having unpaired electrons," says Butterfield. "So free radicals are very reactive because they are always trying to either give up or accept an electron."

Butterfield made this intellectual connection while walking one day from the chemistry building to his "third or fourth" meeting of the day. "I couldn't wait to talk with John [Carney] and to Mark [Mattson]," Butterfield says. "And to Kenneth Hensley, a grad student from Ashland who ended up contributing a lot to the project."

"I was immediately excited about this," Carney says. "We were over in the chemistry lab the next day to see if the beta pep-

tide formed a free radical, and we found that it did." Carney explains that free radicals can be determined in solution by use of electron paramagnetic resonance spectroscopy, or EPR, equipment purchased a few years ago as a result of the state's $20 million bond issue. Though you can't literally see free radicals, they do give off signals that can be read like a fingerprint. Each free radical can be seen as a unique graphic representation, so Butterfield and Carney knew, after checking their library of "fingerprints," that what they were detecting had to come from the beta peptide.

"It turned out," Mattson says, after the three researchers did more control experiments, "that other peptides also form free radicals. But they don't damage cell proteins the way the beta amyloid peptide does. Only amino acids in the sequence of the beta peptide damaged enzymes and inactivated them. I've never seen Allan quite so exuberant, and at this point, I got pretty excited too."

For Mattson, who has spent the past seven years studying the mechanisms involved in the death of nerve cells in the brain, the fragmentation of the beta peptide into free radicals was a missing piece of the neurotoxic puzzle he had put together. In a paper authored by Mattson and several co-researchers which appeared in *Trends in Neurosciences* last October, he shows how the amyloid beta peptides break off from the larger protein, collect outside the cell, and stick together. This "aggregate" of the peptide is extremely toxic to nerve cells. His research shows that it then attaches to the cell, which needs relatively little calcium to function, damaging proteins that are involved in keeping calcium out. The barrage of calcium into the cell kills it.

"The new thing we found," says Mattson, "is that this peptide -- after it breaks off -- fragments into smaller reactive pieces, or free radicals. Because the nature of these radicals is to pair up, we think now that they specifically attack the cell membranes, substantially damaging them." Butterfield's discovery of free radical formation and the ability of these radicals to damage the cell membrane, thereby allowing calcium to leak in, explains how the beta peptide works to kill cells. This discovery was the missing piece of the puzzle.

This leap forward in understanding how brain cells are undermined was possible because of a lot of preliminary groundwork and the combined expertise of the researchers. "What coalesced at UK," says Carney, "is a synergy of expertise. We're lucky to have people here in different but related disciplines, people with a lot of experience under their belts to help enlarge findings from another area."

Butterfield's experience includes the use of EPR to study membrane abnormalities in degenerative neurological disorders, including Alzheimer's disease. Carney has been examining protein oxidation in stroke for many years. "We knew from previous studies of Alzheimer's brains that there was an age-related increase in protein oxidation and loss of critical enzymes," Carney explains. "The central question was, How did the cell become oxidized?" Mattson has been working for the past seven years -- sometimes in collaboration with Carney -- on how brain proteins protect nerve cells against stroke in animal models. "What we've learned from this research," Mattson says, "is that certain proteins prevent elevation in calcium levels by sort of scavenging up free radicals. The proteins are able to do this by increasing production of anti-oxidant enzymes."

"Anti-oxidants," Butterfield explains, are molecules that can destroy these damaging free radicals. "How do you explain why an old person gets Alzheimer's and young people don't?" Butterfield asks. "The answer is, in all likelihood, that as young people we have a tremendous amount of anti-oxidant strength within our system. But as we get older our genetic machinery winds down -- the ability to reproduce these beneficial chemicals weakens and free radicals more easily subvert the brain's cells."

The analogy of the brain as a machine that wears down seems to be a recurring analogy in their talk. Hensley, whose Ph.D. dissertation deals in part with the role of oxygen radicals, explains the importance of the body's ability to control oxygen levels. "For a good many years," Hensley says, "there has been a hypothesis that aging and Alzheimer's disease have one commonality -- the body loses its ability to defend against oxidative stress. We obviously need oxygen to live, but the reactions that oxygen undergoes in the body have to be carefully controlled or else your body begins to produce oxygen radicals which escape and can then damage cells."

"Call it brain rust," says Carney. "If the brain gets too much oxygen that's essentially what happens." Carney adds that this comparison is particularly apt because rust is iron oxide, or oxidized metal. "In many ways the process of protein aging involves iron inside the cell promoting oxidation," Carney says. "So the iron is actually rusting the protein."

Researchers investigating possible causes for Alzheimer's have from the beginning looked for common traits in the various explanations of why people get the disease, even while acknowledging that Alzheimer's is almost surely multicausal. Perhaps the most important result of the UK group's research, Butterfield says, is that their work for the first time puts Alzheimer's disease into a single theoretical framework, accounting for what other scientists have observed in making various suppositions about what causes the disease.

Some researchers believe, for example, that at least some cases of Alzheimer's disease may result from an inherited defect in mitochondria, the oxygen-dependent energy factories in cells. Other scientists have put forth the idea that membrane defects may be the main cause of Alzheimer's (in fact, the first researchers to do so [in 1980] were Butterfield and William Markesbery, director of the Sanders-Brown Center on Aging at UK). Still other researchers point an accusing finger at disorders of the immune system or at trace metals such as aluminum or mercury -- found by some scientists in high concentrations in amyloid plaques during autopsy of Alzheimer's victims.

One other leading theory has been that Alzheimer's is genetic. Allen D. Roses, a neurology professor at Duke University, believes that late-onset Alzheimer's is of genetic origin. His research indicates that the gene responsible is located on chromosome 19, and that it is some sort of "housekeeping gene that is supposed to keep cells tidy and operational but burns out with age." Roses adds that, "We could all potentially develop the disease by 120 years of age," but that "since none of us live that long what we see is the beginning of the curve -- patients who begin to display symptoms in their 60s, 70s and 80s."

Roses, in a study reported last November, showed that a rare form of a gene called apoE2 appears to protect people from developing Alzheimer's disease. But people with another form of the gene, apoE4, were at substantially greater risk of developing the disease. This discovery, for the first time, offers the possibility of developing a drug that would copy the natural protective action against Alzheimer's that may be provided by the apoE2 gene. The Duke research, which has been verified by others, shows that people

with two copies of the E4 gene had 11 to 17 times greater risk of developing Alzheimer's.

"I hope it doesn't sound too grandiose to say this," states Butterfield, "but a real strength of our shrapnel model is that it accounts for various abnormalities of Alzheimer's disease that have been observed for years in the literature. Everything fits. It accounts for various enzymes that have been reported to be abnormal, various transport processes that have been seen to be aberrant, particular proteins that have been compromised because of attack by a free radical peptide ... Our model puts all of these observances under a solid umbrella."

If the shrapnel model proves to be accurate, then what? What can people do to protect themselves against the onslaught of Alzheimer's?

"The therapeutic implications of our research are that if one could interfere with this free radical damage, if you could prevent it, then you could significantly modulate the disorder," Butterfield says. "Eventually, it might be possible to give people anti-oxidant pills that protect them -- that may not be all that far in the future," Hensley adds. "In fact right now, there are a number of people who believe taking lots of vitamin C and vitamin E can help protect brain cell membranes." Hensley goes on to say that in separate studies done at UK it was shown that vitamin E protects cell membranes by inserting itself into the membrane and preventing damaging over-oxidation.

"I think of it as a preventative measure," says Mattson. "Vitamins E and A absorb free radicals and prevent them from damaging cells. We've found that vitamin E in nerve cell cultures, for example, can protect against amyloid beta peptide toxicity." Butterfield, Hensley, and an undergraduate chemistry major, Beverly Howard, have found that vitamin E protects brain membranes from the damaging effects of beta peptide free radicals. Hensley, Mattson and Butterfield admit to taking "more than the normal recommended daily dosage" of vitamin E. "There's absolutely no evidence that these vitamins are bad for you, and there's some strong evidence that they're good for you," says Mattson.

Now that the researchers have gotten this far, what's next?

"We've recently filed patents on several compounds that we find, at least in cultured nerve cells, can protect against beta peptide toxicity," Mattson says. "On one hand, we're trying to understand more and more about how the free radical kills cells, and we're also trying to identify compounds that interfere in this process. So that's the strategy now."

"How significant is this research?" Earl Stadtman asks rhetorically from his office at the National Heart, Blood and Lung Institute. Stadtman, the chief of the laboratory of chemistry in Bethesda, pauses only briefly. "This work is highly significant. It's becoming increasingly apparent that free radical damage to proteins is important in a number of disease processes. The University of Kentucky group has shown that the beta peptide is converted into a form which has the ability to spontaneously generate free radicals. They've taken a very novel approach to understanding the part free radicals play," he continues. "I know that John Carney, in collaboration with Robert Floyd in the Oklahoma Medical Research Foundation, has been looking directly for such an event for some time. This is unquestionably a breakthrough in the understanding of the pathology of Alzheimer's disease."

For the millions of Americans who will develop Alzheimer's disease in the next few years, any major discovery that may lead to the control or cure of the disease is welcomed. And indications that the Alzheimer's puzzle may be solved and effective therapies developed have never been stronger. "I am absolutely convinced that within 10 years we will have a pill that prevents Alzheimer's disease," says Roses of Duke.

"Within the next five years," says UK's Markesbery, "we're probably going to have a drug that will enhance memory. There are too many drug companies working on this and too many ingenious pharmacologists for this not to happen."

LIBRARY RENOVATIONS

New! Expanded! Improved! Yes, the Chemistry/Physics is all this and more. Over the last two years the library has been renovated twice. During the first renovation, part of the C/P Building renovation, compact shelving was installed. The renovation doubled our capacity and enabled the library to consolidate parts of the collection that had been stored at other locations. The compact shelving moves on tracks, opening an aisle at the push of a button. It has numerous safety features that stop the movement if there is any weight or movement in the closing aisles. To install the shelving, we had to move 122 tons of books from the library, store them for three months, then move them all back in. Chemistry faculty, staff, and graduate students helped in this massive project. During the first renovation we also added private study carrels, a group study area in what had been a classroom, and expanded the office space and library work areas. The old, inefficient wooden circulation desk was replaced and new furniture was purchased for the entire library.

Unwilling to rest on these improvements (and barely giving us time to enjoy them), Information Systems, the University unit to which the library belongs, decided last April to install a computer laboratory in the Chemistry/Physics building! A fifty-computer laboratory was with a group study area. The laboratory has both MacIntosh and IBM compatible computers, as well as laser printers, a scanner, and CD-rom readers. Chemistry-related programs such as Comprehensive Chemistry, ChemWindows, Squalor, Inorganic Qualitative Analysis, and Mathcad are available, as well as standard wordprocessing, spreadsheet, and database programs. In addition, the computer lab gives us access to the Internet, the libary system's card catalog, the campus cdrom network, and indexes such as ERIC (Educational Resources), Medline, and Infotrac (indexes about 1000 journals of use to the undergraduate curriculum).

The Chemistry/Physics Library now has over 54,000 volumes. We have about 400 active journal titles in the areas of chemistry,

physics, and astronomy. During the last fiscal year over 65,000 people used the C/P Library. According to the Association for Research Libraries, the UK Library System is the 34th largest in the country. Of all SEC schools only Georgia is ahead of us. This ranking takes into consideration the number of volumes, the budget, and the number of faculty, staff, and student employees.

As you may have heard, the University is planning (the legislature willing) to build a new Commonwealth Library on campus. The new library will consolidate the humanities, social sciences, and life sciences into one building and provide much needed space for students, books, computers, and staff. The C/P Library will not be moving into the Commonwealth Library. At present the plan is to renovate King South and consolidate the physical sciences there.

