



UNIVERSITY OF MINNESOTA
TWIN CITIES

Department of Chemistry
139 Smith Hall
Minneapolis, Minnesota 55455

MINNESOTA CHEMISTS NEWSLETTER

No. 4

January 1975

Dear Fellow Alumni:

As with so many messages, there is both good news and bad news! The good news this year was the appointment of Paul Gassman as Professor of Chemistry. Professor Gassman, formerly of Ohio State, arrived at the University of Minnesota late this past summer, together with his group of 14 graduate students and postdoctoral fellows. With his arrival the Department completed a search for a distinguished organic chemist, which began almost two years before that.

The Department's faculty was also augmented by the appointment of Dr. Harold Wittcoff as Adjunct Professor. Dr. Wittcoff, formerly Vice President and Director of Corporate Research for the General Mills Corporation and now Special Advisor to the President, General Mills Chemicals, Inc., has developed a course in industrial chemistry which is now being offered for the second year. The Department has been recognized by the President of the American Chemical Society for pioneering in this area of instruction.

Since 1970-71, undergraduate enrollment in chemistry has increased by more than 22%. Over the same period of time, the Department's teaching assistant staff was reduced from 104 to 72, as a result of the University's budgetary retrenchments. In an effort to continue to provide as much individual attention as possible to undergraduates in laboratory courses, the Department has put a limit on the enrollment in these courses for the first time in its history.

The Department's most serious problem has come to be the maintenance of major chemical instrumentation. Over the past six years more than a half-million dollar's worth of instrumentation has been added, thanks to the Chemical Instrumentation Program of the National Science Foundation. Unfortunately, it is not NSF policy to provide funds for the maintenance of this kind of equipment. In view of the fact that the Department's supply and expense budget has increased by less than 2% in the last biennium, we have a problem. The situation is crucial, especially since it comes at a time when graduate enrollment in chemistry is increasing. We welcome the suggestions of any of our alumni to the solution of this problem.

With our regards,

Bob Hexter



PROFESSOR EMERITUS I. M. KOLTHOFF

On February 11, 1974, Professor I. M. Kolthoff reached his 80th birthday. During the year, this occasion was recognized by his colleagues with the "I. M. Kolthoff 80th Anniversary Symposium" at the spring meeting of the American Chemical Society in Los Angeles. Professor Kolthoff presented the first paper of the symposium, "The Role of Hydrogen Bonding and Transfer Activity Coefficients on Resolution of Acid Strength in Non-aqueous Media" and later served as a panel member in discussing: Non-aqueous Analytical Chemistry.

On May 19, Brandeis University awarded Professor Kolthoff an honorary doctor's degrees. In June, he received the doctor honoris causa degree from the Hebrew University of Jerusalem.

Dr. Kolthoff continues to maintain an active research program. The National Science Foundation awarded him \$22,600 to continue work on his project, "Acid-Base Equilibria in Aprotic Solvents". The total award for this project now equals \$96,300. An award of \$25,457 has also been made to Dr. Kolthoff by the National Cancer Institute for research on, "Polarography with Albumin and Cancerous Human Blood Sera".

Recently an interview with Professor Kolthoff has appeared. Just in case some of his friends and colleagues among our alumni did not have the opportunity to read it, we are pleased to reproduce it for your enjoyment.

Interview with I. M. Kolthoff

by Robert C. Brasted

Brasted: *Dr. Kolthoff, you had your early schooling in Holland. What were some of the factors that influenced you in your decision to enter chemistry; perhaps parental influence or early teachers?*

Kolthoff: *To answer the question properly I think I should tell you in some more detail of differences in high schools in Holland at the time of my early education in my home country. There are several types of high schools in Holland but there are only two which allow graduates to enter a university without taking or passing entrance examinations. One is called the Gymnasium and the other is what the Germans would refer to as the Oberrealschule. The Gymnasium, and it is basically the same in Germany as it is in Holland, concentrates considerably on Latin and Greek while the so called Oberrealschule concentrates particularly on the mathematical sciences as well as on modern languages. The education is really quite a stiff one. When I entered high school there were 52 in the class and when I graduated five years later only 12.*

I might say a few words of the final examination in those days (1906-11) that seem to be an effective weeding device. We had to spend three weeks in written examinations and later three days in oral examination. In the written we had three hours to answer questions in algebra, solid geometry, plane geometry, mechanics, astronomy, and of course physics and chemistry. In foreign languages there was, in addition to Dutch of course, English, German, and French. We had to write a composition in each of those languages. At the oral examination we had to submit a list of 20 books we had read in each language, and the examiner could ask us in the particular language not only to give an account of what was in the book but also to discuss some of the philosophical aspects so that memorizing an abstract of the book was only part of the exam.

I believe that you asked me something about my interest in chemistry and how this was developed. We had three years of chemistry in high school which started in the third year. The first two years were mainly concerned with general chemistry with emphasis on inorganic chemistry. The last year was mainly devoted to organic chemistry. In the last year we also had one afternoon of a practical course which dealt mainly with qualitative inorganic analysis. I had such an interest in chemistry that I started a laboratory in my home much to the disgust of my parents and my

entire family. As I recall the laboratory was actually built under the kitchen sink. I did the more spectacular experiments that are often done by budding scientists at the present time: making and exploding gun powder—incidentally, a lasting effect was evident from that experiment since I had a dermatitis that stayed with me the rest of my life—and of course we produced sulfides of various colors. There was one particular experiment which I had seen in high school and which had impressed me considerably from the spectacular point of view. It was the old "pharaohs serpent" which formed by holding a burning match on mercury(II) thiocyanate. At home, in order to get the necessary mercury I ruined one of my family's favorite antiques, a barometer.

On another occasion I remember going into my kitchen laboratory and finding my mother desolate. We were to have an important guest for dinner. By mistake my mother had put into the chicken soup several large spoons full of sodium carbonate instead of sodium chloride. She was just about ready to throw everything into the sink when I told her that it was child's play to transform sodium carbonate to sodium chloride. Thus, at a rather tender age I made my first titration adding hydrochloric acid until, at a pH of 7, blue litmus paper turned pink. In my experience this is still the optimum pH of chicken soup.

Brasted: *Piet, it would seem that your early introduction to chemistry is not entirely different than the introduction that many of us have had, although I am not sure that we could duplicate your chicken soup experiment. It is well known to many of us that you are actually by training a pharmacist or Apotheker. How did this training affect your eventual status?*

Kolthoff: *In those days, at the time of my graduation from high school in 1911, the law in Holland still required that the person who had come from the type of high school that I have just described had to pass also examinations in Latin and Greek before he was allowed to enter the university. This law was changed in 1917 and I profited from it at that time. I decided that since I was mainly interested in studying chemistry to go to the Technical University in Delft and become a chemical engineer. However, after a few weeks I gave it up because there was no space in the chemistry laboratory and I would have to wait for two years devoting most of my time to the study of mathematics. This particular approach did not appeal to me. I was given*

by my father the option of either going into business or going to another university and majoring in pharmacy. The classical languages were not required from students in medicine and pharmacy. I was attracted to Utrecht because the man in charge of education in pharmacy was an outstanding analytical chemist by the name of Schoorl. Professor Schoorl had a very broad scientific background having studied under such people as van't Hoff, the organic chemist Lobry de Bruyn, and also Rozeboom who was the man who introduced the Willard Gibbs phase rule into Europe.

