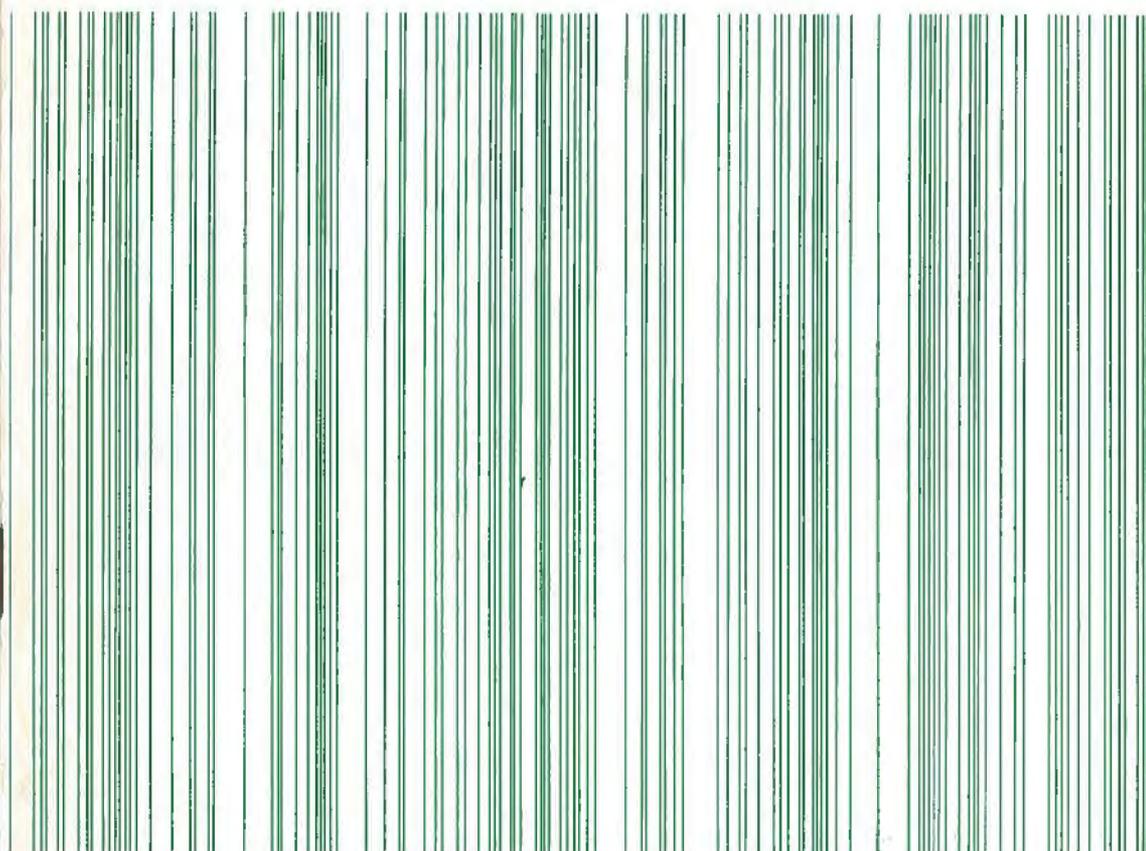

ALUMNI NEWSLETTER

School of CHEMICAL SCIENCES

UNIVERSITY OF ILLINOIS at Urbana-Champaign



NO. 5, JANUARY, 1971

Letter From The Editor

Dear Alumnus:

Many things have happened this fall in what used to be called the Department of Chemistry and Chemical Engineering—things that please us and of which we are proud. We hope that you, as members of the Illinois chemical family, will be pleased and proud, too—new programs, new honors, and new challenges. They are chronicled in what follows.

The plan of having students on committees of the School of Chemical Sciences seems to be working well—the student members show a real interest in their work, and have made valuable suggestions.

One thing, however, does not please us so well—there is little hope, at present, that the state legislature will appropriate funds for the construction of a new wing of East Chemistry this year— one or two new buildings will probably be authorized for the university, but ours will not be among them. We comfort ourselves with the thought that Priestley discovered oxygen in a laboratory which he built in his home and that Pasteur's work on optical activity and on rabies was done in a small, dark basement laboratory. Think what they might have done in better surroundings! In any event, we shall keep on doing our best in the present laboratories, hoping that the legislature will be in a better mood at its next session.

A Merrie, Merrie Yule Time to you all, and a Healthy, Prosperous 1971.

Ye Olde Editor

P.S.: Don't forget to send your contribution to the Roger Adams fund. The need for undergraduate scholarships is very great.

School Of Chemical Sciences

As anticipated in the spring issue of the Alumni Newsletter, the School of Chemical Sciences is now a reality. The last hurdle was passed on September 1, when its formation was approved by the Illinois Board of Higher Education.



Our Present Leaders - - Profs. Hager, Westwater, Gutowsky (right to left)

Professor H. S. Gutowsky, Head of the Department of Chemistry and Chemical Engineering since 1967 and on the faculty since 1948, was named Director of the School and also Head of the Department of Chemistry.

Professor James W. Westwater, who headed the Division of Chemical Engineering under the former organization, heads the Department of Chemical Engineering. A U. of I. alumnus (B.S., 1941), he has been on the faculty since 1948.

Professor Lowell P. Hager, an Illinois alumnus (Ph.D., 1953) and faculty member since 1960, who headed the Division of Biochemistry, heads the Department of Biochemistry.

The school is responsible for overall direction, represents the broad field of chemical sciences, carries on inter-area projects and is responsible for the

chemistry library, laboratories, shops and storerooms.

The reorganization is designed to meet the continued growth and evolution of the chemical sciences, enabling each department to develop its interests while retaining close relations with the others.

In the School of Chemical Sciences and its three departments, there are 70 faculty members, 3,000 students enrolled in freshman and sophomore courses, 200 juniors and seniors majoring in chemistry, biochemistry or chemical engineering, 420 graduate students, and research involving 150 projects and \$2.5 million per year.

U. of I. activities in chemistry date to the opening of the university in 1868. Except for the earliest years, the Department of Chemistry at Illinois has had some form of divisional structure. The three divisions which now are departments were established three years ago when four areas of chemistry—analytical, inorganic, organic and physical—were combined into what now is the Department of Chemistry.

Chemical Engineering has had a close relation with the College of Engineering and the Engineering Experiment Station, and Biochemistry with other areas of the life sciences.

Gutowsky was born in Bridgeman, Michigan, in 1919, received his bachelor's degree from Indiana University in 1940, master's from the University of California at Berkeley in 1946, and doctorate from Harvard University in 1948. He served in the Army and taught at California and Harvard before coming to Illinois, is known for his interdisciplinary research in chemistry and physics, and was elected to the National Academy of Sciences in 1960. He was the first chemist to recognize the importance to chemistry of nuclear magnetic resonance, a phenomenon used by physicists to study the makeup and behavior of atoms and molecules. His research provided an experimental and theoretical basis for identification and analysis of complex chemical compounds and for studying the course of very fast chemical reactions.

Westwater was born in Danville, Illinois, in 1919, received his bachelor's degree from Illinois in 1941, master's from the University of Delaware in 1943 and doctorate there in 1948. He worked in industry, served with the Navy, and taught in the University of Delaware before joining the U. of I. faculty.