University Libraries are open to all, and anyone with a Kentucky drivers license may obtain a library card. The library system is a statewide resource here to serve all citizens of the Commonwealth. If the C/P Library can help you with any information needs please call us at 606-257-2954. Or, better yet, stop by and visit our new facility. *(Maggie Johnson, Chem-Physics Librarian)*

STUDENT AFFILIATES WIN $2000 PRIZE

During the month of November, 1993, Banana Don, disk jockey for "The Oldies Station" in Lexington ran a celebrity contest. Whoever could get the biggest celebrity to call Banana Don on the air would win prizes worth $2000. In early November at the suggestion of Dr. Leonidas Bachas, the Student Affiliates of the ACS at the University of Kentucky asked Dr. Phillip Sharp, Kentucky native and MIT Nobel laureate for 1993, to call Banana Don on their behalf. Dr. Sharp graciously agreed. SAACS waited all month while other celebrities like Jim Varney (Ernest), Loretta Swit (Hot Lips Houlihan), Pete Rose (ex-baseball great), Dan Issel (basketball great) and Randy (Macho Man) Savage called Banana Don. The judge for the contest was Anita Madden, local socialite, renowned for her Kentucky Derby parties. In early December, SAACS was excited to learn that Dr. Sharp had beaten Hot Lips and Macho Man to win $1000 in cash, a $500 shopping spree at a nearby outlet mall, and a $500 limousine ride to the mall. The Student Affiliates added the $1000 to their scholarship fund, from which each spring they make awards to the high scorers on an ACS exam taken by the many graduating high school seniors who are willing to travel to Lexington for the exam. When Julie Yates, secretary to SAACS, called Dr. Sharp to thank him for their prize, he was out of town. In Sweden. Accepting his prize.

SCHEURICH MOVES OUT; SHAMBRO MOVES IN

Larry Scheurich, who was Business Manager of the Department of Chemistry for twenty years, has become Budget Analyst for the Lexington Campus under Assistant Chancellor James Chapman. Larry earned two degrees at UK, the B.A. in Chemistry in 1968 and the MBA in 1978. After four years as a Captain in the Air Force and two years working for Pfizer Pharmaceutical, he became Business Manager for the Chemistry Department in 1974. In that job he was responsible for the department's budget, for purchasing all its supplies, and for managing the people who ran the stockrooms, the glass shop, the NMR and mass spectrometry labs and assorted other offices. Missing a bulb for an overhead projector? See Larry. Want to move CHE 555 from its MWF time slot to Tuesday? See Larry. Your grant was charged $500 instead of $5 for 5 milligrams of testosterone triflate? See Larry. He was available at any time to solve any problem. He did so many things with such patience and politeness that he made the job seem easy. His successor now knows otherwise.

The arrival of Debra Shambro in the Business Manager's office in December of 1993 has made the loss of Larry seem less than life-threatening. Debra has been the department's Programmer/Computer Analyst since 1990 and, in that role, is thoroughly familiar with many of the departmental business operations: accounting, purchasing, and stockroom inventory. She earned the Bachelor of Computer Science (magna cum laude with departmental honors) from Kentucky State University. Before coming to UK in 1989, she worked as Information Systems Manager at PDG International Headquarters in Lexington. As the department's computer specialist, Debra was also an all-purpose problem solver. She did so many things with such politeness and patience that she made the job seem easy. It's hard to imagine a better replacement for Larry.

WILBUR L. PRICE MEMORIAL SCHOLARSHIP

A passion for research and a persistent interest in its applications are remembered by the scholarship fund established in memory of Wilbur Price by his widow, Catherine G. Price, and his son, John Price, both of Lexington. Their generosity is multiplied because the Phillip Morris Co. makes a two-fold match of their gifts. The award, which pays for tuition and books, is intended for Kentucky high school seniors who demonstrate a potential for academic excellence, show need for financial assistance, and plan to major in chemistry at U.K. The first award was made to Anna Khoury of Nicholasville in the fall of 1991. Awards were made to Mandela Wilson of Lexington for 1993-94 and to Kathryn Barlow of Union and Beverly Howard of Bardstown for the spring semester of 1994. The following biography of Mr. Price is based on information from Mrs. Price.

Wilbur Leonard Price (1911-1967) was born and raised in Louisville, Kentucky. His mother died when he was three. His father believed in hard work, and Price's paper route as a child led him to believe that everyone should have such an experience. When he was older, he worked for a construction company and built filling stations. He was employed by a large paint company while attending the University of Louisville. Price was a good student and liked chemistry. He loved research and was happiest when working in the lab. He frequently said, "Human behavior is unpredictable, but you always knew what went into a test tube and could change what came out." Next to being in his lab, he liked baseball.

It was Price who developed a coating that stuck to bobby pins. Previously, the coating popped off when the bobby pin was bent, and the exposed area rusted. He developed the formula while in

college. When the news of his discovery was heard, many companies came after him. He accepted a job in Chicago and left Louisville.

His next big accomplishment came years later when he developed a furniture varnish that would not show marks, prints, or burns, and would not crack. The lacquer men said, "It can't be done." But he was a varnish man and worked at this hopeless assignment year after year, day and night, without positive results. His dream came true when he developed AMROC. The new finish was introduced at the Furniture Mart in Chicago, and Price was the talk of the show; it was the finish everyone had been waiting for. Again Price got top recognition and was in demand, but by this time his health was too poor to make a change. Now his interest was in resins, which were new. He so badly wanted to work with resins and use them in the making of new products, but time ran out.

It was chemistry, and the love for it, that started Price on his way as an Industrial Research Scientist, and made him an outstanding man in the paint business.

CHARLES W. HAMMOND GIFT

Income from Charles W. Hammond's generous gift to the Department will be used starting in the fall of 1994 to support undergraduate education in chemistry at U.K. Hammond Scholarships will go to undergraduate chemistry majors in recognition of special needs or abilities; Hammond Assistantships will be awarded to majors who will assist faculty members in the development of new courses or in the revision of existing courses; Hammond Prizes will go to majors who have demonstrated excellence in both course work and research; and Hammond Grants will be used for student travel to meetings to present papers and for other activities associated with undergraduate research in chemistry.

Charlie Hammond grew up in Vanceberg, Kentucky and graduated from U.K. during the depression with a B.S. in May, 1935. He spent the summer of 1935 looking, without success, for work. During that search he remembers a plant manager who called him over to the window to point out a man operating a lawn mower. "That's my chief chemist," he said, "and that's all we have for him to do." Mr. Hammond entered U.K.'s graduate program in September. When, during Christmas vacation he called on DuPont in West Virginia, they said "Yes, we need a chemist. Can you start work tomorrow?" When he explained that all his clothes and belongings were in Lexington, he was told to report on the following Monday or not at all. He was delighted to accept a job that paid the handsome salary of $92 per month.

DuPont claimed Charlie Hammond's loyalty from December, 1935 until he retired in 1970. He worked on ammonia production in West Virginia from 1935-1940. In December of 1940 he was transferred to Louisville and Birmingham to work on the manufacture of smokeless powder (nitrocellulose) for use in a wide range of ammunition -- from 32 calibre pistols to 16 meter naval guns. He later moved to the manufacture of nitric acid and was unexpectedly called to replace a plant manager who had died suddenly.

In 1941 he was told to get ready to move to Chicago, although no one could tell him what the new job was to be. He soon found himself at the University of Chicago in the middle of the Manhattan Project, assigned to a group that was to prepare and purify plutonium. He followed progressively larger plutonium production from Chicago to Oak Ridge and then to Hanford, Washington, where he stayed until the end of the war. From then until his retirement in 1970, Mr. Hammond served DuPont in a variety of divisions: Photo Products, Orgchem, AgChem, and Textile fibers.

In retirement he has led an active life. He enjoys cabinet making, especially colonial era furniture like grandfather clocks and Chippendale chairs. He has been involved with the United States Power Squadrons for 35 years with boats on Pamlico Sound near his home in North Carolina. He rose from Commander of the local squadron to posts in the national organization, where he was chair of one of the course committees for 15 years, a teacher of several courses, an organizer of squadrons and Rear Commander, a two-year elective post. His distinguished racing career is now behind him, for vertigo keeps him from boat travel. He still raises roses and makes model lighthouses.

At U.K. in 1935 he was one of the 3 H's who graduated as chemistry majors: Hammond, Headly (Hal Price) and Hubert (Stephen). He remembers chemistry faculty members Maxson, Stewart, Barkenbus and Mitchell, the last, his best teacher. Lon Squires, Marvin Dunn and David Young were students on campus during Hammond's tenure at U.K.

Charlie Hammond, now in his 80's, says that he is "more and more aware that there is an end-point in this titration of time." He says that he has lived "a very uneventful life." The skeptical reader will take the issue with that claim.

PEW FELLOWSHIPS

It is hard to tell who got the most benefit: Jim Lowe from his experience at the University of Kentucky, or U.K. from its experience with Jim Lowe. Dr. James Lowe was a Pew Appalachian Fellow in the Chemistry Department for a year starting in August, 1992.

The Pew Foundation has, since 1986, provided fellowships for faculty from colleges in the Appalacian region of Kentucky, North Carolina, Tennessee, Virginia and West Virginia to come to the University of Kentucky for study and research. The fellowships can last as long as a year or as short as a summer. Pew Fellows may apply to bring with them students from their colleges. Since 1986, ten Pew Faculty Fellows have done research with chemistry faculty at U.K.: Nazir Khatri (Union College, KY), Yueh Giza (Wheeling Jesuit College, WV), John Happ (Shenandoah University, VA), James Beard (Pikeville College, KY), Robert Maruca, Richard Wonkka (Alderson-Broaddus College, WV), David Johnson, (Ferrum College, VA), David Aylmer (Alice Lloyd College, KY), and James Lowe (The University of the South, TN).

Jim Lowe began his college teaching career at Smith College immediately on finishing his graduate work at Stanford in 1963. In 1965 he moved to the University of the South in Sewanee, Ten-

nessee, where he is now F. B. Williams Professor of Chemistry. In addition to a number of research publications, he is the author of three textbooks, "An Introduction to Biochemical Reaction Mechanisms" with L. L. Ingraham, "Worlds of Chemistry" and "Chemistry, Industry and the Environment".

The last book was finished while he was at U.K. During that time he also worked in the labs of Dr. Mark Meier preparing small peptides for use in structural studies. Jim's academic experience and maturity made him valuable resource as a colleague -- a perfect person with whom to test ideas on organic chemistry, teaching, campus politics, or life in general. Jim's evaluation of his year at U.K. was very positive. He reports that he felt very welcome at Kentucky and that he returned to Sewanee with a renewed sense of excitement about chemistry and teaching . Chemistry at U.K. was enriched by Jim's research and by that sense of excitement.

UNDERGRADUATE RESEARCH

Undergraduate research in the department is a year-round activity. During fall and spring semesters, students are involved in CHE 395, Independent Work in Chemistry. In addition, during the summer, students from other colleges and universities come to work in the labs of U.K. faculty.

Majors with a grade point average of at least 3.0 are encouraged to enroll in CHE 395 in their junior or senior years. They choose research problems and preceptors in the same way that entering graduate students make the choice. At the end of the project, each participant prepares both a paper and a set of posters describing the results. The poster session is held in April of each year, and students from Kentucky and surrounding states are invited to participate. The conference room of the Chemistry-Physics Building is opened for all to view the posters, and a variety of people accept the invitation to do so: U.K. faculty and graduate students, administrators from the offices of the Vice President for Research and Graduate Studies, Dean of A&S, and the Chancellor of the Lexington Campus, curious undergraduate students from across campus, and sometimes parents and other relatives of participants. In 1993 and 1994 the high school chemistry exam sponsored by the Student Affiliates of the American Chemical Society was held on the same day as the poster session so that some of the high school visitors could see students close to their own ages enthusiastically involved in chemical research. Cash prizes are awarded from the Robert Boyer Memorial Fund.