Professor Schoorl's main interest was in analytical chemistry but he also was required to give lectures in such subjects as chromatology, toxicology, and pharmaceutical chemistry. After entering the university and spending a year taking courses in chemistry, physics, biology (particularly botany and zoology) as well as mineralogy, I entered the pharmaceutical laboratory. It should be made quite clear that the education in pharmacy which leads in the Dutch system to the title of Apotheker requires six or seven years, about the same time that it takes to get an MD. Education was very broad and I profited from it. After I passed the examinations for Apotheker, I started to concentrate more on the theoretical fundamentals of chemistry. It happened that our new pharmaceutical laboratory was built right next to the van't Hoff laboratory where all of the chemical courses were being taught. I profited particularly through my relations with Kruyt who had gained an international name as a leader in colloid chemistry. One year Kruyt would give lectures in phase rule and another year he would teach a course in colloid chemistry. His latter course particularly excited me and in part explains why I got, in later years, so much interested in research dealing with precipitates and especially precipitates which have more or less colloidal character. In later years all of these courses helped in developing research projects not a few of which have received considerable recognition.

Brasted: Your work on precipitates has perhaps been given as wide acclaim as any of the many fields in which you have worked. Is there any story that might explain your early interest?

Kolthoff: I could be reasonably brief on that. In my first year in Schoorl's laboratory we started determinations. Professor Schoorl appeared to have confidence in my ability for accurate experimentation and attributed my deviating results more to coprecipitation than in the results which I was obtaining. He gave me my first literature reference. It was to a paper by Johnston and Adams which I still recall. It was in the Journal of American Chemical Society, Vol. 33, pages 8 and 9, 1911, and it dealt with coprecipitation with barium sulfate. It is really a classical paper and one which we have described and referred to in many editions of a text book with Sandell. Certainly Schoorl's encouragement developed my interest in this phase of research.

Brasted: You are describing experimental work and research that seem to be achieving acclaim throughout the continent yet you were still a student. Was it possible for you to do this kind of research at this age and receive recognition?

Kolthoff: As I mentioned Professor Schoorl encouraged my interest in research. I published my first scientific paper in 1914 in the Dutch Chemical Week. It dealt with the titration and dissociation constant of phosphoric acid. I was impressed in my early studies by the fact that analytical texts used in those days only gave us procedures. They did little or nothing to explain what was going on and why. I didn't understand the color change of indicators, their choice in titrations, etc. One thing led to another acquainting me with the work done by non-analytical chemists in the field of

pH and applications to titrations. Certainly the name Sorensen who was the head of the Carlsberg laboratory near Copenhagen in Denmark should be mentioned at this point. He published in 1909 a very fundamental paper with which many people still are acquainted. It dealt in great detail with the determination of pH by potentiometric and colorimetric methods, and presented a complete set of buffer solutions. In 1914 the famous Danish chemist Niels Bjerrum published another very fundamental monograph (in German) entitled "The Theory of Acidimetric and Alkalimetric Titrations."

My interest in electro-analytical methods also developed in those early years. At the time I was studying Sorensen's papers I had no notion of the theory of potentiometric determinations. I studied books on electrochemistry and soon I constructed with the aid of a slide wire and a Lipman capillary electrometer equipment to make potentiometric measurements and titrations. Of course, I also became acquainted with the papers by the famous physical chemist Walther Nernst, the originator of the Nernst equations and of electroanalytical chemistry. It should be emphasized that this was a very wonderful period of my life. Analytical chemistry especially in those days was bare of almost any scientific interpretations. It became clear to me that such an understanding was not only necessary to increase the prestige of analytical chemistry as a real science by providing these interpretations but that a good understanding of physical, chemical, physico-chemical fundamentals would lead to the development of new methods, improvement of existing methods, and to the calculation of errors in analytical procedures.

Brasted: Could you give us in a few words something of your professional progress on the continent before you came to the United States in 1927 and why and how you made this move?

Kolthoff: In those days I published quite prolifically in various chemical journals, several in Dutch and many in German, some in French in the Dutch Recueil and even a few in the Journal of the American Chemical Society. In 1920 I summarized my research on acid-base indicators in a book which was published in German. Some years later it was translated in English and published in the United States; it eventually experienced four German editions. In 1923 I published a book on conductometric titrations in which I summarized the work I had been doing which was followed in 1927 by a two-volume treatise on "Volumetric Analysis." The first volume was theoretical and the second volume dealt with the practical side of titrations.

In 1924 I made a visit to the United States, where I met my great friend the late Professor Furman. I prepared a text for a book for potentiometric titrations; a subject in which Furman had a great deal of interest. We published this together. It was my first book in English in this country. During my visit in 1924 I gave talks in New York, Ohio, Illinois, and Michigan amongst other places.

Brasted: How did you happen to come to Minnesota?

Kolthoff: In 1927 a cablegram was received from Dr. S. C. Lind who at that time was head of the Department of Chemistry at the University of Minnesota. He invited me to come for one year as a professor and to become head of the Division of Analytical Chemistry with the intention to make the position permanent.

This appointment gave me a wonderful opportunity to extend and expand my research. One reason Dr. Lind had asked me to come was that he had become acquainted with my publications and he was very anxious to develop the scope of research at the University of Minnesota. Don't forget, Bob, that in the very early

days in this century, most of the well-known professors of this country had carried their doctorates either in Germany or some other European country. Dr. Lind had his degree from Paris with Madame Curie. The graduate schools of the United States were at a very tender age.

Brasted: As you say, the graduate schools were just developing in this period. Could you enlarge on the way in which your interests in the field of electrochemistry grew?

Kolthoff: I felt that Minnesota was an El Dorado as far as research was concerned. In those early days there was very little competition from other members of the faculty to attract deserving graduate students. I was extremely lucky in having a long list of outstanding students. Teaching loads were rather simple. I didn't have to give the usual general course in quantitative analysis but was able to concentrate immediately on advanced education and research in electro-analytical chemistry and other topics. I was greatly chagrined to find that outstanding students who graduated with me and went into analytical chemistry got positions in industry where they were asked to act as routine analysts, certainly not as scientific analytical chemists. For this reason Professor MacDougall, who at that time was head of the physical-chemical division, here at the University of Minnesota, permitted me to have my graduate students major in physical chemistry if they fulfilled the requirements of that division. Thus, many of my students amongst whom we might mention Herbert Laitinen and James Lingane, certainly well known figures in analytical chemistry, majored in physical chemistry and minored in analytical chemistry but did their thesis work with me.