Hager was born in Girard, Kansas, in 1926, earned his bachelor's degree from Valparaiso University in 1947, master's from the University of Kansas in 1950, and doctorate from Illinois in 1953. He was in the Army Air Corps, worked with industry and the Kansas Board of Health, was a postdoctoral fellow in Massachusetts General Hospital and under a Guggenheim Fellowship in the Max-Planck Institute in Munich, Germany, and taught at Kansas and Harvard before coming to Illinois.

New Members Of Our Faculty



Our Future Leaders - - Assistant Professors Hendrickson, Chandler, Teipel, Schmidt and Barefield (left to right)

We are very fortunate this year in welcoming five outstanding young men into our faculty family as assistant professors.

Dr. E. Kent Barefield received his B.S. from Western Kentucky University in 1965 and holds a Ph.D. from Ohio State University (1969). His research interests involve the study of coordination compounds which mimic naturally occurring molecules by binding small molecules in solution or in the solid state.

Dr. David Chandler comes to us with his Ph.D. from Harvard University (1970) following a B.S. from M.I.T. in 1966. His research is directed towards understanding the microscopic properties of strongly interacting systems within the framework of statistical mechanics.

Dr. David N. Hendrickson received his B.S. from UCLA in 1966 and his Ph.D. at the University of California, (Berkeley) in 1969. His research is directed toward the characterization of the electronic structure of transition metal complexes to provide improved understanding of their chemical reactivity.

Dr. Paul G. Schmidt followed his B.S. at Pomona College (1966) with a Ph.D. at Stanford (1970). His research interests are centered around the application of nuclear magnetic resonance methods to the study of biological micromolecules.

Dr. John W. Teipel received his B.S. from Rockhurst College in 1964 and his Ph.D. from Duke University in 1968. His research is directed toward a better understanding of the *in vivo* folding process whereby newly synthesized polypeptide chains assume biologically active conformations.

Physical Chemistry At Illinois

The program in physical chemistry at the University of Illinois is unusually varied. It includes such important modern specialties as chemical physics, biophysical chemistry, and areas bordering on physical-inorganic and physical-organic chemistry. Of the approximately seventy faculty members in the School of Chemical Sciences, sixteen are directly associated with the program in physical chemistry. Among these are such award winners and internationally recognized scientists as Herbert S. Gutowsky (American Chemical Society-American Physical Society Irving Langmuir Award in Chemical Physics, member of the National Academy of Sciences), Harry G. Drickamer (American Physical Society Oliver Buckley Prize in Solid State Physics, American Chemical Society Ipatieff Award, member of the National Academy of Sciences), and Rudolph A. Marcus (member of the National Academy of Sciences).

At the present time there are about ninety graduate students majoring in physical chemistry and chemical physics. This is only slightly less than the number of majors in organic chemistry which has traditionally been the largest area in the School. The number of physical chemistry majors this year is about twenty greater than the average for the past several years. It is too early to tell whether this increase represents the start of a new growth spurt or if it is a temporary perturbation. A wide variety of research programs is available for these students. These involve both theoretical and experimental work and cover a wide range of phenomena. Some feeling for the breadth of the program can be obtained from the following paragraphs in which a few features of the research programs of the various staff members in physical chemistry are described briefly. They will be discussed in alphabetical order of the professor's names.

One area of activity in the research program of Associate Professor R. Linn Belford is the use of shock tube techniques to study the kinetics of small molecule reactions in the gas phase. In these experiments, which are designed to elucidate energy transfer mechanisms, species involved in dissociation reactions in the shock waves are studied by time-resolved emission and absorption spectroscopy and dynamic mass-sampling techniques. In addition to this work, Dr. Belford is conducting studies concerned with the anisotropic properties of oriented crystalline compounds of transition metal ions. This program involves the concerted use of X-ray crystallography, single-crystal polarized spectroscopy, and electron paramagnetic resonance in the study of the structural details of the systems.

A new member of the faculty this year is Assistant Professor David Chandler. His research is directed towards understanding the macroscopic properties of strongly interacting systems within the framework of statistical mechanics. Particular physical systems that are currently under investigation are simple liquids, polar liquids, and ionic solutions. Specific properties receiving attention in this theoretical work are the thermodynamic quantities, phase transitions, solvation effects, and transport properties.

The research program of Professor Harry G. Drickamer is centered around the use of very high pressures to elucidate the electronic structures of solids. At

present, his group is able to make optical absorption measurements at pressures up to 170 kilobars, electrical resistance studies to 600 kilobars, X-ray diffraction measurements to 500 kilobars, and Mossbauer resonance studies to 300 kilobars. These techniques are being applied to a wide range of materials including chelates, aromatic crystals, alkali, alkaline earth, transition and rare earth metals, and iron alloys.

A close union of theoretical and experimental work involving the general area of inter- and intramolecular interactions characterizes the research program of Professor Willis H. Flygare. Some specific current projects are the determination of nuclear quadrupole and spin-rotation interactions, internal rotation, conformational changes, and vibration-rotation interactions in molecules using high resolution microwave spectroscopy techniques, the study of magnetic susceptibilities, magnetic moments and molecular quadrupole moments using molecular Zeeman effect measurements, the study of rotational and vibrational relaxation times using double resonance experiments, a study of the rotational and translational motions of macromolecules in solutions using laser light scattering techniques, and a radio astronomy study of the molecules present in outer space.

Although Professor Herbert S. Gutowsky has his hands quite full with his duties as Director of the School of Chemical Sciences and as Head of the Department of Chemistry, he still finds time to conduct a vigorous research program. A major interest now is the determination of fast chemical exchange rates from high resolution nuclear magnetic resonance line shapes and nmr radiofrequency pulse experiments. A variety of other research programs is directed towards improving the understanding of chemical shifts and electron coupling of nuclear spins and their relation to molecular geometry and intermolecular interactions. Another area of study is the use of nuclear magnetic relaxation times to investigate the dynamic structure of liquids.

Work in nuclear chemistry is being carried out by Professor John P. Hummel. One aspect of his program has involved the application of radiochemical techniques in the study of the cross sections of nuclear reactions that are induced by high-energy gamma rays. A second area of work involves the study of the effects of the chemical environment on the rate of annihilation of positrons; this yields information about the chemical properties of positronium.

Associate Professor Jiri Jonas is using nuclear magnetic resonance to study the dynamic structures of liquids. The adiabatic fast passage method and pulsed methods are used to measure nmr relaxation times which, in turn, are used to obtain information about dynamic coherence effects in molecular fluids and the relationship between inertial and frictional effects and their dependence on the sizes and shapes of the molecules involved. In addition, high pressure studies of relaxation times and diffusion coefficients are being used to test the transport and relaxation theories as applied to liquids.

The research program of Assistant Professor John R. Lombardi is centered on electronic structure and spectra of diatomic and polyatomic molecules using high resolution spectroscopic techniques. His work is concentrated on the properties of excited electronic states obtainable from studies of the rotational fine structure and Stark splitting in electronic spectra. In addition, theoretical work is being carried out on the nature of vibration-rotation and vibration-electronic interactions.

Much of the current research conducted by Professor Rudolph A. Marcus involves the analytical mechanics of certain bimolecular chemical reactions. This work uses a new coordinate system and method to calculate such properties as the rotational and vibrational energy distribution of reaction products, the angular distribution of products and reactants in molecular beam experiments, the effect of the vibrational energy of a reactant on its reactivity, the reaction crosssections, and the rate constants. Other work in progress includes the theoretical study of electron and atom transfer reactions, electrode reactions, and rotational-translational-vibrational energy transfer processes.