Winners for the spring of 1993 were: First prize ($200): Angela Horn, University of Cincinnati (advisor, William Heineman); Second prize ($100): John Huff, University of Kentucky (advisor, Dennis Clouthier); Honorable Mention ($50): Bereket Berhane, Berea College (advisor, Lee Roecker); William James, University of Kentucky (advisor, Allan Butterfield); Edward Miller, University of Kentucky Engineering (advisor, Lynn Penn). For 1994 the winners were: First prize: Brian Hickory, Central Missouri State University (advisor, Dennis Faulk); Second prize: Kelly Brooks, Transylvania University (advisor, Leonidas Bachas, UK); Honorable Mention: Wendy Shaw, University of Kentucky (advisor, Allan Butterfield), Shing Mirn Lee, Berea College (advisor, Lee Roecker), Randy Arnold, Bellarmine College (advisor, Graham Ellis). Following the poster session, dinner for the participants, an awards ceremony and an address by a visiting speaker ended the day. The organizers for the program were U.K. Professors Carolyn Brock in 1993 and David Robertson in 1994.

In recent summers, grants from the National Science Foundation (REU or Research Experience for Undergraduates program) and the Department of Education (Women and Minority Participation in Graduate Education) supported about 20 students from other colleges in research labs at U.K. Dr. Sylvia Daunert was in charge of the program for the largest group of REU students. Drs. Allan Butterfield and Leonidas Bachas headed the program for the Membrane Sciences Division and Dr. Joe Wilson was in charge of the four students in the Minority-Women program. The REU students have been on campus for the last four summers. These students are in general a bright, hard-working and enthusiastic group, and the department gets as much as it gives from these ambitious students. The summer is in many ways the busiest time of year in the Chemistry Department.

RICHARDSON NAMED CANADIAN PROFESSOR OF THE YEAR

In June of 1992 the Council for Advancement and Support of Education (CASE) named Mary Frances Richardson, a professor of chemistry at Brock University, its 1992 Canadian Professor of the Year.

A panel of Canadian and U.S. judges selected Richardson from among 35 nominees, commending her commitment to the Brock community. Specifically, she has focused on getting students—especially women—interested in chemistry. She led the committee that developed the women's studies program at Brock University and also worked extensively with colleagues to review and revise the undergraduate curriculum for chemistry students. Additionally, she played a part in the design of an adjustable height wheelchair so students could reach normal-height research equipment and library shelves. Dr. Richardson is also a national expert on the chemical composition of beer and beer making and periodically lectures on this topic.

Richardson graduated with a B.S. and Ph.D. from the University of Kentucky. In 1971, after four years of postdoctoral experience, she became assistant professor of chemistry at Brock University. Richardson became an associate professor in 1975 and full professor in 1981. She became an associated faculty member in the women's studies program in 1991, which she helped to shape as a new degree.

Richardson was honored in Toronto at the annual meeting of the Canadian Council for the Advancement of Education (CCAE). She received a $5,000 cash award supported by program sponsor, Merck Frosst Canada Inc., as well as a framed citation. "It is a particular pleasure for CASE to recognize Mary Frances Richardson for her extraordinary commitment to teaching and her dedication to her students, community, institution, and profession," said Peter Buchanan, president of CASE. "She is an excellent role model for her students and for faculty throughout Canada and the rest of North America." *(From a press release of June, 1992)*

FEATURING ALUMNI FROM 1965 - 1969

Since 1980, Chem-News has featured news of alumni from five-year periods, starting with graduates in 1920. Alumni from the classes of 1965-69 were asked to describe their careers since leaving U. K. News from people who missed the deadline is always welcome.

Randolph L. Cooke, B.S. 1969; 1972, M.S. in Pharmacology at U.K.; 1978, M.B.A. in Finance at the University of Texas. "In 1978 I joined Johnson & Johnson Products, Inc., New Brunswick, NJ as an FDA compliance auditor for the Research and Development Division. I worked on topical drugs such as retinoic acid, anti-fungals and sunscreens.

In 1980 I moved to the Orthopaedic Division of Johnson & Johnson in Braintree, MA, as Manager of Regulatory Affairs and Clinical Research. I worked on joint replacement devices. A long way from chemistry.

1983 I joined Health Products Research, Inc. North Branch, NJ, as a Vice President. The group provided consulting services to Drug and Medical Device companies.

1985 I took over Washington Regulatory Services, Inc. a company providing FDA Regulatory Product Development and Compliance consulting services. The company has eight associates and functions primarily through computer networks. I am President and CEO.

James A. Cunningham, Ph.D. 1968; program director at the Wright-Patterson Air Force Base in Ohio for the LANTIRN Weapon System. He is responsible for all decisions regarding the development, testing, production and support for LANTIRN. He describes LATIRN as a navigation and targeting system that allows the F-15E and F-16C/D aircraft to fly at night 200 feet off the ground at 600 mph. Originally from New York, Dr. Cunningham worked with Professors William Wagner and Donald Sands as a graduate student at UK, under a grant funded by the Atomic Energy Commission.

Ray Hammond, Ph.D. 1973. "First I will tell you a little about Fredrick C. Nahm, someone whom I know well. Rick is a Centre Graduate (1968) who returned to Centre in 1974 as alumni secretary, later to become Vice President and general secretary. He was quite involved in Centre's development efforts, recognized nationally as among the best. He left Centre at the end of 1986 to take a position as Vice President for university relations at the University of Pennsylvania, where he has continued to be very successful in development work. Then, just recently, he was named President of Knox College in Galesburg, IL, a college not unlike Centre.

As for me: I too have strayed from the lab and science classroom. From 1972 to 1988, I advanced through the academic ranks at Centre to Professor of Biology and Biochemistry. For the past five years, I have served as Dean of Students. Beginning July 1, 1993, I will be Director of Athletics, Health and Recreation, a new position at Centre which seeks to blend intercollegiate sports, recreation, intramural and physical education activities, and wellness/healthy lifestyle concepts into a legitimate educational partner in the academic enterprise. The concept is unique and should serve as a model for small, residential, liberal arts institutions across the nation where commitment to NCAA Division III (non-scholarship) remains the strong and guiding athletic principle.

To be in a position to take on a new challenge every 5 years or so keeps me young! Certainly, I would never have predicted such a path when I was struggling through chemistry and biochemistry classes during 1965-1969! But, I wake up each day with an enthusiasm for the day's prospects. To be at the "cutting edge" of a new concept is refreshing."

Steven Hannum, Ph.D. 1969. "Jerry Roehrig and I taught together at Aurora College (now Aurora University) in Aurora, IL from 1970 to 1978. I left there in 1978 to be Chairman of the Division of Science and Mathematics at Asbury College in Wilmore, KY. My family and I enjoyed our time back in Kentucky. It was nice to be able to visit the Chemistry Department at UK. In 1985 we moved to George Fox College in Newberg, OR.

Professionally, I attended the 12th Biennial Conference on Chemical Education at the University of California, Davis, CA where I presented a paper - The Macintosh in General Chemistry. Every freshman at George Fox receives a Macintosh computer so all of the faculty are busy trying to figure out ways to use computers in their classes. I an finding that you can do some really interesting things with chemistry and spreadsheets. I have had a paper, "A Low Cost Constant Rate Buret", accepted by the Journal of Chemical Education. I am also deeply involved in the design of a new science building.

My wife, Diane, and I are moving into the "empty nest" era of our lives. My daughter, Laurel, is a graduate student in school psychology at the University of Cincinnati. My son, Brian, will begin graduate study in mechanical engineering this fall at Purdue."

Thomas L. Hearn, B.S. 1969, M.S. 1972. "I can hardly believe that it's been 24 years since I graduated with the Bachelor's degree. Evidently, I learned something along the way because I have had a very enjoyable and productive career. After finishing requirements for the master's degree in the summer of 1972, I went to work for the University of Kentucky Medical Center. That was the beginning of my career as a clinical laboratory scientist.

In 1977 I took a job at the National Centers for Disease Control in Atlanta. I have been there ever since. I am currently Chief of the Laboratory Practice Assessment Branch which is a part of the Division of Laboratory Systems, Public Health Practice Program Office. Our job is to determine how well clinical laboratory tests are performed in the nation's laboratories. Related to that function we develop both voluntary and regulatory standards for testing and provide some limited training and consultation. (Much of the focus of my work is on those laboratory tests used to diagnosis HIV-1 infection and to monitor disease progression.)

Several years ago I also pursued another graduate degree, a Ph.D. in experimental pathology and laboratory medicine from Emory University. Work assignments curtailed progress, but I am taking a "sabbatical" starting in September to see about finishing up. I will be doing research in the Department of Pathology.

As for keeping up with my classmates, about the only one that I routinely correspond with is John Motlow in Baton Rouge. Both John and I have daughters the same age so we have commiserated as parents throughout the years. (Both his and my daughter have done extremely well despite our interference; his graduated from Bryn Mawr and mine from Boston University last year. Neither are scientists...so much for parental influence!)

I will try to make better efforts to stay in touch. Both my wife and I are from Kentucky so we do visit occasionally. (I still have my season basketball tickets!)."

Robert Z. Joseph, B. A. 1968; 1973, Doctor of Dental Medicine, University of Louisville; 1976, Speciality - Oral and Maxillofacial Surgery, University of Cincinnati; 1988, Doctor of Medicine, University of Louisville; 1989, Intern in Internal Medicine, University of Louisville Hospitals; presently in private practice in oral and maxillofacial surgery, part-time in emergency medicine and part-time in sports medicine at Centre College. Wife, Mary Jo, and two daughters, Noel Elizabeth and Kathryne Michael.

Thomas R. Kemp, Ph.D. 1970. "I received a Ph.D. with a major in organic chemistry in May, 1970 after completing research on the structure and quantification of volatile aldehydes, alcohols, esters, and terpenes emitted from plant tissues. This work was carried out under the guidance of Dr. W.T. Smith as my major professor and with a great deal of help from Dr. John Patterson and Dr. Leonard Stotty of the Horticulture Department at UK.

In July 1970, I joined the faculty of the Horticulture Department at UK and was promoted to Professor in 1985. My work has been concerned with natural products chemistry over the period of my tenure at UK. I was able to characterize several volatile organics not previously reported as natural constituents of plants including polyunsaturated aliphatic aldehydes derived from the enzymatic oxidation of fatty acid substrates. These compounds seem to protect plant from infection by pathogenic microorganisms.

I have also studied cytokinins which are a group of alkyl substituted adenosines (nucleic acid bases) which occur free and as constituents of RNA in plants and are hormones which cause cell division.

Currently, I am working on the isolation of natural antimicrobial compounds from plants. These compounds are á, â unsaturated aldehydes and are toxic to both bacteria and fungi, and are especially active against strains of Salmonella. Dr. David Hildebrand of UK and I are working on moving the genes for the enzymes which produce these antimicrobial compounds from one plant species to another in order to enhance the defense of plants against pathogens.

In 1980, I married Lois Groce and we are in the process of moving to a new home on Williamsburg Rd. here in Lexington. We enjoy traveling, reading, gardening, and genealogy.

Again, thanks for the interest expressed and I am indebted to the many fine professors I encountered during my tenure as a student in the UK Chemistry Department."