Brasted: Are there any special techniques of student-professor relationships that you would like to mention that you would seem to feel have contributed to the success of turning out such outstanding students?

Kolthoff: Many of the students that I have had have pointed out in the years following their graduation that they felt one of the most important and significant contributions to their graduate studies was the personal relationship in our discussions in the laboratory. Actually what I tried to impress upon my students was the fact that they should not accept anything on authority regardless of who and how famous the originator might be. I encouraged them to disagree with me when they felt that I was wrong, which was often the case. I also impressed upon them the importance of being critical not only of the literature but that it was equally important to be self-critical and of their major adviser. This attitude was apparently exciting both to the students and to me.

Brasted: Recognizing the difficulty of answering, would you care to make a personal evaluation as to which of your many contributions has been most far reaching?

Kolthoff: Keep in mind that when I first came to the University of Minnesota I had done most of my research in an effort to develop a more complete interpretation of what we might call "wet chemical analysis." Obviously there was still much to be done on my arrival in the United States in that area and also in electro-analytical chemistry. For example, after a visit in 1933 from Heyrovsky of Prague University, the originator of the technique of polarography, Lingane and I decided this was an interesting and analytically very important topic. Lingane decided to take this as a subject for his doctoral thesis. It is obvious now that the topic is not only one of general analytical interest but to electrochemists, organic chemists, inorganic chemists, physical chemists, and industrial and biochemists. Another topic which involved carrying out quite a bit of research was an attempt to determine why precipitates formed under various conditions but were invariably

impure. This area led to elaborate studies on adsorption by precipitates or, quite generally on co-precipitation, as well as post-precipitation and on the aging of precipitates. I might add that in 1933 we were visited by Professor Otto Hahn, the man who split the atom in 1939. Hahn in those days was interested in similar topics as far as adsorption of precipitates was concerned. He in fact did not quite agree with my interpretation of the very spectacular phenomena which accompanied the aging of precipitates. In this research I profited greatly from the fact that Dr. Lind was the specialist in radioactivity and that I got a post-doc from him who did the early work on aging of lead sulfate using thorium, the radioactive isotope of lead.

Brasted: Two areas which you have contributed so very prolifically seem to be on the surface far apart in their basic chemical phenomena. One you have just mentioned, that of precipitation and the other is protein chemistry. Is there a reason for this particular combination?

Kolthoff: Actually my research in protein chemistry has a humanitarian background. As I mentioned, the subject of polarography had been developed in Prague. One application was a polarographic test by which cancer could be detected in human blood serum. In 1939 Lingane worked one summer on this test. It looked to be somewhat promising. After World War II there were requests from PhD's in Europe, or refugees elsewhere, who were or had been victims of the Hitler regime and who were asking for post-doctoral fellowships. In those days it was pretty hard to get money for research; however, when "cancer research" was mentioned it seemed to open the door even at that early time for a grant from the U. S. Public Health Service. This was the way we received support and began our protein research. Sulfhydryl and disulfide groups in proteins are extremely important from the biological viewpoint. We had already developed "the amperometric titration technique." This technique allowed us to determine in a fairly simple way and quite rapidly the number of sulfhydryl and disulfide groups in proteins. One thing led to another, eventually involving us in the denaturation of serum albumin. As a matter of fact, in the late 50's we broke all of the 17 disulfide bonds in the serum albumin. By reversing the reaction we reobtained the protein in its original state. We still are engaged in research on the catalytic polarographic protein currents.

Brasted: In the early 40's I recall your very active program in which you and Professor Meehan directed rubber research. We are apparently adding a reasonably unique area, rubber research, to the other combinations already mentioned: cancer research, studies on proteins, electro-analytical chemistry, and the nature of precipitation. Is there a story here?

Kolthoff: It was anticipated toward the end of 1941 that as a result of the war the natural rubber situation in this country would become critical. It was reasonable that we would become involved in the war and, of course, we did. Several universities were requested to participate in the development of synthetic rubber. We received a grant from the Office of Rubber Research in Washington. Dr. Meehan and I directed together this research in synthetic rubber. Originally our problems were of an analytical nature. Very soon we became quite interested in the kinetics and the mechanism of emulsion polymerization. We certainly do not have time to go into details, but the free radical initiation of polymerization led Dr. Meehan and me after the war to detailed studies of "induced reactions." There were other ramifications of this research at the University of Minnesota because practically all of our graduate students were being drafted into the army. Does this ring

a familiar bell? Our group of graduate students was permitted to continue their research because it was essential to the war effort. It would frequently happen that one of our students in a project would be drafted 1-A. We would have to fly immediately to Washington and talk to the President's Committee. I gave them a choice between allowing the students to be drafted into the Army or to discontinue our war research. We never lost anyone from our research group.

Brasted: Long before your retirement, Dr. Kolthoff, you were pursuing work in nonaqueous solvents. Here again you have published books and have numerous articles in the area. Could you add a little on the present status of that work?

Kolthoff: The French have a well known proverb that goes something like "on revient toujours a ses anciens amours," or in English "one always returns to his old love." As we have said earlier, I was much interested in my early days in the interpretation of acid-base behavior in water and other solvents. In later years it was quite clear to me that although acid-base titrations and electrochemistry in general were very important in nonaqueous solutions, our interpretations of the known facts were very incomplete, to put it mildly. This briefly explains why in the last 10 or 15 years we have been concentrating on the various aspects not only on the analytical chemistry in nonaqueous media but also in electrochemistry and quite generally in chemistry in nonaqueous media.

Brasted: I don't mean to probe into your political beliefs but it is pretty difficult not to become involved in politics when we find ourselves being very severely limited in many of our research projects because of government edicts. Do you have anything to offer on this matter of government support for research?

Kolthoff: We could talk about this subject for hours but I will try to be brief. During the war it was quite evident (especially in the later stages) that we were engaged in a very scientific war. The country that lagged behind in research and accomplishments in research would certainly come out second best. This point of view was equally true after the war, and various branches of the armed forces started to make funds available for what we might call "pure research." I think this has been extremely important not only in education of our graduate students but also in our country taking leadership in the development of research. Let's look at the total number of Nobel Prizes which have been awarded to Americans before the war and after the war. I think that this difference makes it quite clear as to the impact of this kind of funding on American leadership in research. You recall that in the late 50's the interest of the government and its branches in support of fundamental research started to lag again. Questions were asked by (and in) Congress of the "practical" value of research. Then, of course, in 1957 we got a pretty rude shock when the Russians made their first Sputnik shot. This was recognized by the government, and we entered another era of very substantial support of fundamental research which ended

only a few years ago. It is perfectly clear that the leadership in research that this country gained and has maintained many years after the war is being lost. It is very obvious that other countries are taking over.