Associate Professor Iain C. Paul is conducting X-ray diffraction studies on a wide range of organic and biologically interesting molecules. Objectives of this work include the establishment of gross structure and the details of bonding and the determination of preferred conformations. Much of this work is done in conjunction with staff and graduate students in other areas of the School. In addition, new methods of structure determination are being examined as are improved and automated methods of data collection.

Another new staff member this year is Assistant Professor Paul G. Schmidt. In his research program, he is bringing physical methods to bear on problems of importance in biological chemistry. A main part of the program involves using nuclear magnetic resonance techniques for studying the structure and function of biological macromolecules.

The research of Associate Professor Don H. Secrest is mainly theoretical in nature. Some of the problems under investigation by his group include rotational and vibrational energy transfer in molecular beam scattering and particle exchange during collisions (i.e., reactive collisions). In addition, some work related to computer control of experiments is being carried out.

Also new to the biophysical program this year is Assistant Professor John W. Teipel. He plans to explore the kinetic and thermodynamic parameters associated with the refolding of randomly coiled polypeptide chains. This research is specifically concerned with whether or not randomly coiled proteins refold to the conformation state of lowest free energy and what influence environmental factors (such as the pH, temperature, and ionic strength of the renaturation medium) have on protein renaturation.

Another member of the biophysical group is Assistant Professor James G. Wetmur who is interested in the application of physical methods to the study of topological changes in nucleic acids and in the kinetics of DNA renaturation and DNA-RNA hybridization. Electron microscopy is an important tool in this work.

Professor Peter E. Yankwich's research program is devoted to experimental and theoretical studies in chemical kinetics. Of particular interest is the investigation of isotope effects which provide insight into such properties of transition states and activated complexes as the structure, the distribution of energy, and the actual atomic displacements which lead to reactions. The reactions under study include the gas-phase decompositions of small molecules, enzyme-catalyzed and thermal reactions in solution, and the pyrolytic breakdown of crystals.

The final member of the physical chemistry staff is Assistant Professor James T. Yardley. His research involves the study of energy transfer from one quantum state to another during gas-phase molecular collisions, with particular emphasis on experimental studies of vibration-to-vibration and vibration-to-translation

energy transfer. This is done using high power infrared gas lasers to produce a large quantity of vibrationally-excited molecules in a particular quantum state. Kinetic spectroscopy is then used to follow the populations of various quantum levels as the systems return to equilibrium.

Most of the work mentioned here is being conducted in Noyes Laboratory where much of the space available is too antiquated to house research programs in modern physical chemistry. Relief is hopefully on the way, however, in that much of the physical chemistry program is scheduled to be transferred to the proposed Chemical Sciences Building (a second addition to the East Chemistry Building).

There are, of course, many research programs in other areas of the School that involve a substantial amount of physical chemistry. In many cases these attract graduate students majoring in physical chemistry, but generally speaking they serve mainly the students in the other areas. The staff members involved would include Professors Brown, Drago, Stucky, Beattie and Hendrickson from the Inorganic group; Professors Martin, Applequist, Smith, Curtin and Ford from the Organic group; Professors Laitinen and Malmstadt from Analytical Chemistry; Professor Weber from the Department of Biochemistry; and Professors Drickamer (already mentioned, but listed here again because he is a member of both the Department of Chemistry and the Department of Chemical Engineering), Eckert and Alkire from the Department of Chemical Engineering.

“Relevant Chemistry” Series

An innovation in the program of the School of Chemical Sciences this fall has been the “Wednesday Night at the Lab” series of lectures, subtitled “Is Chemistry Relevant?” The series had its inception during the crisis last May following the invasion of Cambodia and the deaths of students at Kent State University, when our campus was in a state of turmoil and a regular afternoon discussion period was held among students and faculty. One thing which appeared clear from those informal meetings was that a number of students felt that what they were learning in classes had very little relationship to the problems of the world. The “Relevant Chemistry” series was devised in an attempt to clarify the role of chemistry, either in causing some of the major problems of ecology, environment, and health, or in solving them.

The series this fall has consisted of nine lectures by speakers from our Chemistry and Biochemistry Departments, from other departments, and from other universities. Each speaker was asked to discuss a current problem, including the chemical basis for the problem or its solution. He was requested to assume that his audience would consist of students and townspeople with no more than a high school background in chemistry. Initial response was enthusiastic, and 100 Noyes Lab has usually been full for the lectures. Tapes have been made of all the lectures for rebroadcast at a later time on WILL, the University's radio station, which is heard throughout Illinois and in parts of Indiana. The lectures are also being transcribed and the authors have agreed to put them into appropriate form for publication in a paperback book which we hope to publish this summer. Lectures in the fall series were “People Who Live in Gas Houses” (The

Greenhouse Effect, Man's Influence on Climate) by T. L. Brown, "Butterflies on the Brain" (Drugs and Mental Illness) by W. O. McClure, "The Legacy of the Mad Hatter" (Heavy Metal Pollution) by J. M. Wood, from our Chemistry and Biochemistry Departments; "Drugs, Bugs and You" (Resistance and Reaction to Antibiotics) by W. G. Huber, Department of Physiology and Pharmacology, University of Illinois, "When Great Lakes Die" (Eutrophication) by J. E. Dunwoody, Instructor in the Social Implications of Science and Technology Program, University of Illinois, "Pests and Pollution" (The Challenge of Modern Pest Control) by R. L. Melcalf, Department of Zoology, "Blight, A Corny Story" (Phytoalexins, Antifungal Agents Produced by Plants) by J. D. Paxton, Department of Plant Pathology, all at the University of Illinois; "Oiling the Skids" (The Chemistry and Politics of Petroleum) by Robert West, University of Wisconsin and "Birth Control after 1984" (Future Birth Control Prospects) by Carl Djerassi, Stanford University.

The series will continue in the spring with an additional seven lectures scheduled. Members of the committee responsible for the series have included both faculty (Kenneth Rinehart, Ted Brown, Arnold Hartley, John Lombardi, Bob Lowstuter, Bill McClure, John Quinn, John Wood) and students (Alan Muirhead, Hugh Parkhurst, Bill Pearson, Marty Watson).

JOBS FOR CURRENT AND FUTURE GRADUATES

Back in 1968 we did not foresee the depth of federal cuts in financial aid to graduate research and to student fellowship support that have actually occurred. Neither did we forecast the extent of the inflation nor the effect on our economy of the attempts to curtail inflation and the change from a war to a peace economy. However, we did see the beginnings of a significant shortage of jobs, both academic and industrial, for Ph.D. graduates. In one of our early newsletters this subject was discussed briefly with the request that those of you who are in positions to assist Illinois chemists who are looking for work, use whatever influence you can. We are very proud of our graduates and the record of your achievements and believe that Illini everywhere have proven their capability and competence. Our current and future graduates show every promise of upholding the Illinois standard.

In our earlier newsletter article, we discussed the effect of the military draft on reducing the number of Ph.D. graduates who would be available in 1972 and 1973. The financial turmoil of 1969 and 1970 have resulted in further decreases in the number of students doing graduate work across the nation, perhaps even more than the draft. Yet during the past year there has been substantial publicity about an oversupply of scientific Ph.D.'s. Purveyors of the doomsday philosophy of a long range oversupply and a continually shrinking demand by both education and industry seem to be attracting the most attention. However, the University of Illinois Long-Range Planning Committee has made studies of the future need for people with various levels of education. As with most such studies, the 1970-80 decade has received the closest scrutiny. Although fluctuations in demand are expected, the real need for the highest level of education is shown to increase at a steady rate for the entire period of the study.