William T. Mattingly, Jr., B.A. 1969; 1973, M.D., Vanderbilt University; 1973-77, residency in general surgery at Vanderbilt; 1977-79, residency in cardiovascular surgery at U.K.; 1979-81, Assistant Professor, Surgery, U.K. "For the last 12 years I have been in private practice, first in Lexington and now in Wausau, WI. I primarily do heart surgery and other related activities.

I do not recall much that would be of interest to you from my student days. It has been many years, but I do recall sitting long hours in the lecture halls of the Chemistry-Physics Building and struggling with qualitative analysis which probably is the one course that I still make practical use of in my work. I believe Dr. Sears was the professor in that course.

I remember the greatest tragedy of my chemistry career was my first course in chemistry, which I stupidly took as a summer course in the summer of 1966. I had been out of school between high school and college because of injuries sustained in an automobile accident. I thought I did real well in the initial summer school but received a "B" despite having a numerical score for an "A". The visiting professor teaching the course (who I believe was from Knoxville) would only give one "A" in the small class of 10-11 people, and that went to a graduate student from Indiana. Thereafter, I did re-double my efforts and I am sure was something of a nerd throughout my years at Kentucky. However, I did receive a good basic education which helped me when I did reach Vanderbilt in the biochemistry and physiology courses that we were taught in the medical school by a number of past and to-be Nobel laureates."

Howard Mize, Jr., B.A. 1965; 1965-69, M.D., University of Louisville; 1969-70, internship at Denver (Colorado) General Hospital; 1970-74, general practice, Anaconda, Montana; 1974-77, orthopedic residency at U.K.; 1977, Hand Fellowship, University of Louisville, with Drs. Klienert, Kutz, and Atasay; 1977 - present, private practice of orthopedic and hand surgery, Kingsport, TN.

John B. Neale, B.S. 1965. "It has been almost thirty years since I spent an exciting summer employed as Dr. Wilson's laboratory assistant and attending summer session classes. We were using ultraviolet light to brominate ring compounds. The products were strange and sometimes unpleasant. One, I remember, was insoluble in any solvent or acid in the laboratory. We had to destroy the glassware. Another product was so reactive that a painful burning sensation would last for hours where it touched skin. The effect could not be washed off. I still have my lab notebook stored away somewhere.

I am presently associated with Martin-Marietta in Largo, FL, as Director of Program Management. It occurred to me that many of our finest technical managers hold degrees in chemistry. There seems to be a logical reason for this. Chemistry requires an acceptance of the abstract, the ability to envision that which you can not see, the curiosity to look beyond the surface and satisfaction in achieving a solution that was not necessarily the obvious. The analytical thought process is, of course, a key as is the acceptance that you can never know it all but can make rational decisions by knowing what is necessary. This might be interesting to students that may not be intended for the world of research. A chemistry education is better preparation for a broad technical management career than some might imagine.

Other fond memories I recall include a party at Dr. Smith's apartment (my first confirmation that professors were in fact normal people) and Dr. Sears' Physical Chemistry (long hours of work followed by terror at exam time).

I can only imagine how wonderful the university experience must be today with personal computers to make the drudgery of laboratory records, formal reports, and data analysis so fast and flexible -- and professional.

Thanks for your help and counsel while I was at UK. Our association is a very happy memory."

Stanley J. Opella, B.S. 1969; 1974, Ph.D. Stanford University; 1975-76, postdoctoral fellow, MIT; 1976-present, University of Pennsylvania faculty, now Grossman Professor there; member of

the editorial boards of *Solid State Nuclear Magnetic Resonance, Journal of Biomolecular NMR, Journal of Magnetic Resonance.* "Perhaps the most relevant comments I can make are that I think it is an extraordinary privilege to be able to participate in research and teaching activities as a professor at a major research university, and that I discovered that these opportunities existed as an undergraduate chemistry major at UK. I can clearly remember many conversations with Joe Wilson during which I learned that it was perfectly natural to be enthusiastic about research, as well as what was involved in pursuing a scientific career. Conversations with Bob Guthrie, W. T. Smith, and John Patterson were also valuable, as was a summer research position arranged by Drs. Smith and Patterson, and, of course, my undergraduate research project with Stan Smith introduced me to NMR spectroscopy as well as a bit more flamboyant style of chemistry. Although I benefited from all aspects of my undergraduate education at UK, the most valuable information and experiences came from my own research projects, as modest and tentative as they were, and the broad informal discussions with the faculty outside of the classroom. I have tried to keep this is mind in my own teaching activities. For example, this summer I have four undergraduate students working full-time on various projects. In the fall, I teach a rather unconventional freshman seminar course (where they subscribe to *Science* rather than purchase a textbook) on structural biology to about 15 freshman students, largely because this format serves as an extension of informal discussions. In the spring, I teach a graduate course on NMR spectroscopy.

My research and teaching are focused on structural biology, in particular NMR spectroscopy of proteins. Structural biology is an emerging discipline, built on the revolutions that occurred in molecular biology and computation in the 1980s, which is going to be among the most important areas of investigation of the 1990s. The three-dimensional structures of proteins will enable us, for the first time, to appreciate how chemicals account for all of the properties of biological systems. These structures are essential components of medicine and biotechnology.

NMR spectroscopy of proteins is undergoing extremely rapid development at the present time. It is unique in its ability to describe both the time-average positions (structure) and the time-dependent fluctuations (dynamics) of all of the atoms in a protein. This ability has been recognized since the first NMR spectra of proteins were obtained in 1957. However, it has taken 30-35 years for sufficiently powerful instrumentation, especially high field magnets and computer work-stations, and experimental and computational methods, especially multidimensional experiments, to be developed. At the present time, X-ray crystallography and multidimensional solution NMR spectroscopy are used to determine the structures of globular proteins. X-ray crystallography had an enormous head start, since by the late 1950s it was already capable of determining the structures of proteins, and its instrumentation and methods have also improved with the availability of area detectors and computers. Nonetheless, the advantages of NMR spectroscopy in terms of determining the structures of proteins in their native state inaqueous solution (by multidimensional solution NMR methods) or as part of supramolecular structures, such as membranes or viruses (by high resolution solid-state NMR spectroscopy), and eliminating the need for single crystals and heavy-atom derivatives are clear. Of course, NMR spectroscopy and X-ray crystallography will remain complementary approaches to structural studies; there are always going to be examples where one of the methods works well and the other encounters significant problems.

My research group is about average size for this department, consisting of 7 graduate students, 6 postdoctoral research associates, an electronics engineer, a senior research investigator, a secretary, plus the undergraduates. The research effort is divided about equally between molecular biology and NMR spectroscopy, enabling us to express and isotopically label proteins of interest for spectroscopic studies. We utilize both high resolution solid-state NMR and multidimensional solution NMR experiments in parallel to study proteins. This gives us a great deal of flexibility for the development and applications to proteins that are not amenable to conventional approaches. It also means that we devote considerable resources to instrumentation.

The major focus in spectroscopy is on the development of solid-state NMR spectroscopy as a new method for determining the structures of proteins. This method is suitable for proteins that are immobilized by their interactions in complexes and are uniaxially oriented in the magnetic field of the spectrometer. The filamentous bacteriophages continue to serve as an important system for investigation and we are now determining the structures of peptides displayed on the surface of filamentous bacteriophages by solid-state NMR spectroscopy. Phage display of peptides is a rapidly progressing area of molecular biology, and the NMR experiments can bring structural insight into the design and selection of peptide sequences that bind to antibodies, receptors, or other macromolecular targets of interest.

We are also developing an approach to structural studies of membrane proteins that takes advantage of complementary results of multidimensional solution NMR experiments on samples of proteins in micelles and solid-state NMR experiments on oriented and unoriented samples of proteins in membrane bilayers. Many new projects have been initiated in this area in the last year, including on vpu protein from HIV, merP and merT proteins from the bacterial mercury detoxification system, and several channel forming peptides and proteins. With new higher dimensional experiments and higher field spectrometers, I am confident that membrane proteins will become as tractable as globular proteins for NMR structural studies. "

Maija Avots Russell, B.A. 1967. "Got my M.D. at the University of Chicago in 1971, residency in pathology at the University of Wisconsin; married in 1971, divorced in 1986, practiced in California, now in St. Petersburg temporarily. I plan to travel around the US in the next year. Would love to hear from any friends, classmates. Mailing address: 216 17th Avenue, NE, St. Petersburg, FL 33704-3501."

Jack Steele, Ph.D. 1968; 1968-70, postdoctoral fellow at Washington State University with Dr. J. Ivan Legg; 1980-present, professor at Albany State College, Albany, GA; 1980-81, acting chairman. "Just celebrated our 25th anniversary with Carolyn. Have three kids -- who have not left home yet -- Craig (23), Rebecca (21), and Jeff (18). They all attend the Community College part-time and work full-time.

Now on another level: I don't know how the grad school is doing now, but in the mid 60s you had the largest group of [graduate student] loonies that any faculty could possibly stand. I have been fortunate in the groups that I have been involved with -- the UK experience; the group I worked with in founding the local

ACS section; and BMX bike racing (not me). All of these groups worked hard, had fun, and accomplished a great deal.

Also, I want to thank the faculty of the 60s. In particular Don Sands, William Plucknett and Joe Wilson for being excellent role models for instruction. My hat is off to you all.

If you don't hear from Cunningham, Possley, Rogers, or Girard, it is because they are under the Federal Witness Protection Program or similar methods to protect society from them."

James T. Tanner, Ph.D. 1966; 1966-67, postdoctoral fellow at Carnegie Institute of Technology; 1967-69, Lecturer in Chemistry, Carnegie-Mellon University; 1969-present, Food and Drug Administration, currently Chief, Methods Research Branch and Special Assistant to the Director, Office of Special Nutritionals, Center for Food Safety and Applied Nutrition; Fellow and Chairman of the Editorial Board, Association of Official Analytical Chemists International, Fellow of the American Nuclear Society. "I must apologize for [taking so long to reply] but this past year has been one I would like to forget. The big issue was on the regulation of dietary supplements. The supplement people put out rumors that vitamins and minerals were going to be regulated by the FDA as drugs and access to them would be limited. This resulted in hate mail and many phone calls telling us to keep our hands off their supplements. Also, some TV ads gave the same information. Of course, they had it all wrong and all we were doing was regulating the labeling and claims being made and the conditions they were being manufactured in to be sure they were sanitary. After the regulations were published, the crisis passed and things are now beginning to return to normal, whatever that is.

Bonnie is in the process of finishing her Ph.D. in Agriculture and is currently going through the horror of writing her dissertation. I have been trying to make sure her bibliography is correct but that is a job because it is 60 pages long. She should finish sometime this summer, early I hope. We thought she would finish [in April] and I cancelled plans to attend the MARC III and BERM 6 meeting in Hawaii so I could be on hand to provide last minute support. Unfortunately, more rewriting had to be done so that is what is happening now.

It's hard to believe that in 5 more years I will be ready to retire after having been with the FDA for 30 years. Time marches on when you are having fun. I don't know what I will do at that time but Bonnie and I are planning on coming back to Kentucky as our home base. It turns out that KY is a very good state for federal retirees because they do not tax the federal retirement income. That's like getting a raise!

We do see some of our friends from KY from time to time as they pass through the Washington area. It's always nice to see them and catch up on all that has happened. I hope that if you are in the area you will let us know. Our home phone number is 703-548-9542 and my work number is 202-205-4168.