Brasted: Dr. Kolthoff, do you see any broad chemical areas particularly in analytical chemistry that should be developed in more than quantum jumps?

Kolthoff: Analytical chemistry, like the other fields of chemistry, is in a state of flux. With all of the modern developments particularly in physical methods of analysis, emphasis in analytical chemistry has changed today to a great extent from wet analytical chemistry to instrumental analytical techniques. This, of course, you already know. If you compare the contents of an issue of The Journal of Analytical Chemistry 25 years ago and the contents at the moment, I think you would have your question pretty well answered. At the moment the analytical chemist is becoming more and more part of a team, who together with his colleagues in other fields of chemistry are going to answer the problems which not only occur in industry and "pure" research but also in our environment. Although I do not believe that wet analytical chemistry will disappear entirely, it is perfectly obvious that there will be growing developments in new physical methods of analysis. Certainly the developments in physical trace techniques have received great publicity in recent years.

Brasted: The last and perhaps the hardest, though it might be the easiest, question might take the abstract form. Suppose you could roll back the clock. You are now 21 years old (or thereabouts) but it is still 1973. Do you think that you would see now the same excitement in analytical chemistry that you saw then?

Kolthoff: To give you an honest answer, Bob, I must say that in my early days analytical chemistry scientifically speaking was a very bare field. Therefore, it was with great enthusiasm that I learned from physical chemists, biochemists and others, ways in which we could introduce "science" into what apparently was empirical analytical chemistry. At the moment although there is still compartmentalization in the whole field of chemistry, border lines between various fields are getting more and more diffuse. A modern analytical chemist is certainly intrigued by the problems of the physical, organic, and inorganic chemist. There is quite a bit of overlapping amongst these various fields. As an example a couple of years ago when we had an international conference on nonaqueous electrochemistry, the main speakers were an organic chemist, an inorganic chemist, a physical chemist, and an analytical chemist. To finally answer your question and to try to be more specific, I may say that I would be attracted by various problems that are still left in the field of chemistry whether they be analytical, physical, organic, or inorganic. In my young days I really became intrigued with the (analytically important) problems of solution chemistry and I still am. I am happy with the development of all new techniques, but I would not make this my major or minor field of research.

FRANK H. MACDOUGALL

October 24, 1883 - November 21, 1974

IN MEMORIAM

The Department of Chemistry regrets to inform you of the passing of Professor Frank H. MacDougall, long-time Professor of Physical Chemistry in our Department.

Professor MacDougall was born in Maxville, Ontario on October 24, 1883. He received his B.A. (1902) and M.A. (1903) at Queen's University, Kingston, Ontario and his Ph.D. in Leipzig in 1908, where he studied with R. Luther.

Professor MacDougall's association with the Department began as Instructor in General and Physical Chemistry in 1915. He became Assistant Professor in 1917, Associate Professor in 1919 and Professor in 1924. From approximately 1926 until his retirement on June 30, 1953 he was Chief, Physical Chemistry Division. An entire generation of chemists was raised on his textbook, "Physical Chemistry" and many studied his text, "Thermodynamics in Chemistry".

He will long be remembered by his friends, students, and colleagues. His friends may wish to write to his daughter, Mrs. T. M. Preuss, whose address is 86 Stuyvesant Avenue, Larchmont, New York 15038.

NEW FACULTY

Paul G. Gassman

The Department of Chemistry, is pleased to announce the appointment of Professor Paul G. Gassman, previously of Ohio State University, as Professor of Chemistry, effective September 15, 1974. A native of Alden, New York, Professor Gassman received his B.S. from Canisius College in Buffalo, New York, cum laude, in 1957 and his Ph.D. from Cornell University in 1960.

Professor Gassman has been a Fellow of the Alfred P. Sloan Foundation (1967-69), and was Chairman of the Gordon Conference on Hydrocarbon Chemistry (1972). He was the recipient of the American Chemical Society Award in Petroleum Chemistry in 1972. He has held several offices in the Columbus Section of the American Chemical Society, including Chairman (1970) and is a Counselor of the Society. He is the author of over 150 publications and has given invited lectures at most major universities in this country as well as abroad.

Professor Gassman's research interests are in the chemistry of nitrenium ions and, recently, the chemistry of organometallic reagents. Much of this work has resulted in new methods of aromatic substitution and new syntheses of a variety of physiologically important heterocyclics. His newest research programs include organoelectrochemistry, the chemistry of organolithium reagents, and reactions of strained rings. With this appointment, the University looks forward very much to the distinction Professor Gassman will add to the Department of Chemistry.

Harold A. Wittcoff

Dr. Harold A. Wittcoff has been appointed as an Adjunct Professor of Chemistry. He has been associated with industrial chemistry for over 31 years, having served as a Vice President of Corporate Research for General Mills, Inc. Dr. Wittcoff teaches a course in The Chemistry of Industry which is a two quarter course which began in the Winter Quarter 1975.

A short description of the course follows:

The Chemistry of Industry is designed to satisfy the strong interest in the world of industrial chemistry by undergraduate and graduate students in the Department. The objectives of the course are: (a) to acquaint the student with the actual chemistry on which the chemical industry is based; (b) to acquaint the student with the all-important interrelationship between the applications of a chemical and its properties which make that application possible; (c) to decrease the "induction period" which a new chemist in industry frequently must experience before he is able to make meaningful contributions; (d) to provide the student insight into the perplexities of the future as these affect scientific and technological effort; (e) to prepare the student so that he may be better able to choose both an area and a company with which to continue his career.

To achieve these objectives, sixty percent of the course is devoted to basic industrial chemical processes such as chlorine, production, polymers, petroleum refining, fermentation, and other similar basic areas. The

NEW FACULTY (cont.)

remaining forty percent of the course covers the economic aspects of industrial chemistry, management, industrial literature, and case histories of successful industrial chemical ventures. The course has been described in an article to appear this year in the Journal of Chemical Education.

NEWS OF ALUMNI

Robert W. Sandelin, B.Ch.E. 1938, recently retired as Chief Metallurgist from Connors Steel Division, H. K. Porter Company, Inc. of Birmingham, Alabama.

John L. Wilson, Ph.D. 1931, received the 1974 Minnesota Award for outstanding contributions in chemical research and in service to the chemical profession.

Isabella Margaret Webster, Ph.D. 1936, received her newsletter of last year in Rome, Italy. She is No. 7 in the graduate student picture of 1936 which is printed again in this newsletter with the persons identified from information provided by alumni.

AWARDS

The Department was most pleased that Dr. Robert G. Bryant, Associate Professor, has been awarded a Camille and Henry Dreyfus Teacher-Scholar Grant. The amount of the grant is \$25,000. These grants are awarded in chemistry, chemical engineering and related sciences to young faculty members of exceptional promise who combine interest and demonstrated ability in teaching and performing imaginative research.