These studies have substantiated our conviction that strong departments such as ours have an obligation and a responsibility to the industrial and educational

communities to maintain their strength and quality of education and research. In our case, during the past six years this has been fostered by our emphasis upon improving the faculty, facilities and the quality of entering students, rather than growth in numbers and size. Hopefully, these efforts assure that our current graduates and those who will come in the future, will be of the highest quality in capability and training.

With the exception of a few foreign graduates who returned to their native countries, all of our recent Ph.D. graduates have found positions and are working.

Those graduating within the next year have been interviewing actively and quite a few have secured jobs. However, the short term picture is far from easy, and we repeat our previous plea for help.

Introducing Chemistry

The undergraduate chemistry program at the University has been undergoing very rapid change during the past five years, in attempts to introduce chemistry to a large number and variety of first year students in new and interesting ways. We always hope that some uncommitted students will find a new fascination in our courses and continue on to careers in chemistry. Although it is recognized that introductory chemistry is a service course for most of the 2,500 first year students, we feel that it is important that our national leaders in government, law, business, engineering and many other fields have a broad understanding of the chemical principles operating in our environment.

In 1966, Chemistry 100 was established to provide a basic introductory course for those who have either very weak chemistry backgrounds or none at all. A new service course, Chem. 101-102, was established for that majority of students who plan to go into academic fields other than chemistry. Chemistry 107-8 has been retained with the purpose of giving beginning chemistry and chemical engineering majors an in-depth introduction.

For the last couple of years, large scale experiments have been underway in the use of television in presenting lectures to large classes. Although the results show that students can progress about as well as with the live lectures, they are not particularly pleased with the tape format. The experiments are continuing next semester with some sections scheduled from small TV tape lecture-discussion groups only rather than the combination of the usual large lecture classes plus the small quiz section. Teachers will be able to control the TV tapes, stopping for discussion and replay, as questions arise.

Chemistry 100 — Deficient Backgrounds

The course designed especially for students with little or no background is Chemistry 100. It is a no credit course which prepares the student for the regular non-major sequence. Chemistry 100 employs audio-visual methods to achieve a tutorial effect. Besides one live lecture and one quiz section per week, the students have access to the TV lab three days a week for twelve hours each day with no limit on the length or number of visits. Discussion of the material being presented is on audio tape. At pertinent times the tape sends the student either to one of several

full-color 8-mm film demonstrations or to the laboratory bench where demonstrative experiments and diagrams are displayed. A graduate teaching assistant is always present. There are about 300 students in this course this semester. Dr. Elizabeth Rogers, who has developed the materials for this course, plans to use the computer teaching system, to teach topics such as stoichiometry, nomenclature, and balancing redox equations.

Chemistry 101-102 — Non-majors

Chemistry 101-102 for the non-majors is by far the largest course in the chemistry program, comprising about eighty 24-student sections each semester. This year we are using the new Dickerson-Gray-Haight system (D-G-H, for short). R. E. Dickerson and H. B. Gray are at the California Institute of Technology and G. P. Haight, Jr., is Director of the General Chemistry Program here at Illinois. The age old problems of teaching large numbers of students with a variety of backgrounds are being attacked in this course. Almost half of the material in Chemistry 102 is organic chemistry, since about 80 per cent of the students are terminal.

Chemistry 101-102 is staffed by several members of the permanent faculty plus visiting professors on one and two-year appointments. Also teaching Chemistry 102 this year is Dr. Russell S. Drago, winner of the Texas Instruments Award for excellence in inorganic chemical research in 1969. Professor Drago's interest in General Chemistry is indicated by his production of a variety of textual materials for the program. Another regular faculty member who has taught Chemistry 102 recently is Dr. Peter Beak, from the organic group.

Three recent Ph.D. graduates are serving as Visiting Professors in the Chemistry 101-102 sequence. Dr. J. J. Ewing from the University of Chicago is providing much of the Program's guidance this year. The second Visiting Professor is Dr. M. Nozari, from the University of Detroit, who has spent two years here doing post-doctoral work with R. S. Drago. The third Visiting Professor in Chem. 101-102 is Dr. James Nusz from the University of Washington.

Chemistry 107-108 — Majors and Chemical Engineers

The two-semester course for the chemistry and chemical engineering majors, Chemistry 107-108, is evolving rapidly. Key emphasis is being put on the laboratory portion, which has been restructured in light of the new Core Laboratory Program. Chemistry 107-108 labs emphasize quantitative work and problem solving and involve both qualitative and quantitative unknowns. Individual research projects are encouraged.

Lending their experience and fresh points of view to the majors' program are Professors Norman Griswold and Kent Barefield. Dr. Griswold, a graduate of the University of Nebraska and currently on sabbatical leave from Nebraska Wesleyan College, has brought with him a wit and way in the presentation of chemistry which has added vitality and depth to his courses. He is directing the laboratory portion for approximately 350 students in Chemistry 107 and is course director for Chemistry 108 which involves thirty-four students, most of whom have Advanced Placement credit in chemistry. Dr. Barefield joined the regular faculty this fall as a member of the inorganic group. He is the lecturer for the 350 students in Chemistry 107.

Award And Honors To Staff Members

Professor Marcus Elected to the National Academy



Prof. R. A. Marcus

Professor Rudolph A. Marcus, who joined our staff as Professor of Physical Chemistry in 1964, has been elected to the National Academy of Sciences.

Marcus is internationally recognized as a leader in the theoretical study of chemical kinetics. His early experimental work gave him an unusually broad and sound perception of the significant problems in the field. His theoretical work deals with the nature of unimolecular reactions, the interactions governing electron transfer processes in solutions, and the use of analytical mechanics to determine the trajectory of reactants through the activated complex.

The Marcus theory of electron transfer in solution develops a model for the transition state. With it, Marcus and others have treated successfully many problems in solution chemistry. For example, a general relation has been established between the rate constant of a redox reaction, the isotopic exchange rate constants, and the equilibrium constant. For electrode processes, the transfer coefficient has been related to the electrode potential, and homogeneous rates to electrode rates.

In gas-phase kinetics, the RRKM (Rice-Ramsberger-Kassel-Marcus) theory of unimolecular reactions is the only one currently being used for meaningful comparisons with experiment. Marcus incorporated modern molecular dynamics and blended statistical ideas with activated complex theory to free the earlier theory from arbitrary parameters. Recently, he has developed a statistical-dynamical theory of reaction cross sections and is now engaged in the first major extension in the analytical mechanics of the transition state since the classic work of Eyring and Hirschfelder.

Marcus is a dedicated scientist whose enthusiasm has infected many audiences. His work is characterized by exceptional physical insight, and most has been done without benefit of coauthors (52 of his 77 papers). He has provided significant leadership and service to the scientific community in roles such as editorial, advisory and governing boards and, presently, as Chairman, Board of Trustees, Gordon Research Conferences.

Professor Marcus was born in Montreal, Canada, on July 21, 1923, but became a United States citizen in 1958. He received the B.Sc. degree from McGill University in 1943, and the Ph.D. from the same school in 1946. From 1951 until 1964, he was a member of the staff of the Polytechnic Institute of Brooklyn.