I have been busy with two conferences in the past few months. The first one was on anti-oxidant vitamins and cancer and cardiovascular disease and the next one is on fiber. The antioxidant conference was in November, 1993 and at that time the connection between the antioxidant vitamins and the diseases could not be made except that a **diet** rich in antioxidant vitamins was beneficial to your health. Since then the Finnish study has come out (New England Journal of Medicine, Vol. 330, April 14, 1993 page 1029) which has backed up our conclusions. I have that conference on disk if anyone there wants a copy. I am enclosing a couple of announcements about the upcoming Fiber and Cancer and Coronary Heart Disease conference in May. I will also have that conference on disk later if anyone is interested in a copy.

It was nice to hear from you and it's nice to know that the graduates are keeping in touch and also that the Department is keeping in touch with the careers of their graduates. I have rambled on at some length so will close at this point. Best wishes to all there. I do think back about my time at Kentucky and always remember it as being some of the very best of times."

NEWS OF ALUMNI AND ALUMNAE

J. Leroy Keffer, B.A. 1928, deceased November 13, 1990.

Robert H. Baker, B.S. 1929, of Kalamazoo, MI, died May 15, 1992. Born in Central City, KY, on June 14, 1908 the son of Alfred T. and Mary H. Baker, he was educated at Bethel College and the University of Kentucky (B.S. & M.S.), and received his Ph.D. at the University of Wisconsin. He was professor of Organic Chemistry and Dean of the Graduate School during his tenure at Northwestern University from 1941-1976, and was honored as one of the University of Kentucky's Outstanding Alumni in 1965. In his early years he was a farmer, a mechanic, and worked in the mines of Western Kentucky. During his professional life he was an educator, a scholar and an administrator, but he will be remembered as a gardener, storyteller, golfer, and most importantly, a husband and father. He is survived by his wife of 60 years Frances (Holland) Baker, two sons, Dr. Robert H. Baker Jr. Kalamazoo, MI, and Peter B. Baker, Chicago, IL; three grandchildren, Robert H. Baker III, Eureka, CA, Capt. Margaret M. Baker M.D., San Antonio, TX, and Elizabeth J. Stoyanovich, Lexington. He was buried in the Lexington Cemetery in Lexington.

James W. Poynter, B.S. 1930, writes: "Dr. David Young's reminiscences in the last issue of Chem-News was especially interesting to me since I received the B.S. in Industrial Chemistry in 1930 and did graduate work there in 1932-33. Dr. Bedford certainly earned and deserved all the praise that he received and a lot more. However, I must take exception to Dr. Young's characterization of him as only "a fair teacher". I found him to be an excellent teacher with a warm personal interest in each of his students. He was always striving to make you understand and think, not just recite facts from the textbook. When I would have some difficulty in class, I would visit Dr. Bedford in his office. I will never forget those sessions! I would describe my difficulty. Dr. Bedford would smile sweetly and say nothing. After a long embarrassing (at least to me) silence, I would venture some guess as to the answer. Dr. Bedford would continue to smile patiently. After much stammering and floundering around on my part, I would usually work through to my answer and Dr. Bedford would say, "That's right." Sometimes he would give some clue to guide me but I would have to work it out myself. He was also very supportive during my graduate work. Some electrometric titration problem that I was working with would not give reproducible results even after repeated modifications. As a last resort, we decided that the power source (as I remember batteries) was slightly unstable so Dr. Bedford came up with some equipment that gave a very stable potential and the experiment worked. I don't yet know where he got the apparatus for money was really scarce that year.

Only once did I see Dr. Bedford somewhat perturbed. That was on a Saturday morning outside the door to the water analysis laboratory (where Dr. Stewart taught the lab course). The still was malfunctioning and water was running all over the place and threatening to run through the ceiling of the basement labs. Dr. Bedford was trying to get in and shut off the still but the door was locked. When Dr. Stewart was finally located he did not want to open the door, patiently, explaining that he had come in about 4 a.m. to start the still (Dr. Stewart operated full steam on a 24 hour day) and then went home for breakfast, where he had eaten two slices of bacon; therefore there was the possibility that the residual chloride ions on his hand would contaminate the water if he went in for another hour or so. Dr. Bedford did not seem to really appreciate the scientific preciseness involved and the still was turned off!

I was surprised at Dr. Young's experience with Dr. Tuttle. While I had much less contact with Dr. Tuttle than Dr. Young had, he always impressed me as very formal, possibly rather than strict, but fair and impersonal. I do know that in my last semester before graduation in 1930, all finals for seniors in the chemistry department (with one exception!) were waived. The one exception was Dr. Maxson and his Industrial Chemistry Process course. He insisted that we had to take a final but when we appeared on the last day, he said we wouldn't have to take it after all. He apparently thought it a cute trick but none of the class appreciated it. But the less said about Maxson, the better."

John Jacob Owen, M.S. 1930, Ph.D. 1934, was born in Arlington, Carlisle Co., Kentucky October 8, 1894, was the son of Lenna Buckner and Katherine (Flegle) Owen. His father, L. B. owned a drug store and pharmacy in Arlington and was also a member of the state legislature. His mother "Kate" was the daughter of Jacob Flegle, who owned the Flegle flour mill in Arlington. His grandfather, Dr. John Reese Owen was a physician and served in the Civil war with the Second Kentucky Infantry, Company A.

John was educated in the public schools of Arlington and graduated high school cum laude in 1913; received a Bachelor of Arts at Transylvania College, cum laude 1917 with a major in Chemistry and minor in Languages; Masters degree at the University of Kentucky, 1930, in Analytical Chemistry (Dr. Tuttle), became a graduate student at Ohio State University 1931-32; a Fellow at University of Kentucky during the summers of 1933 and 34. His Doctor of Philosophy degree in Organic Chemistry presented by the University of Kentucky (Dr. Barkenbus) was the first degree given in Organic Chemistry at this institution. All of this training resulted in over one hundred credit hours in chemistry alone and the successful preparing of a series of organic chemicals, many of which had never before been prepared.

While at Transylvania he was a laboratory assistant 1916-17. Upon graduation, was the Head of Science Dept., Ogden College, Bowling Green, Ky. (This school is now part of Western Kentucky State Teachers College).

John was Head of the Chemistry Dept., Linsly Institute, Wheeling, West Virginia 1919-33. When their Department of Technology was established in 1925, he also taught the college chemistry, as well as private tutoring and teaching at Wheeling Technical night school. During this time none of his students failed a college entrance examination and none of his students failed a U. S. Civil Service examination for technical positions. Many of his graduates were employed in research laboratories with large corporations or were at universities doing their own research.

From 1934-1959 John was employed by Esso Research Laboratories, Esso Standard Oil Co., Baton Rouge, Louisiana (now part of Exxon Corp., Houston, TX). He was appointed section head in 1937 and administrative assistant in 1950. During World War II he served in several capacities with Esso and the government concerning the original research of synthetic rubber and development of high octane aircraft fuels. He was later a consultant with the Petroleum Administration for Defense and Oil and Gas Division, Dept. of Interior 1954-55. He held twenty-six patents which were principally involved with catalysis, petroleum, and petro-chemical product and manufacturing processes for the benefit of Esso and Exxon.

Little talked about today are the fluid catalytic cracking units which were such a factor in helping us win World War II. This process, new to the gasoline refining industry, made it possible for our country to supply record quantities of 100 octane aviation fuel and other key products such as the first synthetic rubber. Since Japan had control of our Malaysia natural rubber source, it was imperative to find another option. A unique concept of team research was created in October, 1938 that made all this possible — called Exxon (then named Esso) Research and Development Laboratories, Baton Rouge, LA. This team of four hundred top scientists and engineers, with a large research staff of one thousand members was the largest concentration of scientific minds ever assembled this way at one time. John was a part of this team, working directly with Edgar Murphee, one of the four leaders of this successful research enterprise. One could call this cooperative system the pilot plant for the later Manhattan Project.

On April 11, 1917 John married Mae Miller Sanders (1897-1988) at the home of her parents Charles Watson and Lura (Haden) Sanders. of Nicholasville, Jessamine Co., Kentucky. John met Mae on the steps of Morrison Hall while at Transylvania College. Their children are: John J. Jr., Curtis Leroy, and Irene Haden Owen. John was president of the Graduate Club, University of Kentucky; member of Sigma Xi (national honor society); a sixty-five year member of the American Chemical Society; member of the Masons and Scottish Rite Lodges; both he and the family were members of the Christian church.

In 1959 John retired from Exxon, Baton Rouge, Louisiana and moved to Longview, Texas. At this point in his life he had time to pursue a hobby of photography which took him and Mae on many tours taking pictures of scenic America. After a successful career, seventy-two years of marriage, and thirty-one years of retirement he died at the age of ninety-six, November 18, 1990 in Longview, Gregg Co., Texas.

Emerson G. Cobb, M.S. 1931, Ph.D. University of North Carolina at Chapel Hill, died July 30, 1987.

H. Philip Orem, B.S. 1932, M.S. 1934 was born in 1910 in Campbellsburg, KY His B.S. was in Industrial Chemistry and his M.S. in physical chemistry. In September, 1934 he entered the Pennsylvania State College to work with Dr. Frank Whitmore. After completing most of the work for the Ph.D., he took a position in the Research Department of the Calco Chemical Co., a division of the American Cyanamid Company in Bound Brook, NJ, under the direction of Dr. H. A. Lecher. In 1938 his Ph.D. research was published in JACS, but shortly afterwards all hydrocarbon research was sealed under government secrecy order until the end of World War II. Dr. Whitmore died during this period and the Ph.D. was never awarded.

Mr. Orem worked in the Azo Dye and Intermediate Division of American Cyanamid Co. and was Technical Superintendent there when he moved to the Research Department of Sloss Sheffield Steel and Iron Co. in Birmingham, Alabama in 1950. In that position he was involved in developing processes for the reduction of aromatic nitro compounds to amines using coke oven gas, for the catalytic conversion of toluene to benzonitrile, and for the preparation of 4,4'-dihydroxydiphenyl sulfone. In 1975 he retired from this company, which had become the United States Pipe and Foundry Co., Division of the Jim Walter Co..

Mr. Orem held leadership positions in a number of the professional organizations of which he was a member, the American Chemical Society, the American Institute of Chemical Engineers (of which he was a founding member and its first secretary) and the American Institute of Chemists. He was also a student member of Alpha Chi Sigma and was elected to full membership in Sigma Xi at U.K.

As a student Mr. Orem was a member of the U.K. Rifle Team, an interest that he has maintained ever since. He has competed in contests involving a variety of firearms and has won over 200 medals, trophies and prizes. He has a dozen publications in "Muzzle Blasts", the journal of the National Muzzle Loading Rifle Association. In retirement Mr. Orem lives in Warm Springs, Virginia

James B. Irvine, B.S. 1937, is retired and still active as a consultant in textile chemistry. He also has a regular TV spot about chemistry and minerals on a local "Good Morning Show". "I went to high school on the UK campus at the now non-existent University High School. My high school chemistry teacher, John Leroy Keefer, was on the UK faculty at that time. He wound up his career here as Director of Applied Research for P. Lorillard. He and I played hundreds of rounds of golf together until his death last year."

Marshall B. Guthrie, B.S. 1940, M.D. University of Pennsylvania Medical School, died of pancreatic cancer on December 17, 1989. He had been a dermatologist at the University of Pennsylvania, Medical School and Clinical Pharmacologist for Smith Kline Beecham for 35 years.

Richard H. Hunt, B.S. 1945; M.S. and Ph.D. from the University of Wisconsin; retired from Shell Oil Co.'s Houston Research Laboratory; died November 16, 1991

J. Thomas Gunnell, M.S. 1948, deceased.

Dr. Edward J. Griffith, M.S., 1948, Ph.D.; Senior Fellow in the Performance Products Division of the Monsanto Chemical Company, St. Louis, MO; author of the feature article titled "In Search of a Safe Mineral Fiber" in *Chemtech* of April 1992.