PROMOTIONS

Ronald E. Barnett and Louis H. Pignolet have been promoted to Associate Professors with tenure. Professor Barnett now holds a joint appointment with the Department of Laboratory Medicine and Pathology.

VISITING PROFESSORS

Professor George Anderson from Bowdoin College in Maine is spending the academic year 1974-1975 working in Professor John Overend's laboratory.

Professor Alexander Tulinsky spent six months on sabbatical leave from Michigan State University working in Professor Rufus Lumry's Biophysical Chemistry Laboratory.

LEAVES

Professor Robert M. Hexter, Department Chairman, spent a single quarter leave during fall quarter at Oregon State University, Corvallis, Oregon, completing a monograph entitled, "Molecular Vibrations in Crystals," co-authored with J. C. Decius.

Professor Stephen Prager spent winter and spring quarter on leave at the 3M Company, St. Paul, Minnesota. He spent a single quarter leave during fall quarter at Weizmann Institute in Israel where he pursued the development of a molecular theory of solvent and solute transport through monolayers and thin films of polymeric materials.

Professor Richard F. Borch was on leave during fall quarter at the Medical School, University of Minnesota.

PHOTOGRAPH FROM 1936

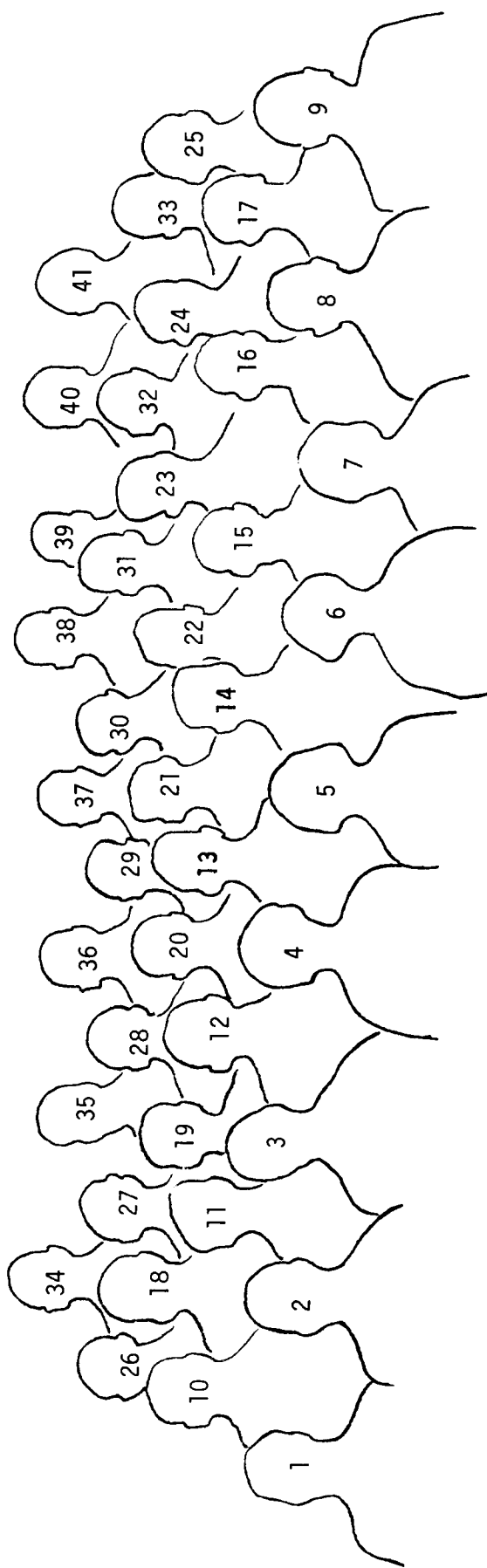
A photograph of the graduate students of 1936 was published in last year's Newsletter. This year we publish it again with the persons identified. We are grateful to Professor Emeritus G. B. Heisig; Professor Emeritus I. M. Kolthoff; Dr. Joseph Opie of General Mills, Inc.; Professor Macolm Renfrew, University of Idaho; Professor H. A. Laitinen, University of Illinois at Urbana-Champaign; Dr. E. W. Kaiser, Western Springs, Illinois; and Dr. Isabella M. Webster of Rome, Italy for supplying the names of the persons in the picture.

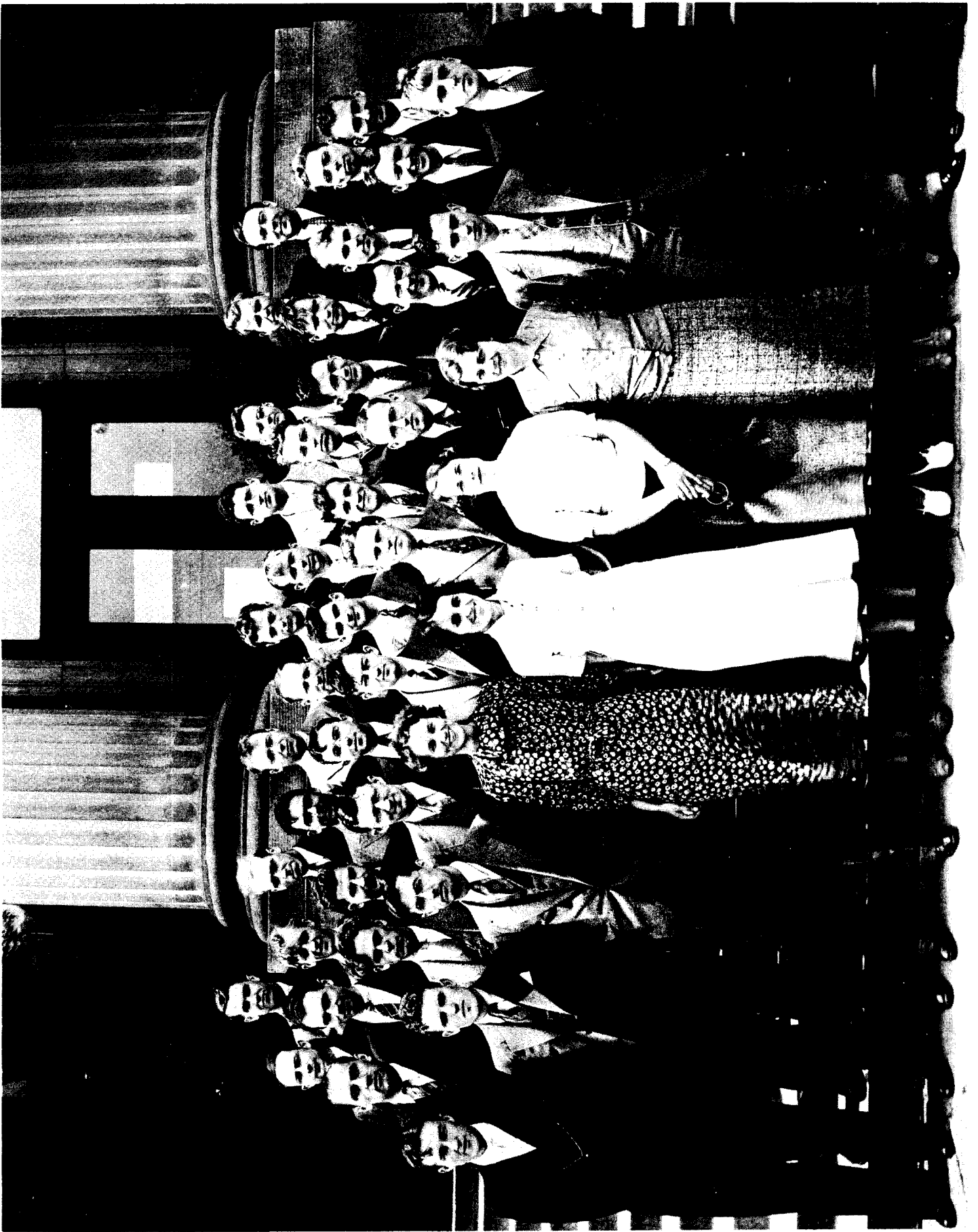
Graduate Students in the School of Chemistry - May 1936