Professor Roger A. Schmitz and Dr. Donald A. Root (Ph.D., 1968) have been named as co-recipients of the 1970 Allan P. Colburn Award of the American Institute of Chemical Engineers. The award is given annually to encourage excellence in contributions to the publications of the Institute on the part of younger members, and includes a certificate, a plaque, and a cash honor of \$1,000, to be divided between the two recipients. They were cited for their paper, "An Experimental Study of Steady State Multiplicity in a Loop Reactor," published in the *AIChE Journal*.



Prof. Roger Schmitz



Dr. Donald A. Root

Dr. Schmitz was born in Carlyle, Illinois, in 1934. He received his B.S. in Chemical Engineering from the University of Illinois in 1959 and his Ph.D. in Chemical Engineering from the University of Minnesota in 1962. He taught at the University of Minnesota from 1960-1962, and then joined the faculty of the University of Illinois.

Active in AIChE and other professional societies, Dr. Schmitz serves on the AIChE's National Program Committee, and on the National Meetings Program Committee of the Division of Industrial and Engineering Chemistry, American Chemical Society. He is also a member of the Combustion Institute.

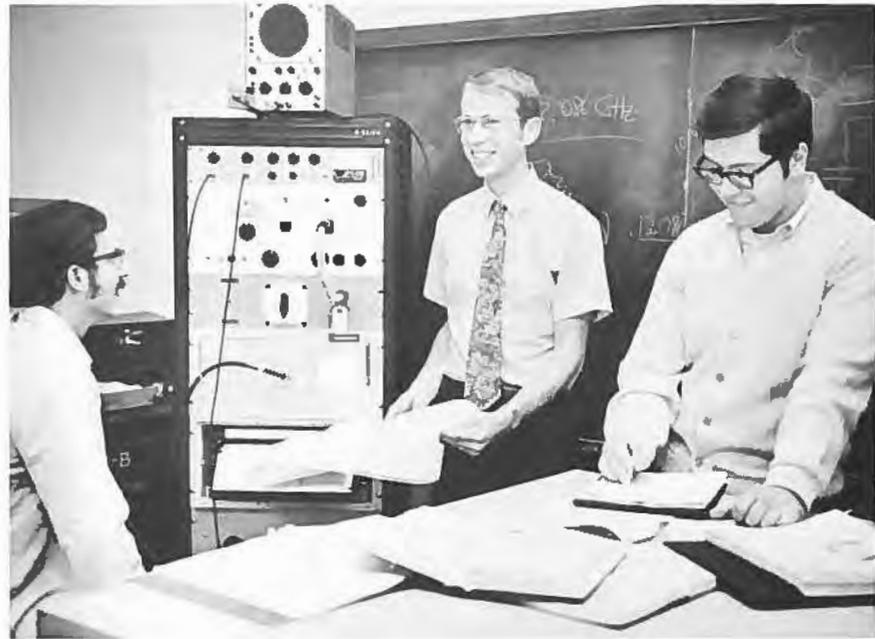
Dr. Root was born in Warsaw, New York. He received his bachelor's degree from Clarkson College of Technology in 1964 and his master's and doctor's degrees from the University of Illinois in 1966 and 1968 respectively. He is now with E.I. du Pont de Nemours and Company in Deepwater, New Jersey.

The award was presented at the 63rd Annual Meeting of the American Institute of Chemical Engineers, at the Chicago Sheraton Hotel, on November 30.

Professor Yardley Wins Award from Dreyfus Foundation

Professor James T. Yardley, III, has been awarded a Teacher-Scholar Grant by the Camille and Henry Dreyfus Foundation, Inc. He is one of fourteen young scholars in Chemistry, Biochemistry, Chemical Engineering and related sciences

in the United States to win one of these \$25,000 awards this year. The money may be used at the awardee's discretion to develop new education programs and to evaluate new research ideas. The program is designed to promote the development of promising careers, and is not a research grant, per se. The grants are designed to foster better contact with students and it is expected that the recipients will continue with classroom work.



Prof. James T. Yardley and two of his students -- Roger Povilus (left) and George Herbert

Professor Yardley was born in Taft, California, on May 15, 1942. He received the B.S. degree from Rice University in 1964, and the Ph.D. degree from the University of California (Berkeley) in 1967. He joined our staff immediately thereafter.

Professor H. V. Malmstadt

The Instrument Society of America has awarded its 1970 Donald P. Eckman Education Award to Professor Howard V. Malmstadt in recognition of his development of the "electronics for scientists" course and of instructional materials used in more than 500 universities, technical schools, and industrial training programs, both in the United States and abroad. This award is sponsored by Magnetrol, Inc., of Downers Grove, Illinois, in honor of the late Dr. Donald P. Eckman of Case Institute of Technology. Malmstadt is cited for "his development of a complete approach, incorporating linked texts and instructional instruments for the training of scientists and engineers."

Dr. Malmstadt was born in Wisconsin in 1922 and received a B.S. degree from the University of Wisconsin in 1943. From 1943 to 1946 he was Radar Officer for a

division of destroyers in the Pacific. After the war he returned to the University of Wisconsin for graduate work and received an M.S. degree in 1948 and a Ph.D. degree in 1950. He stayed at Wisconsin as a Postdoctoral Research Associate for one year. He joined the faculty of the University of Illinois in 1951, and became a full Professor in 1961. He was a Guggenheim Fellow in 1960, and in 1963 he was the winner of the American Chemical Society Award in Chemical Instrumentation. He has served as national chairman of the Analytical Division of the American Chemical Society, and as a member of the Advisory Council of College Chemistry.



Prof. Howard V. Malmstadt and one of his students, Elliott Jackson (right)

Early in his research and teaching career, Malmstadt recognized the lack of a closely coordinated curriculum of instrumentation texts and instructional instruments. He conceived and led in the development of his Department's project to devise such combined curricula. His new concepts of education in electronics and instrumentation were employed progressively in three co-authored texts, "Electronics for Scientists," "Digital Electronics for Scientists," and "Computer Logic." With the laboratory "hardware" which he devised to accompany the texts, experiments are not performed by analogy or with gross simplifications but by methods of the most modern laboratory practice. For example: A potentiometric

strip-chart recorder and an operational amplifier system (the primary elements for experimentation with feedback measurement and control) are included in the laboratory station. The text reference and the experiments performed on these units provide a basic understanding and working knowledge of servo systems, operational amplifiers, and their applications.

Dr. Malmstadt's major areas of research are in time-resolved spectroscopy, short-time phenomena in sparks, laser plumes and flames, fast reaction-rate methods and automation. More than eighty technical publications authored by Dr. Malmstadt and his students bear witness to his successful research efforts.

Professor Stanley G. Smith

Students in an introductory organic chemistry course in the University of Illinois at Urbana-Champaign are getting results in less than a second from experiments which elsewhere take days or weeks.

The trick involves the PLATO computer-controlled teaching system invented at the U. of I. The chemistry course has won a \$1,000 prize for Professor Stanley G. Smith. Dr. Smith came to Illinois in 1960 and has given much of the past two years to developing the use of PLATO in chemistry teaching. He developed it to give students the opportunity to study independently, at their own speed, and carry out laboratory work beyond the time—and even equipment—limitations of a laboratory. Each student has an electric typewriter and a television screen. He gives instructions for an experiment and in less than a second the computer reports the results. The student also directs the computer as it presents information and problems to which he writes answers, as it judges and comments on his answers, and as it gives help when he's confused. He takes an active part in the course—far more than when in a lecture or watching a demonstration—and moves ahead at his own speed. He can do a great deal more and get wider experience than in traditional teaching.