Alan G. Veith, B.S. 1949; 1956, M.S.in polymer chemistry, University of Akron; consultant for Technical Development Association, Akron, OH. He retired from Uniroyal-Goodrich Tire Co. in June 1991, as Senior R&D Fellow after 43 years in industry. He also participated in ASTM D11 and ISO TC45 standardization work (rubber industry) for the past 30 years. Named an ASTM Fellow and received "Award of Merit" in 1978.

Sondra Edwards Holt, M.S. 1966, is U.S. Distribution Manager for Lexmark International.

Jim Setzer, M.S. 1966, was interviewed April 18,1992 on CBS evening news about radioactive waste disposal problems in Georgia where he is Chief Environmental Officer of the state of Georgia.

Nabeel F. Haidar, Ph.D. 1970; Vice President of Beirut University College in Beirut, Lebanon.

Kurt Huhtanen, Ph.D. 1970, is Research Associate Scientist for Ricerca, Inc., where he does registration chemistry with an accent on metabolism of pesticides.

Russell Moser, Ph.D. 1970, works for GMC, Packard Electric, Warren, OH.

Terrell W. Holt, Ph.D. 1971, is Vice President, Batesville Casket Co., a division of Hillenbrand Industries.

Alice Krekel Kruegel, Ph.D. 1972, heads the largest drug laboratory in the US and probably the largest one in the world. As director of the North East Regional Laboratory, Drug Enforcement Administration in New York City, the Louisville native directs 35 chemists and 15 support staff.

W. Reid Thompson, B.S. 1973, was featured in the pages of the summer/fall 1992 issue of *Odyssey*, the magazine of U.K. research. After a Ph.D. at Cornell University, he is now a Senior Research Associate in Astronomy and Space Sciences at Cornell, where he is "playing a major role in the $1.5 billion Galileo project, whose mission is to begin orbiting Jupiter in December of 1995, relaying information about the solar system's largest planet. 'The goal is to orbit Jupiter for about two years, to study the moons, the planet itself, and to drop a probe into the atmosphere,' says Thompson, whose specialty is the composition and chemistry of planetary materials." "Thompson, whose academic honors include the Clark Award for Distinguished Teaching at Cornell, looks back at his UK days with 'a lot of fondness and gratitude,' recalling several professor who left their mark. 'I remember Bill Plucknett, who taught physical chemistry, very well. He was relaxed and very charismatic, and it's always easier to learn from someone who can make you feel comfortable. We appreciated his genuineness and his ability.' Thompson also mentions the importance of the 'even-handed advice' he got from a number of professors when he began thinking about graduate school. 'Bill Ehmann, Donald Sands and Paul Corio all gave me good advice about which schools to apply to, which government grants to try for, and I just wouldn't have known how to go about any of that without some directions.' One result of this mentoring was a NSF Fellowship, which Thompson held from 1973 to 1976. Thompson's research through the years has resulted in nearly 50 presentations and abstracts and over 30 published articles, a number of these co-authored by a 'C. Sagan.' 'Carl's office is just down the hall, and he's a pleasant guy, very easy to talk to,' Thompson says. 'And I've never met anyone who's so joyous about discovery--Carl has been able to keep alive a kind of childlike fascination with science.'"

Bill Bloemer, Ph.D. 1973; Dean of the School of Liberal Arts & Sciences, Sangamon State University, Springfield, IL.

David Wesley, Ph.D. 1975; Ashland Petroleum Company; has been named manager of the analytical section, research and development.

Ray Guffey, B.S. 1976, M.S. 1978; 1984, J.D., Northern Kentucky University; 1992, M.S., Life Sciences, Indiana State University; Senior Patent Attorney for Pitman-Moore, Inc. in Terre Haute, IN. He is an intellectual property attorney responsible for patents, trademarks, copyrights, licensing and technical contracts.

James S. Swan, B.S. 1976; Ph.D. Pennsylvania State University; Associate Professor of Chemistry (1992) at Bucknell University, Lewisburg, PA.

Albert Filo, M.S. 1979, works for Eastman Kodak in Rochester, NY.

Stanley S. Seelig, M.S. 1979; Senior Research and Applications Chemist for LA-CO Industries, Inc., Chicago, IL; Chicago Sec-

tion ACS involvement includes: Director (1990-92), Alternate Councilor (1990-93), Public Relations Chair (1989-91) and member, Public Affairs Committee member, NCW committee member, volunteer in Public Outreach.

Carolyn Sands Loof, B.A. 1979, mother of triplet girls, works at home on contract with UK.

Edgar C. Nicolas, Ph.D. 1980, is the head of Analytical/QC, Chemical Process R&D, DuPont Merck Pharmaceutical Company. He is back to research after 11 years in manufacturing and QC and is now able to pursue new analytical technologies such as HPLC-MS, SFC, CE and chiral separations.

Christa Hartmann, B.S. 1982; Ph.D. at UC Berkeley; Assistant Professor in the Department of Chemistry at Temple University, Philadelphia.

Glenda Dahlquist Planz, B.A. 1982; M.D. 1986 University of Louisville; currently an anesthesiologist.

Aman Khan, Ph.D. 1985, is employed by Isotopes Products in Burbank, CA.

Gaye Morelan, B.S. 1985, works for Mallinckrodt in Paris, KY.

Vicki L. (Abbott) Nienaber, B.S. 1985; protein crystallographer and postdoctoral fellow at Central R&D, DuPont Merck Pharmaceuticals, Wilmington, DE.

Dan Pawley, M.S. 1985, is an environmental chemist with Dow Corning Corporation, Greensboro, NC, leading the environmental control department. He and his wife, Lisa, have a son, Aaron, 5, and a daughter, Elizabeth, 2.

Diane Vance, Ph.D 1986, is now a Development Staff member in the radiochemistry group at the Y-12 plant lab of Martin Marietta Energy Systems, in Oak Ridge, TN. She was a Senior Scientist with Westinghouse Savannah River Co.

Danna Evans, B.S. 1986, is Senior Chemist for the Kentucky Department of Transportation and is presently pursuing an M.S. in Chemistry at Eastern Kentucky University.

Barry McKenzie, M.S. 1986, has nine years experience as a QC and R&D analytical chemist with Mallinckrodt Specialty and Performance Chemical Company. His current responsibilities include analytical methods and new product development. He has served on the US Chemical Reagents Committee and the Analytical Methods Subcommittee for SEMI. Barry was the author of the featured article titled "Volumetric vs. Coulometric: Titration Trade-Offs" in Today's Chemist, January 1993.

Bill Sartain, Ph.D. 1986, at Quantum Chemical, transferred to Cincinnati, OH.

Amy Howell, Ph.D. 1987, will join the faculty as Assistant Professor at the University of Connecticut in August, 1994. She was a visiting professor at UK for the 1993-94 academic year and a very popular and effective teacher in several organic courses. Until she leaves for the east coast she will be in South Bend with her husband Stewart Richardson, who is a Postdoctoral Fellow at Notre Dame.

Bryan R. Payne, B.A. 1988; M.D. University of Louisville, is a neurosurgical resident at Louisiana State University, Medical Center - New Orleans.

John F. Walker, B.A. 1989, is a financial analyst responsible for cost planning at Lexmark, Lexington, KY. Presently working on an MBA at UK.

Patrick Prince, B.S. 1989, is a Quality Assurance Manager at Milliken Corp. He and his wife, Nancy, had their first child, Christopher Keller, on January 1, 1993.

Kevin G. Frank, Ph.D. 1990, is Senior Process Chemist with Miles, Inc., Pittsburgh, PA.

Rick Gatenby, Ph.D. 1990, at Bettis Atomic Power Laboratory, a Division of Westinghouse, in West Mifflin, PA.

Greg Simpson, B.S. 1990, entered the graduate program in chemistry at Washington State University in Fall 1992.

Mary Anne Yacko, Ph.D. 1990, is a Research Associate working with Professor Dennis Chapman of the University of London in the Department of Protein and Molecular Biology.

Vincent Stapp, B.S. 1991, is developing methods for GC, HPLC and GC/MS at Procter & Gamble in Cincinnati, OH.

Anu Rangachari, M.S. 1991, is a Research Scientist at Endocrine Sciences near Los Angeles.

Tommy McCall, B.S. 1992, is working with ink formulations for ink-jet printers at Lexmark's Product Research and Development Division in Lexington, KY.

Julie Sharpensteen, B.A. 1992, has taken a job as an analytical chemist with American Synthetic Rubber, Inc., in Louisville, KY.

Allan Witkowski, Ph.D. 1993, assistant professor at Kentucky Christian College in Grayson, KY.

NEWS FROM FACULTY AND STAFF

Carol Brock is Co-Editor of Acta Crystallographica. She attended the following meetings: American Crystallographic Association meetings in Pittsburgh (August 1992) and Albuquerque (May 1993) and organized a session for the former; International Congress on the Chemistry of the Organic Solid State in Jerusalem (July 1993); Congress of the International Union of Crystallography (August 1993), plenary lecture.

Leonidas Bachas started 1993 with a half-year sabbatical leave in Barcelona, Spain. This sabbatical stay was funded by the Spanish Ministry of Education and Science. Leonidas has an active collaboration with Manuel Valiente of the Universitat Autonoma de Barcelona and several of the students of his Spanish collaborator visit periodically the University of Kentucky to perform research. Leonidas had to return to the US in the middle of his sabbatical to accept the 1993 Young Investigator Award of the Society for Electroanalytical Chemistry at the Pittsburgh Conference in Atlanta. During this past year he received a new research grant from NASA to complement his current grants from NIH, NSF and American Cyanamid. He continues to serve as the Director of the Research Experiences for Undergraduates program of the Center of Membrane Sciences of our University. In 1993, he and his students presented research talks at the Pittsburgh Conference, the III Italian-Spanish Congress on Thermodynamics of Metal Complexes, the 1993 International Solvent Extraction Conference, and the ACS National Meetings in Denver and Chicago. Additional talks were given at the Universitat de Girona (Spain) and American Cyanamid.

Allan Butterfield was invited to give a plenary presentation at the *Third International Conference on Alzheimer's Disease* near Padova, Italy. He was also invited to give research presentations at the *10th Membrane Conference on Technology and Planning* in Boston and the *Central Regional American Chemical Society Meeting* in Cincinnati. In addition, he gave a research presentation at the *Southeast Magnetic Resonance Conference* in Raleigh, NC. In Allan's role as Director of the University of Kentucky

Center of Membrane Sciences, he, along with Professor DB Bhattacharyya of Chemical Engineering, organized and hosted the 5th National Meeting of the North American Membrane Society. More than 350 scientists and engineers from 16 countries attended this meeting at which more than 120 papers were presented. This was the largest meeting ever of this organization, which brought increased recognition to the University and to the Center. Allan presented two invited papers on his research at the *American Chemical Society* in San Diego and at the *Fourth International Conference on Alzheimer's Disease* in Minneapolis.

Allan is the Principal Investigator of a National Science Foundation grant entitled "Biofunctional Membranes: Synthesis, Structure, and Function", a grant for 3 years totaling $1.3 million. He is also a Co-Principal Investigator of a NSF grant entitled "Research Experiences for Undergraduates in Membrane Sciences at the University of Kentucky". This is a 3-year grant to bring rising juniors and seniors principally from Appalachian colleges and universities to obtain research experience. The overall goal is to encourage more students to obtain graduate degrees in chemistry and chemical engineering. Dr. Leonidas Bachas is the Principal Investigator of this effort. Allan is also a Co-Investigator of a 5-year National Institutes of Health Program Project Grant entitled "Calcium Regulation in Brain Aging and Alzheimer's Disease". This grant, with Prof. Philip Landfield of Pharmacology as P.I., is for nearly $4 million. Allan is P.I. on a newly-funded NSF grant, "Membrane-Supported, Highly-Ordered Biomaterials for Bioreactors". This 3-year grant for $270,000 also involves Professors Leonidas Bachas and D.B. Bhattacharya as co-P.I.s. In early 1993, Allan had his 100th scientific research paper published. Allan's work on an amyloid peptide free-radical mechanism for brain cell death and senile plaque formation in Alzheimer's disease, published in 1994 in the *Proceedings of the National Academy of Sciences USA* was featured in *Chemical and Engineering News* in April, 1994.