- | | |
|--|-------------------------|
| 1. Frank T. Eggertsen | 22. William Prichard |
| 2. James J. Lingane | 23. Robert M. Leekley |
| 3. William M. MacNewin * | 24. John Anthes |
| 4. Marion Sedin-Bushey | 25. Henry Yutzy |
| 5. Effie Hughs | 26. Frank Griffith |
| 6. Wila Irwin-Guss | 27. Paul Johnson |
| 7. Isabelle Margaret Webster (Sister Mary Frances) | 28. Moses Gordon |
| 8. Joseph Opie | 29. Malcolm M. Renfrew |
| 9. Unidentified | 30. Stuart Harrison |
| 10. A. S. O'Brien | 31. Ken C. Johnson |
| 11. Norman Cromwell | 32. Ralph Peck |
| 12. Stanley Wawzonek | 33. Bruce Gillespie |
| 13. James Horner | 34. E. William Kaiser |
| 14. Courtlandt Agre | 35. Arthur W. Wishart |
| 15. Frank W. Hurd | 36. Francis W. Martin |
| 16. John Vincent | 37. Frederick T. Wall |
| 17. Wilbur Pings | 38. Howard Kahn |
| 18. Herbert Ungnade * | 39. Unidentified |
| 19. Lyle Overholser | 40. George Noponen * |
| 20. Shelby Miller | 41. William von Fischer |
| 21. George Mitchell | |

* deceased

Graduate Students in the School of Chemistry
May 1936





COLLOQUIA, CONFERENCES, LECTURES, SEMINARS, SPEECHES, SYMPOSIA

Professor Ronald E. Barnett was an invited speaker at the Cyclic AMP Gordon Conference, Tilton Academy, New Hampshire, June 10-14.

Professor Victor Bloomfield was co-chairman of the Gordon Research Conference on "Physics and Physical Chemistry of Biopolymers", in July.

Professor Robert Brasted presented a paper on "The Examination Program of the Division of Chemical Education" at the spring meeting of the National Science Teachers Association. He also presented two seminars on "Chalcogen Cyclic Imides" and "Anomalous Behavior of Resolvable Complexes in Solution" at Colorado State University in April. During the month of May he presented seminars and consulted on curriculum evaluation at California State College in Bakersfield, California and attended a conference on Inquiry Approach in Science Education. At the spring meeting in Los Angeles of the American Chemical Society, he presented a paper on "Recent Chemistry of Chalcogen Cyclic Imides." He presented the talk, "Political and Educational Interface in Eastern and Western Europe - Experiences and Experiments in International Education" at the spring meetings of the Sioux Valley and Western Wisconsin Sections of the American Chemical Society and of the Chicago-Land Area Association of Colleges. In June, he presented a paper "Lecture Experiments and Demonstrations Supporting Structure-Acid-Base and d-Orbital Concepts" at Purdue University during the Great Lakes Regional Meeting of the American Chemical Society. Dr. Brasted attended the Biennial Chemical Education Conference at Penn State University, August, 1974, honoring the 200th Anniversary of Priestley's discovery of oxygen. An invited paper on "Intellectual Tools in Predicting Solubility-Lecture Experiments" was given. He visited, in October, the Western Wisconsin ACS Section and discussed the subject, "Recent Chemistry of Cyclic Sulfur Imides." He also visited the Peoria Section of the ACS and presented a talk: "Prattlings of a Peripatetic Professor on Politics and Pedagogy of Peculiar People and Places-Peeks at Posteriors of Pink Panels." In November, Professor Brasted gave a seminar to the students of Bradley University on "Applications of Nonaqueous Systems-Sulfur, Nitrogen Chemistry." During a site visit in mid-December, he evaluated the curricula and staff of the newest university in the University of Texas system, U.T. Permian Basin, Odessa, Texas. He visited the Lincoln Campus of the University of Nebraska as a consultant to the Exxon Education Foundation and evaluated materials produced for orientation of graduate teaching assistants.

Professor Sidney Buttrill attended the 22nd Annual Conference on Mass Spectrometry and Allied Topics in Philadelphia, Pennsylvania, May 19-24. He presented a paper entitled "Time-Resolved Photoionization Study of the Unimolecular Fragmentation of Toluene Ions". He was one of 108 scientists from NATO countries who participated in the NATO Advanced Study Institute on Ion-Molecule Interactions in Biarritz, France, June 24 - July 6, at which he made five short presentations during the Institute on various aspects of his research.

Professor L. E. Conroy attended the Gordon Research Conference on Inorganic Chemistry at New Hampton School, New Hampton, N.H., August 5-9, and he presented a paper, "Sodium Tungsten Bronze - An Experiment in High Temperature Synthesis and Solid State Chemistry," before the Symposium on Solid State in the Classroom and Laboratory, ACS Meeting, Atlantic City, September 9.

Colloquia, Conferences, Lectures, Seminars, Speeches, Symposia, (cont.)

Professor Paul G. Gassman presented the following lectures during the year: "The Chemistry of Azasulfonium Salts", 3M, St. Paul, Minnesota, September 16; "Azasulfonium Salts in Organic Synthesis", Department of Chemistry, Western Michigan University, Kalamazoo, Michigan, October 7; "Recent Progress in Indole Synthesis", Pharmaceuticals Division, Ciba-Geigy Corporation, Summit, New Jersey, October 16; "Azasulfonium Salts in Heterocyclic Syntheses", Department of Medicinal Chemistry, College of Pharmacy, University of Minnesota, Minneapolis, Minnesota, October 22; "Azasulfonium Salts - New Intermediates in Organic Synthesis", Department of Chemistry, North Dakota State University, Fargo, North Dakota, October 28; "Rearrangements of Strained Ring Systems", Department of Chemistry, Northwestern University, Evanston, Illinois, November 12; "Chemistry of Azasulfonium Salts", Department of Chemistry, Bucknell University, Lewisburg, Pennsylvania, November 14; "Azasulfonium Salts - Useful Intermediates in Indole Synthesis", Sandoz-Wander, Inc., East Hanover, New Jersey, November 15.