"Chemistry texts usually give only one answer to a problem, but there may be many, all correct," Smith said. "PLATO is programmed to carry out a student's instructions and ideas to solve the problem in any way he chooses. "Students like it. It's a faster way to learn, more challenging. They cover more information and do more experiments, and explore the subject in greater depth."

He worked on the course last summer under one of 23 U. of I. grants to projects for improvement of undergraduate teaching. It was one of four judged outstanding when the university trustees awarded \$1,000 prizes financed by the Standard Oil (Indiana) Foundation.

Two sophomore level organic chemistry courses are involved, one for chemistry majors who go on to specialize in the field, the other for non-majors (largely pre-medical students).

Groups of 20 are using PLATO. Computer-controlled study is supplemented by laboratory experience and lectures. Twenty is the student capacity of the controlling computer now available. New equipment will raise this to 2,000 in two years. Smith sees all his students using PLATO then. Enrollment in elementary organic chemistry now totals 575.

Parkland Community College, Champaign, is giving the course to 11 students, using PLATO connections to the U. of I.

PLATO originated with Professor Donald Bitzer who directs the university's

Computer-Based Education Research Laboratory where both the hardware and varied courses at different levels are being developed and tested.

In 1968 the university began a six-year project to expand the program with a computer capable of handling 4,000 students at one time and student facilities both on and off the campus.

PLATO stands for "Programmed Logic for Automatic Teaching Operations."

Professor Corey Receives Two Honors

Professor Elias J. Corey, a member of our staff from 1951 to 1959, but now a professor at Harvard, has been selected as the 1971 recipient of the American Chemical Society's \$1,000 Award for Creative Work in Synthetic Organic Chemistry sponsored by the Synthetic Organic Chemical Manufacturers Association.

Dr. Corey's eminent accomplishments of the past two years are the basis of this award, since he has previously received ACS awards for his earlier discoveries. Of unique significance is his design, in collaboration with W. T. Wipke, of a computer program that can generate realistic pathways for the synthesis of complex organic molecules. The authors foresee the development of computer programs which will be indispensable to future synthetic chemists.

Of possible importance to insect control may be Dr. Corey's recent synthesis of the insect juvenile hormone, which required the development of two new synthetic methods capable of wide utility. He has devised ingenious approaches to the synthesis of prostaglandins, an important problem occupying research groups all over the world. Furthermore, he has discovered new synthetic uses for bis-thiocarbanions and new reagents for "nucleophilic acylation"—the new general area of synthetic chemistry which Dr. Corey is credited with developing.

Born in Methuen, Mass., Dr. Corey received the B.S. degree in 1948 and the Ph.D. degree in 1951 from the Massachusetts Institute of Technology. His graduate research at MIT resulted in the total synthesis of 5-phenyl penicillin. In 1948, he worked as a research chemist for A.D. Little Co., Inc.

Author or coauthor of 185 research papers, Dr. Corey is widely recognized as an authority in his field. Honors accorded him include the ACS \$2,000 Award in Pure Chemistry sponsored by Alpha Chi Sigma Fraternity (1960) and the \$2,000 ACS Ernest Guenther Award in the Chemistry of Essential Oils and Related Products sponsored by Fritzsche-Dodge and Olcott Incorporated (1968).

Professor Corey has also received the 1970 Harrison E. Howe Award of the Rochester Section of the American Chemical Society for his work in computer-assisted analysis. He gave a lecture on that subject on the occasion of his receipt of the award.

Dr. William H. Lycan, B.S., 1924, M.S., 1926, and Ph.D., 1929, is the recipient of the Society of Chemical Industry's Chemical Industry Medal for 1970. He is cited for outstanding contributions to the chemical industry.

After finishing the work for his doctorate, Dr. Lycan was a research chemist at du Pont where he did basic research on anthraquinone dyes. From 1936 to 1938, he was a Senior Fellow at the Mellon Institute, and from 1938 to 1949, he was with Pittsburgh Plate Glass, where he became Director of Research and then Executive Director. He then became Director of Research at Johnson and Johnson. The following year, he became a member of the Board of Directors of Johnson

and Johnson, and the next year, Vice-President for Research. He retired in 1969.

Dr. Walter R. Benson, B.S., 1951, has been given the Award of Merit of the Bureau of Scientific Research, Food and Drug Administration, for his "sustained high quality performance in stimulating interest in and encouraging and guiding research on the organic chemistry of pesticides, vital to an understanding of residue methodology." After his graduation from Illinois, Dr. Benson did graduate work at the University of Colorado, receiving the Ph.D. degree in 1958.

Dr. Wendell M. Stanley, Ph.D., 1929, has been elected a Foreign Associate Member of the French Academy of Sciences of the Institute of France. Dr. Stanley is a Nobel Laureate and a leader in the study of viruses. He is Professor of Biochemistry and Molecular Biology at the University of California.

Summer Program In Electronics

The 12th annual summer program in *Electronics for Scientists* at the University will be accepted—45 under NSF grants and 25 others. Added to the course will be Malmstadt. Accepted for the summer course will be chemists, physicists, medical scientists, engineers, teachers and research workers—people who use electronic devices but have little or no background in how they operate.

NSF will pay partial costs and living expenses for teachers who come to take the course back to their campuses. Persons from industry pay their own expenses and \$450 for the course.

Last summer, 49 were enrolled. This summer, with the addition of night work, 70 will be accepted, 45 under NSF grants and 25 others. Added to the course will be new ideas in electronic device interface with computers and computer use.

In 12 years, NSF grants to support the course have totaled \$261,080. More than 500 persons have taken the course, and teachers who have attended have taken it back to campuses across the nation.

Our 1970 Ph. D Alumni

We have received repeated requests to list the names and addresses of new alumni of the department. We also have the addresses of nearly all of the alumni of the School, and will be glad to answer specific requests for addresses. In order to satisfy the demand, we shall, hereafter, publish data on the recent Ph.D.'s. In addition to serving as a directory, this list will be a record of the research which is underway in the School of Chemical Sciences.