Allan served as Chairperson of the Lexington Section of the American Chemical Society in 1992.

Allan's wife, Marcia, was recently promoted to Nursing Coordinator for the Brain Injury Unit of Cardinal Hill Hospital. She is in charge of all nursing operations for this unit.

Allan and Marcia's daughter, Nyasha, graduated from the University of Maine in May, 1993 with a B.A. degree in psychology and a B.S. degree in Early Childhood Development. Nyasha is certified in teaching for K-8 and she also is certified in both developmental disabilities and facilitated communication. Nyasha is currently employed as a teacher in Charlotte, NC, and she recently became engaged to be married. Allan remains active in Habitat for Humanity, the Hope Center for the Homeless, and as a Sunday School Teacher at St. Michael the Archangel Episcopal Church.

Bill Ehmann presented invited papers at the *International Conference on Mercury as a Global Pollutant* in Monterey, CA and the *Second International Symposium on Nuclear Analytical Chemistry* in Toronto, both in June 1992. He also attended the *PITTCON '92 Conference* in New Orleans where several of his students presented papers and was coauthor of oral papers presented at several other conferences. The 1992-93 year was a very productive one in papers published and degrees granted to group members. Current group members are involved in AD and ALS studies using LMMS, NAA and GFAAS. Bill still holds two NIH Grants with Bill Markesbery in the Center on Aging studying potential trace element involvement in AD. The newest grant involves a study of the relationship of dental amalgams to brain mercury levels and AD. For this study approximately 90% of the Teaching Sisters of Notre Dame in Milwaukee, Wisconsin have offered to donate their brains upon death.

In family news, son Bill finished his Ph.D. in ecology at Utah State University this spring. Nancy and Bill plan to visit him in Logan in June. He plans to teach at Trinity College in Washington, D.C. next year. John still works for state government in Olympia, Washington and Jim continues to deal with rare coins in Lexington with the Jonathan Kern Co. Kathleen is a dietitian at St. Joseph Hospital in Lexington. Nancy still runs *Meals on Wheels of Lexington* which was recently incorporated and she serves as CEO. In the 1993-94 academic year Nancy and Bill travelled to Padova, Italy to present an invited paper on aluminum in AD in late September and returned to Kona, Hawaii in April, 1994 for the *Third International Conference on Methods and Applications of Radioanalytical Chemistry (MARC-III)*. Bill, students and postdocs presented six papers at the meeting. Another meeting of interest to group members will be the *Modern Trends in Activation Analysis Conference* to be held in 1995 at Seoul, Korea.

Bill has been appointed to the Editorial Boards of the *Journal of Radioanalytical and Nuclear Chemistry*, an international journal covering the fields of nuclear and radiochemistry, and the *Journal of Trace and Microprobe Techniques*. He was awarded the 1994 Herty Medal for career achievements (see elsewhere in this newsletter).

Bill will be retiring early in 1995, but will continue his involvement in his NIH research projects with the Center on Aging.

Jack Selegue continues to work on organometallic chemistry, and has also initiated work in the chemistry of fullerenes and solid-state materials. He presented or coauthored presentations at the American Chemical Society National meetings in San Francisco and Denver, the 75th Canadian Chemical Conference in Edmonton, Alberta, the 1993 Workshop on Superconductivity in Fullerene Solids in Lexington, the 1993 Gordon Conference on Organometallic Chemistry in Newport, RI, the Electrochemical Society National Meeting in New Orleans, the ACS Central Regional Meeting in Cincinnati, the Southeast Regional Meeting of the American Physical Society and the American Vacuum Society, both in Oak Ridge, TN. (Fullerene chemistry leads to some unusual meetings.) He also presented research seminars at University of Illinois, University of Minnesota, Indiana University, University of Cincinnati, Ohio University and University of Louisville. He has given chemistry presentations at some local schools, and acted as "mentor" for a student from Dunbar High School. He is 1993-94 Chairman of the Lexington Section of the American Chemical Society. His research as been supported by grants from the U. S. Department of Energy, the National Science Foundation (Instrumentation and EPSCoR programs), DOE-EPSCoR Traineeships to graduate students Michael Morton and Jeffrey Lomprey, the Center for Applied Energy Research and the Southeast Universities Research Association for collaborative work at Oak Ridge National Laboratory. He hosted Dr. Karsten Swarat, who held a Feodor Lynen Fellowship from the Alexander von Humboldt Foundation during 1991-1993. The trip to Alberta included a marvelous family vacation in the Canadian Rockies, staying in cabins in Jasper and Banff. A highlight was a tour of the Athabasca Glacier

in the Columbia Icefield. His wife Edith continues to take classes at UK, perhaps leading to a degree in library science. His son Paul is now a first-grader at Maxwell Elementary School, specializing in rock and coin collecting.

Nancy Stafford was awarded the Arts and Sciences Outstanding Staff Recognition in January, 1994.

Joe Wilson was one of the winners of the Arts and Sciences Outstanding Teacher Award Prize for 1992-3. His wife, Marlene, is Outpatient Admissions Coordinator at Cardinal Hill Hospital. Their issue are slowly progressing through the educational system. In the fall Josh will begin his sophomore year at UK, Ruth will begin her sophomore year at Henry Clay High School, and Sarah will begin her first year at Morton Middle School.

Steve Yates continues to be involved in a number of national organizations, although his duties are decreasing. He has completed his terms as Immediate Past Chairman (a position he found very enjoyable) of the Division of Nuclear Chemistry and Technology of the American Chemical Society and as the nuclear chemistry representative on the Nuclear Science Advisory Committee, a group that advises the Department of Energy and the National Science Foundation on research and funding directions in the nuclear sciences. While his tenure as the monographs coordinator for the Committee on Nuclear and Radiochemistry of the National Research Council has formally ended, he continues to work on some loose ends associated with these monographs. Steve has accepted a three-year appointment as a member of the Program Advisory Committee for the High Flux Beam Reactor at Brookhaven National Laboratory and serves as a member of the Committee on Biomedical Isotopes of the Institute of Medicine/National Academy of Sciences. He also serves on committees for several international conferences and on the Editorial Advisory Board of the *Journal of Radioanalytical and Nuclear Chemistry.*

Steve presented invited talks at the Washington (1992), Chicago (1993), and San Diego (1994) ACS Meetings and at the International Symposium on Capture Gamma-ray Spectroscopy in Fribourg, Switzerland. He organized symposia at the San Francisco (1992) and Washington (1992) Meetings. He has co-authored more than twenty additional papers at various meetings during the past year and chaired sessions at the Workshop on Applications of High Resolution Gamma Spectroscopy in Studies of Atomic Collisions and Nuclear Lifetimes, Grenoble, France and at the Symposium on New Arrays and Detectors in Nuclear Structure Research, Chicago ACS Meeting. He has also recently presented research seminars at Notre Dame University, the University of Missouri at Columbia, Western Kentucky University, the Institut Laue-Langevin, Grenoble, France, and the University of Stuttgart, Germany. He was an invited lecturer at the Summer Schools on Nuclear Chemistry at Brookhaven National Laboratory and at San Jose State University. With A. C. Ling and K. Rengan, Steve was a guest editor of a special issue of the *Journal of Radioanalytical and Nuclear Chemistry* on "The Status of Nuclear Science Education." Steve's research is supported by grants from the National Science Foundation.

Linda Yates is working at the new McAlpin's department store at Fayette Mall in Lexington, and Michelle Lynne, their daughter, will begin her junior year at Henry Clay High School. *(Additional news about Steve may be found in an article about him in this newsletter.)*

GRADUATE DEGREES AWARDED
May 1992 - May 1994

Doctor of Philosophy

Minas S. Barbarakis (Bachas) Dec. 92, "Homogeneous Enzyme- and Fluorophore-Linked Binding Assays That Employ the (Strept) Avidin-Biotin System", Senior Scientist, Immuno Research Group, Ciba Corning Diagnostics, East Walpole, MA.

Edward M. Baum (Yates) Aug. 93, "A Study of the Nuclear Structure of ^{88}Sr and ^{90}Zr at Intermediate Excitation Energy by the (n,n'ă) Reaction", Knolls Atomic Power Laboratory, a Division of Martin Marietta, Schenectady, NY.

Timothy L. Blair (Bachas) Dec. 93, "Use of Recognition Chemistry in the Development of Ion Sensors", Assistant Professor of Chemistry, University of the South, Sewanee, TN.

David P. DiPrete (Yates) May 94, "Dipole Transitions in Shape Transitional Nuclei: Detailed Studies of ^{146}Nd and ^{196}Pt with the (n,n,'ă) Reaction", Senior Scientist, Westinghouse Savannah Company, Aiken, SC.

Margaret R. Harbol (Appling) Aug. 93, "Resonance-Enhanced Multiphoton Ionization and Photoelectron Spectroscopy of Gas Phase Sulfur Phosphorus and Arsenic Atoms", Instructor at East Carolina University, Greenville, NC.

Michal K. Heine (Watt) Aug. 92, "Synthesis of Prostaglandin F2a Photoaffinity Probes Bearing Photoactive Groups at C-I or C-18", Postdoctoral Research Associate in Chemistry, University of Virginia.

Yon-Tae Je (Companion) Dec. 93, "A Theoretical Study of the Adsorption and Dissociation of Carbon Monoxide on Cobalt Single Crystal Surfaces: Co(0001), Co(100), Co(110), and Co(102)".

Ellis Lee Johnson (Yates) Aug. 93, "The Study of Scissors Mode Excitations in 162-, 164-Dy by Inelastic Neutron Scattering", Postdoctoral Research Associate in the area of nuclear imaging. Duke University Medical Center.

Duck-Lae Joo (Clouthier) May 94, "High-Resolution Spectroscopy of Some Transient Molecules", Postdoctoral Research Associate at UK.

Santosh G. Kottayil (Butterfield) May 93, "Implications of Sulfation on the Pharmacological Activity of Morphine a Structure-Activity Study", Senior Scientist, Ora-Med, Inc., Mundelein, IL.

Jeffrey Lomprey (Selegue) Dec. 93, "The Synthesis, Characterization, and Reactivity of Some Alkyne, Vinylidene, and Butatrienylidene Complexes of Ruthenium", Postdoctoral Research Associate, Dartmouth College, Hanover, NH.

Mark A. Lovell (Ehmann) Aug. 92, "Quantitation and Use of Laser Microprobe Mass Spectrometry (LMMS) In the Evaluation of the Toxic Element Hypothesis of Alzheimer's Disease", Postdoctoral Research Associate at UK.

Alynne I. MacLean (Bachas) Dec. 92, "Preparation and Evaluation of Conjugates for the Development of Enzyme-Linked Competitive Binding Assays", Staff Scientist, Bioanalytical and Drug Metabolism Section, P&G Pharmaceuticals, Norwich, NY.

Mitchell D. Owens (Majidi) May 92, "Optical Emission and Mass Spectrometric Studies of Processes Induced by High Intensity Laser Radiation".