Professor Gary Gray presented a seminar at Gustavus Adolphus College on November 18 on "Mycobacterial Components in Tumor Regression".

Professor Robert M. Hexter attended the annual meeting of the chemistry department chairmen of the Big Ten Universities on January 19. The meeting was held at the Indianapolis Airport, and Professor Eugene Cordes of Indiana University acted as host. This series of meetings was initiated by Professor Hexter in 1971. This year's meeting concentrated on the exchange of quantitative information, such as enrollment, teaching loads, graduate student trends, funding, grant support, and instrument maintenance. On February 15 he visited the Miami Valley Laboratories of the Procter & Gamble Company and delivered a seminar on "Multiphonon Transitions: Their Importance to Chemical Spectroscopy." At a luncheon Professor Hexter met with all the Minnesota alumni at the MVL. In the afternoon, he met with the Associate Directors of Research of MVL in order to discuss various aspects of university-industrial cooperation. Dr. Hexter attended the Gordon Conference on Infrared and Raman Spectroscopy at Kimball Union Academy, in Meriden, N.H., August 18-23. He also was one of 60 invited participants in a working conference on Group Relations held at Amherst College, August 23-28. On November 25 he presented colloquia at Oregon State University and at the University of Oregon, November 26.

Professor Emeritus I. M. Kolthoff presented the first paper, "The Role of Hydrogen Bonding and Transfer Activity Coefficients on Resolution of Acid Strength in Non-aqueous Media" at the "I. M. Kolthoff 80th Anniversary Symposium" held at Los Angeles, California, March 31 to April 4. On October 18 Dr. Kolthoff presented a seminar before the Department of Chemistry, University of Florida, Gainesville, on "Hydrogen Bonding and Resolution of Acid Strength in Dipolar Aprotic Solvents."

Professor Maurice Kreevoy attended the Organic Reaction Mechanisms Conference, June 26-28 in Fort Collins, Colorado, and the Gordon Conference on the Chemistry and Physics of Isotopes, Pacific Grove, California, July 1-5. He gave short papers at both. Professor Kreevoy also gave lectures on "Adventure in Borohydride Chemistry", at Duke University, du Pont Company at Wilmington, Delaware, University of Delaware, and Northwestern during November.

Colloquia, Conferences, Lectures, Seminars, Speeches, Symposia, (cont.)

Professor Edward Leete gave seminars at the Universities of Kentucky, Wayne State, and Leeds. His major topic was the origin of the minor alkaloids of tobacco. He was invited to speak on the biosynthesis of the tobacco alkaloids at a symposium devoted to the chemistry and physiology of nicotine, held in Stockholm, Sweden, November 10-14. Dr. Leete spoke at the first scientific symposium on Orchids which was part of the 16th Mid-American Orchid Show held in Detroit, October 25-27. The title of his talk was: "The use of ^{13}C -nmr in a study of the biosynthesis of shihunine, an alkaloid of Dendrobium pierardii". He also gave one of the plenary lectures at the 9th IUPAC International Symposium on the Chemistry of Natural Products, held in Ottawa, Ontario, June 24-28. His lecture was entitled, "The metabolism of nicotine in Nicotiana species". At the 57th Canadian Chemical Conference, Regina, Saskatchewan, June 2-5, Professor Leete gave two invited talks entitled: "Aberrant Syntheses in Higher Plants" and "Metabolism of Alkaloids in Plants".

Professor Rufus Lumry attended the Biochemistry/Biophysics Meeting, held in Minneapolis June 2-7, and presented his paper entitled "The Role of Protein Conformation and Charge in Enthalpy-entropy Compensation Behavior". He also attended the Gordon Research Conference on Water, which was held at the Holderness School, Plymouth, N.H. where he chaired a session primarily concerned with solute-water interactions. Dr. Lumry submitted an abstract, "Storage and Migration of Free Energy Via Bonding Defects in Protein Conformations; Importance in Function of Normally Variable and Abnormal Hemoglobins" to the First National Symposium on Sickle Cell Disease held June 27-29 at the National Institute of Health at Bethesda, Maryland.

Professor C. Alden Mead travelled to Munich, Göttingen, and Berlin, Germany, December 12-20 where he lectured at the Max-Planck Institut für Biophysikalische Chemie, Göttingen on "Das Prinzip des Zunehmenden Mischungscharakters: Grundlagen und Anwendungen".

Professor Victor G. Mossotti, lectured October 17 in Dallas, Texas on "The Information Structure of Analytical Chemistry" at the North Texas Section of the Society for Applied Spectroscopy and the Dallas Society for Analytical Chemistry. At the Hasler Award Symposium of the Federation of Analytical Chemistry and Spectroscopy societies on November 21, Dr. Mossotti presented an invited lecture, "Coherence in Flame Emission Noise Signals".

Professor Warren Reynolds gave a Chemistry Department seminar at St. John's University, Collegeville, Minnesota, October 16, and he presented lectures in March at Texas Wesleyan College, Fort Worth, Texas; Baylor University, Waco, Texas; and Cameron College, Lawton, Oklahoma.

Professor Donald G. Truhlar presented the following papers at the 1974 March Meeting of the American Physical Society, Philadelphia, PA., March 26:

1. "Monte Carlo Trajectories: The Reaction $\text{H} + \text{Br}_2 \rightarrow \text{HBr} + \text{Br}$ ", N. C. Blais and D. G. Truhlar, (joint contribution with Los Alamos Scientific Laboratory).
2. "Effect of Potential Energy Surface on Dynamic Effects in Endothermic Chemical Reactions and Product Energies in Exothermic Reactions", J. W. Duff and D. G. Truhlar.
3. "Ab Initio Effective Potentials for Use in Potential-

Colloquia, Conferences, Lectures, Seminars, Speeches, Symposia, (cont.)

Energy Curve and Surface Calculations", L. R. Kahn and D. G. Truhlar, (joint contribution with Battelle Memorial Institute). Dr. Truhlar served as chairman of the session on "Statistical Effects in Reactions" at the Conference on the Dynamics of Molecular Collisions held at the University of California at Santa Cruz, July 29 - August 2. On August 12 Professor Truhlar presented an invited talk entitled "The Effect of Variations in Potential Energy Surfaces on the Dynamics of Molecular Collisions" at the Gordon Conference on Atomic and Molecular Interactions, Wolfeboro, N.H. On October 23, Professor Truhlar presented an invited talk entitled "Vibrational Excitation of Molecules by Electron Impact" at the Twenty-Seventh Annual Gaseous Electronics Conference, Houston, Texas. A seminar entitled "Trajectory Studies of Threshold Energies and the Production and Utilization of Vibrational Energy by Chemical Reactions" was presented by Dr. Truhlar at the University of North Carolina, Chapel Hill, on November 5.