PH.D. RECIPIENTS IN JUNE 1970

BONDURANT, David LaRue Chemical Engineering Dr. J. W. Westwater
"Performance of Transverse Fins For Boiling Heat Transfer"
Texas Eastman Company, Box 7444, Longview, Texas

BURLINGAME, Terry Gordon Organic Dr. W. H. Pirkle
"NMR Spectroscopy of Enantiomers in Chiral Solvents: The Relationship Between Solvate Physical Properties and Enantiomeric Spectral Nonequivalence in Model Amine-Alcohol Systems"
Department of Chemistry, U. of Pennsylvania, Philadelphia, Pennsylvania

DAVENPORT, Diane Biochemistry Dr. G. Weber
"The Binding of Heme and Some Fluorescent Dyes to Apohemoglobin"
Cardiovascular Research Institute, U. of California Medical Center, San Francisco, California 94122

FANG, Ming Chemical Engineering Dr. R. A. Schmitz
"An Experimental Study of the Carbon Monoxide Flame in Stagnation Flow"
Department of Chemical Engineering, U. of Illinois, Urbana, Illinois 61801
409 East Healey, Champaign, Illinois 61820

GARRETT, Michael Benjamin Inorganic Dr. Jack G. Kay
"Flash Heating As a Technique For High Temperature Spectroscopy"
Drexel Institute of Technology, Philadelphia, Pennsylvania

GRIEGER, Richard Allen Chemical Engineering Dr. C. A. Eckert
"High-Pressure Kinetic Studies of Diels-Alder Reactions"
Department of Chemical Engineering, U. of Wisconsin, Madison, Wisconsin 53706
2464 Fontaine Circle, Madison, Wisconsin 53713

HOUSE, James Evan Inorganic Dr. J. C. Bailar, Jr.
"Kinetic Studies on Solid State Reactions of Chromium Complexes"
Department of Chemistry, Illinois State U., Normal, Illinois 61761
1013 Bakewell Avenue, Normal, Illinois 61761

JACKSON, Elliott Dale Analytical Dr. H. V. Malmstadt
"New Approaches to Precision Spectrophotometry"
American Cyanamid Applied Physics Group, Stamford, Connecticut 06901
251 Sylvan Knoll Road, Stamford, Connecticut 06902

JONAS, Ana Masiulis Biochemistry Dr. G. Weber
"Physicochemical Studies on the Tertiary Structure of Bovine Serum Albumin"
Department of Biochemistry, U. of Illinois, Urbana, Illinois 61801
902 South Lincoln, Urbana, Illinois 61801

KARABELAS, Anastasius John Chemical Engineering Dr. T. J. Hanratty
"Flow Through Regular Assemblies of Spheres"
Shell Pipeline Co. Research and Development Lab, P.O. Box 2648, Houston, Texas
77001

KIM, Young Yuel Chemical Engineering Dr. T. J. Hanratty
"Non-Linear Effects in Wave Motion"
ESSO Production Research, P.O. Box 2187, Houston, Texas 77001

KLEIN, George Joseph Chemical Engineering Dr. J.W. Westwater
"Heat Transfer From Multiple Fins to Boiling Liquids"
Research Laboratories, Eastman Kodak Company, Rochester, New York 14803
172B Demeter Drive, Rochester, New York 14803

LAUVER, Richard William Inorganic Dr. T. L. Brown
"Correlation Function Analysis of Infrared Band Shapes of Metal Carbonyls"
4th Chemical Officers Class, Fort McClellan, Alabama

McCULLOUGH, James Douglas Organic Drs. D. Y. Curtin & I. C. Paul
"The Solid State Beckmann Rearrangement of Benzophenone Oxime O-Picryl
Ethers and the Crystal Structures of the *syn*- and *anti*-p-Bromobenzophenone
Oxime O-Picryl Ethers"
Shell Oil Company, Wood River, Illinois 62095

OLSON, Charles Donald Physical Dr. R. L. Belford
"Single Crystal Polarized Absorption Spectra of Some Copper Chelates"
San Francisco Medical Center, San Francisco, California 94100

PEASCOE, Warren Joseph Organic Dr. D. E. Applequist
"Relative Rates of Metalation by Alkylolithium Compounds"
Uniroyal Incorporated, Research Center, Wayne, New Jersey 07470

SANDERS, Thomas Garrison Biochemistry Dr. W. J. Rutter
"The Purification, Properties and Embryonic Regulation of Pancreatic
Amylolytic and Proteolytic Enzymes of the Rat"
Department of Zoology, U. of British Columbia, Vancouver, British Columbia,
Canada
2350 West 1st Avenue, Vancouver 9, British Columbia, Canada

SCHAFFER, Sheldon Arthur Organic Dr. N. J. Leonard
"The Synthesis and Studies of Some Adenine Nucleoside and Nucleotide Analogs"
Department of Biological Chemistry, Harvard Medical School, Boston,
Massachusetts 02115

SHIER, Wayne Thomas Organic Dr. K. L. Rinehart
"The Hybrimycins"
The Salk Institution, P.O. Box 1809, San Diego, California 92112

THATCHER, John Inorganic Dr. T. L. Brown
"Coordination Chemistry of the Azo Group"
Eastman Kodak Company, Rochester, New York 14803

THOMPSON, Dixon Arthur Roger Organic Dr. D. Y. Curtin
"1, 3 (N,N) Acyl Migrations of N-Acyl-N-Arylbenzamidines"
National Advisory Committee on Water Resources Research, Policy and Planning
Branch
Department of Energy, Mines & Resources, No. 8 Temporary Building, Ottawa 3,
Ontario, Canada

TOMS, Hazel Anne Biochemistry Dr. J. M. Wood
"The Bacterial Degradation of Lignin Model Compounds"
Microbiology Department, University of Illinois, Urbana, Illinois 61801

WATSON, Richard Noble Organic Dr. P. Beak
"Part I: The Mechanism of Hydrogen-Deuterium Exchange of 1-Methyl-4-
Pyrimidone and Related Compounds
Part II. Synthetic Approaches to a Model Compound Suitable for Field Effect
Studies"
Experimental Station, Organic Chemical Department, Building 335, Room 110,
E.I. du Pont de Nemours and Co., Wilmington, Delaware 19899
11 Bobby Drive, Newark, Delaware 19711

PH.D. RECIPIENTS IN OCTOBER 1970

ALBRIGHT, Fred Ronald Biochemistry Dr. G. J. Schroepfer
"A New Substrate For Sumarase, L-trans-2, 3-epoxysuccinate"
Department of Biochemistry, Johns Hopkins University, Baltimore, Maryland
724 Hilltop Road, Springfield, Pennsylvania 19064

ANDRIST, Anson Harry Organic Dr. J. E. Baldwin
"Bicyclo (2.1.0) Pent-2-ene: Structure, Molecular Properties, and Mechanism of
Thermal Isomerization"
Department of Chemistry, University of Oregon, Eugene, Oregon 97402
1360 West 5th Street, Eugene, Oregon 97402

BAUCOM, Everett Ira Inorganic Dr. R. S. Drago
"The Stabilization of Unusual Oxidation States of Nickel With Oxime Ligands"
E. I. du Pont de Nemours and Co., Benger Laboratory, Waynesboro, Virginia 22980
R. No. 1, Box 2, Afton, Virginia 22920

BERNHARDT, Steven Howard Chemical Engineering Dr. J. W. Westwater
"Condensation of Immiscible Mixtures"
E. I. du Pont de Nemours and Co., Plastics Department, Wilmington, Delaware
19800
4310 Miller Road, Apt. 109, Wilmington, Delaware 19800

BLOCH, Daniel Richard Organic Dr. J. C. Martin
"The Dehydrocyclopentadienyl Anion: A New Aryne"
S. C. Johnson and Son, 1525 Howe Street, Racine, Wisconsin 53400

BULL, Thomas Eyvind Chemical Physics Dr. Jiri Jonas
"Nuclear Magnetic Relaxation in Liquids Under High Pressure"
c/o Sture Forsen, Chemical Center, Lund Institute of Technology, Lund, Sweden

DeSIMONE, Richard Edward Inorganic Dr. R. S. Drago
"Magnetic Resonance Studies of Low Spin d⁵ Transition Metal Complexes"
Department of Biochemistry, University of Illinois, Urbana, Illinois 61801
1101a South Mattis Avenue, Champaign, Illinois 61820
FOGEL, Mildred Margaret Biochemistry Dr. J. W. Hastings
"The Relationship Between Soluble and Particulate Bioluminescence in Extracts
of the Marine Dinoflagellate"
Wellesley College, Wellesley, Massachusetts 02181