Manjiri Patwardhan (Guthrie) May 94, "High-Energy Radiolysis of Organic Molecules in Solution".
Krishnan Rajagopalan (Watt and Haley) May 94, "Synthesis and Application of Bidentate Cross-Linking Reagents: Nucleotide Photoaffinity Probes with Two Photoactive Groups", Postdoctoral Research Associate, UK.
Lav Tandon (Ehmann) Aug. 93, "Evaluation of the Toxic Trace Element Hypothesis of Neurodegenerative Diseases", Postdoctoral Research Associate at NIST, Washington, DC.
Sandra A. Umhauer (Butterfield) May 92, "Spin Labeling of Membrane Proteins in Mammalian Brain Synaptic Plasma Membranes: Partial Characterization and Relevance to Aging and Alzheimer's Disease", UK College of Medicine.
Sundar Vasudevan (Watt) May 94, "Synthesis of Terpenoid Natural Products: Interconversions of Tetracyclic Quassinoids", Postdoctoral Research Associate, University of South Alabama.
Paul E. Yeary (Richard) May 93, "Solvolysis and Bimolecular Substitution Reactions of Substituted Benzyl Chlorides", Analytical Chemist, Teknor-Apex, Brownsville, TN.
Robert J. Yoblinski (Guarr) May 93, "Spectroscopic and Electrochemical Investigation of Ligand-Bridged Rhenium (I) Complexes", Assistant Professor of Chemistry, Wheeling Jesuit College.
Weixing Zhang (Majidi) May 94, "Spectroscopic Evaluation of Metal-Algae Interaction", Postdoctoral Research Associate at the Eppley Institute for Research in Cancer and Allied Diseases at the University of Nebraska Medical Center.
Qi Zhuo (Clouthier) Dec. 93, "Laser and FTIR Spectroscopy of Transient Molecules".
Yi Zou (Lodder) Dec. 93, "A Novel Algorithm to Attack the Problem of Pattern Recognition with Near-IR Spectroscopy", Barr Laboratories, Inc., Pomona, NY.

Master of Science

Cecilia Clarke DiPrete (Ehmann) May 93, Chemist, PTRL, Lexington.
Elizabeth A. Ferguson (Robertson) May 94, Veterans Administration Hospital, doctoral program in toxicology, UK.
Somasundar Prasad Gabbita (Watt) Dec. 92, doctoral program in toxicology, UK
Jinbo Lee (Butterfield) Aug. 93, doctoral program in pharmacy, University of Michigan.
Timothy P. Mills (Lodder) Dec. 93, doctoral program in pharmacy, UK.
Prakash N. Nair (Lodder) Aug. 93, doctoral program in toxicology, UK.
Rustem V. Sharipov (Guthrie) May 94, Associate for Research and Consulting with Bridge International, St. Simons, Is. GA; working in Lexington.
Ishmael W. Stevens, Jr. (May 93), Marshall University College of Medicine.
Bin Sun (Butterfield) Aug. 93, doctoral program chemistry, Princeton University.

A DECADE OF NANTZ SCHOLARSHIPS

The 1992-93 academic year saw the beginning of the second decade of Thomas B. Nantz Memorial Scholarships in Chemistry. These were established in 1981 and are funded from an endowment contributed by Mary Halley Nantz (Mrs. Thomas B. Nantz) in memory of her husband who died December 17, 1979. He was a retired Executive Vice-President of the B.F. Goodrich Company.

Thomas Nantz received a B.S. from the Department of Chemistry in 1937. Among his many accomplishments and honors, he was made production manager of Goodrich's nitrile rubber plant in Louisville in 1947 and was named plant manager of the company's vinyl monomer plant in Calvert City, Kentucky, in 1952. He was a member of the U.K. Development Council, a U.K. Fellow, and a recipient of the Distinguished Alumni Centennial Award in 1965.

Mary Halley Nantz lives now in a retirement community in Naples, Florida, although she manages to keep quite busy. She volunteers one day a week at a hospital, and "in season" she also volunteers her time to run the gift shop at a local park.

The income from the endowment provides up to two one-year tuition scholarships for students at the University of Kentucky who are majoring in Chemistry, who have exhibited potential for academic excellence and show need for financial assistance. The recipients may have graduate or undergraduate status, but undergraduate recipients shall be limited to those students entering their Junior or Senior year. Recipients are selected by a faculty committee appointed by the Dean of the College of Arts and Sciences.

Since 1981, there have been 28 recipients of Nantz Scholarships.

1982-83:	Rita K. Calhoun, Christa Hartmann, Peter Nickias
1983-84:	John Davis, William Sartain, Madeline Sampson
1984-85:	Linda Osborne, William Sartain, Gary Kaufman
1985-86:	Mark Scheuer, Ross Shipe, James Goodrich
1986-87:	Kim Warner Woodrum, Charlene Haertzen
1987-88:	Benny Johnson, Gina Calhoun, Donna Palmieri
1988-89:	Ashok Chavan, Benny Johnson, Donna Palmieri
1989-90:	Peter Crocker, Michal Heine, Vanessa Wotring
1990-91:	Michal Heine, Xueqing Zhao
1991-92:	Shannon Rae Long, Sundar Vasudevan
1992-93:	Barbara Armstrong, Rupa Shetty
1993-94:	Scott Cross, Richard Hutchins

STUDENT AWARDS, 1993 & 1994

UNDERGRADUATE AWARDS

Merck Index Award for scholastic achievement in chemistry. 1993: **Agatha J. Feltus, Kathryn E. Linville, Michelle L. Shuffett**; 1994: **Kathryn Barlow**

Undergraduate award in Analytical Chemistry; subscription to the *Journal of Analytical Chemistry*. 1993: **Kalvin J. Gregory**; 1994; **Agatha Feltus**

Undergraduate Service Award for service to the Department. 1993: **Eric C. Potter**; 1994: **Julie Yates**

American Institute of Chemists Award for scholastic achievement, leadership ability and character. 1993: **Amy L. Compton**; 1994: **Michelle Shuffett**

Willard Riggs Meredith Award to the outstanding senior in Chemistry. 1993: **Christopher A. Shelley, William S. James**; 1994: **Amy L. Compton**

Stephen Harris Cook Undergraduate Summer Research Fellowship. 1993: **Loyd Bastin**; 1994: **Shawn Crump**

Handbook of Chemistry and Physics Award to the Outstanding Freshman Chemistry Major. 1993: **Stephen L. Wang**; 1994: **Matt Grunkemeyer, Michael Henning**

General Chemistry Excellence Award to the student with the highest score in general chemistry each semester. **Robert M. Sartin** (fall, 1992), **Aik Chong Can** (spring 1993), **Adam S. Trebolo** (fall 1993), **Julie A. Jeffords** (spring 1994)

Thomas B. Nantz Memorial Scholarship; tuition scholarship. 1993: **Amy L. Compton**

Waldo Semon National Undergraduate Chemistry Research Award, six finalists were invited to Akron to present their papers; the 1992 first prize went to **Kenneth Hensley** for his research with Dr. Butterfield.

Oswald Research and Creativity Prize, campus-wide competition at UK to honor excellence in research and creativity in the arts, social sciences, science and engineering. 1994: **Wendy Shaw**, second place in the physical sciences and engineering division; **Faeimm Tang**, honorable mention

GRADUATE AWARDS

External Awards

Oak Ridge National Laboratory Professional Internship Fellowship to conduct research at the ORNL: 1993-4: **Daniel J. Van Dalsem**

Ford Foundation Minority Fellowship (three-year renewable): **Emily Hernandez**

Office of Naval Research Graduate Fellowship (three-year renewable): **Kenneth Hensley**

Analytical Division of the American Chemical Society Summer Research Fellowship; one of five awarded nationally; $4000 and participation in a special symposium for award winners at the March 1993 National ACS Meeting. **Allan Witkowski**

Sigma Xi Outstanding Graduate Student Research Award. **Jeffrey R. Lomprey**

Crystallography Scholarship Award from the International Centre for Diffraction Data: **Michael Lloyd**

Department and University Awards

Franklin E.Tuttle Fellowships. 1992-3: **William E. Barnhill, Anita Bhardwaj, Cathleen J. Clark, Laura Cross, Scott Cross, Edward L. Dean, James L. French, Nathan C. Hall, Emily C. Hernandez, Richard Hutchins, Michael A. Lloyd, Temba Maqubela, Eric J. Sherwood, Sridhar Ramanathan, Manvinder S. Wahi**; 1993-94: **William E. Barnhill, Anita Bhardwaj, Jennifer L. Bianchi, Pamela S. Cole, Paul J. DeLaLuz, Warren W. Harper, Emily C. Hernandez, Jennifer C. Lewis, Michael A. Lloyd, Temba Maqubela, Douglas J. Rice, Sridhar Ramanathan, Rupa Shetty, Shelley D. Young, Weizing Zhang**

Paul I. Murrill Fellowships. 1992-3: **Lori J. Blanchard, Amy L. Borman, Michael Deibel, Angela Fultz, Christopher A. McGrath**; 1993-4: **Lori J Blanchard, Michael Deibel, Angela Fultz, Christopher A. McGrath**

Thomas B. Nantz Memorial Scholarships. 1992-3: **Scott Cross, Richard Hutchins**; 1993-4: **Wei Huang, Rupa Shetty, Ramachandran Subramaniam**

Ashland Oil Foundation Summer Research Fellowships. 1993: **Michael Deibel, Angela Fultz, Allan Witkowski**; 1994: **Mark Blankenbuehler, Warren Harper, John M Richardson**

Graduate School Academic Excellence In-State Tuition Scholarship. 1992-3: **Corinne C. Eloi**; 1993-4: **Anita Bhardwaj**

Graduate School Quality Achievement Fellowships. 1992-3: **Angela Fultz, Richard Hutchins, Michael Deibel, Christopher McGrath, Allan Witkowski, Eric Sherwood**

Center for Computational Sciences Graduate Assistantship. 1992-3: **Qi Zhuo**

Graduate School Lyman T. Johnson Minority Fellowship; 1992-3: **Emily Hernandez, Temba Maqubela**; 1993-4: **Paul DeLaLuz**

Graduate School Allocated Academic Year Fellowships awarded on the basis of the degree productivity of the program and the general excellence of the program's faculty and graduate students. 1992-3: **Michael Deibel, Weixing Zhang, Rupa Shetty, Ning Xu**; 1993-4: **Wei Huang, Lori Blanchard**

Graduate School Open-competition Academic Year Fellowship awarded in an all-campus competition. 1992-3: **Angela Fultz**; 1993-4: **Christopher McGrath**

Graduate School Dissertation Year Fellowship. 1992-3: **Allan Witkowski**; 1993-4: **Corinne Eloi**

Behrman Fund Awards

Charles H.H. Griffith Outstanding General Chemistry Teaching Assistant Award. 1993: **Richard Hutchins**; 1994: **Amy Borman**

Outstanding Teaching Assistant Award. 1993: **Temba Maqubela**; 1994: **Ramachandran Subramaniam**

Fast Start Award to the graduate student in his or her first or second year in the department of chemistry, who has made outstanding initial overall progress towards his or her degree). 1993: **Scott Cross**; 1994: **Robert Pogue**

Graduate Student Research Award based on research accomplishments for the past year. 1993: **Jeffrey Lomprey**; 1994: **Darrell Taulbee; Qi Zhuo**

100% Plus Award to the student who shows the most exemplary professional attitude. 1993: **Allan Witkowski, Fuqiang Xu**; 1994: **Weixing Zhang**

Outstanding First-Year Graduate Student Award; one-year subcription to *Accounts of Chemiscal Research*. 1993: **Anatoly Kolmeisky**; 1994: **Warren W. Harper**

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