GEBAUER, Peter Anthony Organic Dr. D. E. Applequist
"Identification of the Dimer and Dihydrodimer of 3,3,6,6-
Tetramethylcyclohexyne"
Indiana University - Purdue University, Indiana, 38th Street Campus, In-
dianapolis, Indiana 46200
6225 Parliament, Apartment C, Indianapolis, Indiana 46200

HECHT, Sidney Michael Organic Dr. N. J. Leonard
"The Basis and Scope of Cytokinin Activity"
Laboratory of Molecular Biology, University of Wisconsin, Madison, Wisconsin
53706
2301 Badger Parkway, No. 9, Madison, Wisconsin 53713

HIRSCHBERG, Carlos Benjamin Biochemistry Dr. G. J. Schroepfer
"Structural and Metabolic Studies of Sphingolipids"
Department of Biological Chemistry, Harvard Medical School, Boston,
Massachusetts 02115

HSU, Shih Lo Physical Dr. W. H. Flygare
"Barrier Studies by Microwave Spectroscopy"
Department of Chemistry, University of North Carolina, Chapel Hill, N. Carolina
27514

HUDSON, Earl Nelson Biochemistry Dr. G. Weber
"Synthesis, Characterization, and Application of Some Covalent Fluorescent
Probes For Proteins"
Chemistry Department, Carroll College, Waukesha, Wisconsin 53186

KASOWSKI, Walter John Inorganic Dr. J. C. Bailar, Jr.
"Coordination Characteristics of the Ligands 1,1,1-Tris(Dimethylaminomethyl)
Ethane and 1,1,1-Tris(Monomethylaminomethyl) Ethane"
Department of Chemistry, Michigan State University, East Lansing, Michigan
48823
Lot 31, 6335 Park Lake Road, Bath, Michigan 48806

KLUG, James Herbert Organic Dr. D. E. Applequist
"Stabilities of Cycloalkyl and 1-Methylcycloalkyl Radicals From Quantitative
Decarbonylation Studies"

Central Research Laboratories, 3M Center, St. Paul, Minnesota 55119
1669 East Orange Avenue, St. Paul, Minnesota 55106

KOELTZOW, Donald Earl Biochemistry Dr. H. E. Conrad
"Structural Studies on the Lipopolysaccharide of *Aerobacter Aerogenes*"

Department of Medical Microbiology, Stanford School of Medicine, Stanford
University, Stanford, California 94305

KUTAL, Charles R. Inorganic Dr. J. C. Bailar, Jr.
"Reactions of Coordination Compounds in the Solid State: The Racemization of
(+)-Co(en)₃X₃ · n H₂O Complexes"

University of Southern California, Los Angeles, California

LI, Kuang-pang Analytical Dr. H. V. Malmstadt
"Fundamental Considerations of the Photon Counting Technique and its Ap-
plication in a Comparison of Flame Spectrophotometric Techniques"

Department of Chemistry, Arizona State University, Tempe, Arizona 85281
1122 East Lemon, Apartment 2, Tempe, Arizona 85281

LIN, Chi-Hung Chemical Engineering Dr. J. A. Quinn
"Hydrodynamic Properties of Macromolecules as Determined From Stability
Studies"

Processing Development Division, American Oil Co., 2500 New York Avenue,
Whiting, Indiana 46394

LIN, Fang-maw Physical Dr. R. L. Belford
"Conformation and Stability of Sulfur Rings, Cyclododecasulfur"

Department of Chemistry, North Carolina Central University, Durham, North
Carolina 27707

McDANIEL, James A. Inorganic Dr. J. C. Bailar, Jr.
"An Investigation of Complexes Similar to and Including Those in the Nickel-Tin
Plating Bath"

Department of Chemistry, Farmington State College, Farmington, Maine 04938
P.O. Box 248, Farmington, Maine 04938

MIYA, Makayoshi Chemical Engineering Dr. T. J. Hanratty
"Properties of Roll Waves"

7-8 2 chome Mikado-cho, Fukuyama-city, Hiroshima Ken, Japan

PERRY, William Daniel Inorganic Dr. R. S. Drago
"Nuclear Magnetic Resonance Studies of Paramagnetic Transition Metal Ion
Complexes. Part One: Temperature Dependence of the Isotropic Shift of
Paramagnetic Transition Metal Ion Complexes. Part Two: Study of the Ligand
Exchange Reaction of Octahedral Cobalt(II) by Nuclear Magnetic Resonance
Techniques"
Department of Chemistry, Florida State University, Tallahassee, Florida 32304
2310 West Tennessee Street, Tallahassee, Florida 32304

SMITH, John Lauren Speer Analytical Dr. R. S. Juvet
"Analysis of Polymeric Materials by Photolysis-Gas Chromatography"
Union Carbide Corporation, Tarrytown Technological Center, Tarrytown, New
York 10598
2961 Deerfield Avenue, Yorktown Heights, New York 10598

SPENCER, Richard Dale Biochemistry Dr. G. Weber
"Fluorescence Lifetimes: Theory, Instrumentation, and Application of
Nanosecond Fluorometry"
Department of Biochemistry, University of Illinois, Urbana, Illinois 61801
605 Fairlawn Drive, Urbana, Illinois 61801

STONE, Frederick Carson Chemical Engineering Dr. R. A. Schmitz
"The Stability and Control of an Adiabatic Loop Reactor"
Dow Chemical Company, Midland, Michigan 48640
2103 Laurel Lane, Midland, Michigan 48640

THORNBURG, Katherine Arenson Organic Dr. W. H. Pirkle
"A Cycloeliminitive Approach to the Synthesis of Optically Active Allenes"
502 West Main Street, Urbana, Illinois 61801

VOGEL, Glenn Charles Inorganic Dr. R. S. Drago
"Lewis Acid-Base Interactions. Part One: The Extension and Limitations of the
Frequency Shift-Enthalpy Correlations of Hydrogen Bonding Systems. Part
Two: Extension and Refinement of the E and C Correlation"
Department of Chemistry, Ithaca College, Ithaca, New York 14850
Buttermilk Apartment, Comfort Road, Town of Danby, Ithaca, New York 14850

WALTER, Marc Analytical Dr. A. M. Hartley
"An Electrochemical Study of Nitroferrocene"
Department of Chemistry, Dalhousie University, Halifax, Nova Scotia, Canada

YEOMAN, Lynn Chalmers Biochemistry Dr. L. P. Hager
"Active Site Labeling Studies on Heme Proteins"
Department of Pharmacology, Baylor College of Medicine, Houston, Texas 77036
6000 Bissonnet, Houston, Texas 77036

YOUNG, Chung-chang Analytical Dr. H. A. Laitinen
"Anodic Deposition and Cathodic Stripping of Iron in Acetate Medium"
Department of Chemistry, University of Kentucky, Lexington, Kentucky 40506
1268 Village Drive, No. 212, Lexington, Kentucky 40506

ZINK, Jeffrey Irve Inorganic Dr. R. S. Drago
"Magnetic Resonance Studies of Low Spin d^5 Transition Metal Complexes"
Department of Chemistry, University of California at Los Angeles, Los Angeles,
California 90024