A POTPOURRI OF ACTIVITIES

Professor L. E. Conroy was appointed by the State of Minnesota Environmental Quality Council as chairman of its Advisory Committee on Power Plant Siting. The Advisory Committee must recommend environmental criteria for regulations and policies on power plant siting and the location of transmission line corridors in the state.

Professor Ronald Barnett was a principal participant in the recording of the forthcoming Man and Molecules radio program, "Cancer and the Cell Membrane", produced by the American Chemical Society.

In October, Professor Leete captured 4th place in the annual Land of Lakes Marathon, old man's division, in a time of 3 hours and 15 minutes. The course was four times around Bald Eagle's Lake. In February Dr. Leete was the winner of the Masters Mile, old men's division, in the Northwest Open Indoor Track Meet held at the University of Minnesota. His time was 5.09 minutes.

Professor John Overend held two exhibits of his water colours of urban scenes near the University. One exhibit was at the Theater in the Round; the other was at the Downtown Gallery.

LANDO SUMMER FELLOWSHIPS

The Lando* Summer Research Fellowship Program sponsored by the Department of Chemistry, was conducted for the first time this summer. The program was for outstanding undergraduate students who have completed three years of undergraduate study in chemistry or related fields. Students were selected in a national competition. Thirteen students were selected from 190 applications and participated in advanced research projects under faculty supervision in the Department of Chemistry. Thirteen students who participated the summer of 1974 were:

* The late Maximillian N. Lando was a University of Minnesota chemistry graduate (B.S., 1902) who left a large endowment to the University.

LANDO SUMMER FELLOWSHIPS (cont.)

<u>Student</u>	<u>School</u>
1. James Felser	Univ. of Santa Clara (Calif.)
2. Mary Jane Garry	Coll. of St. Catherine (St. Paul)
3. Craig Gochanour	Wisconsin St. U. (Eau Claire)
4. Kathy Helm	Depaul U. (Chicago)
5. Sandra Knott	Univ. of Nebraska at Omaha
6. Paula Kronebusch	Coll. of St. Teresa (Winona)
7. John Lechleiter	Xavier U. (Cincinnati)
8. Jeanne McHale	Wright St. U. (Dayton)
9. Sharon Nelson	Mt. Mary Coll. (Milwaukee)
10. Radley Olson	Ohio U. (Athens)
11. Ann Schwab	Butler U. (Indianapolis)
12. Matilda So	Barnard Coll. (New York)
13. Dennis Trevor	I.I.T. (Chicago)

The program will be held again in the summer of 1975 and interested persons who wish to nominate students should contact Professor L. H. Pignolet, Department of Chemistry, University of Minnesota, Minneapolis, Minnesota 55455, for the details of the program.

NATIONAL SCIENCE FOUNDATION - UNDERGRADUATE RESEARCH PROGRAM

The Department was awarded \$15,420 to conduct a summer research program for undergraduates. The program was directed and organized by Professor John E. Ellis. The successful proposal was written by Professors: Bryant, Ellis, Kreevoy, Noland, Overend, Pignolet, Reynolds, and Truhlar. The participants who were at Minnesota from ten to twelve weeks were:

<u>Name</u>	<u>College</u>	<u>Name</u>	<u>College</u>
Robert Smith	U. of M.	Merlin Bicking	U. of Wisc. - River Falls
Karen Weihs	U. of No. Iowa	Charlene Swanson	St. Olaf Coll.
Steve Hentges	U. of M.	Richard Bunce	Marietta Coll.
Gary Schmitz	Mankato State	Henry Woo	Macalester
Steve Anderson	Concordia Coll.	Noralane Morey	U. of M.
Steve Kantner	Macalester	Richard Partridge	U. of M.
Barbara Benson	St. Cloud State	Jean Merrick	Sioux Falls, Coll., S.D.

POST-DOCTORAL ASSOCIATES

In the following table are listed the persons who held post-doctoral appointments in the Department.

<u>Name</u>	<u>Institution</u>	<u>Graduation Year</u>	<u>Collaborating Professor</u>	<u>Funding Agency</u>
Gleason, William B.	Minnesota	1974	Britton	NSF
Kowanko, Nicholas	U of Adelaide	1956	Leete	USPHS
Veksli, Zorica	Zagreb	1967	Miller	USPHS & ACS
Hodgson, Philip K.	Cambridge	1974	Gassman	USPHS
Werness, Peter G.	Rice	1974	Lumry	USPHS
Yamashita, Kazuo	Kyoto	1967	Kolthoff	USPHS
Luh, Tien-Yau	U of Chicago	1974	Gassman	USPHS
Pranis, Robert	Northwestern	1973	Lumry	USPHS
Seamans, Lloyd H.	Minnesota	1971	Moscowitz	NSF
Carter, John V.	Purdue	1967	Lumry	NSF & ACS
Chantooni, Miran	Minnesota	1961	Kolthoff	NSF
Swanson, Douglas L.	U of So. Cal., LA	1973	Crawford	NSF
Mitchell, Robert D.	U of Iowa	1966	Wertz	NSF
Kim, Chin H.	Ohio State	1970	Mossotti	NSF
Bailey, Thomas F.	Colorado	1972	Gassman	NSF
Gregory, Thomas A.	Notre Dame	1971	Lipsky	AEC
Sugeta, Hiromu	Osaka	1969	Overend/ Moscowitz	NIH (Lab Medicine)
Amick, David M.	Wisconsin	1972	Gassman	NIH
Cue, Jr., Berkeley	Alabama	1973	Gassman	NIH
Etter, Margaret	Minnesota	1974	Gougoutas	Grad. School
Sawamoto, Hiromiti	Kyoto	1970	Kolthoff	USPHS

INDUSTRIAL GRANTS TO THE DEPARTMENT

The following industrial organizations have made grants to the Department for fellowships and unrestricted use. Faculty and students greatly appreciate this support, for without it many deserving and talented students would not be able to complete successfully their research programs. Industrial grants to individual faculty members are listed elsewhere.

The Camille and Henry Dreyfus Foundation Inc.	\$ 3,000
E. I. du Pont de Nemours and Company	7,500
Gould Foundation	1,000
The Lubrizol Foundation	1,000
Merck Sharp and Dohme	500
Minnesota Mining and Manufacturing Company	5,000
Uniroyal, Inc.	3,000
Amoco Foundation, Inc.	5,500

Research Grants to the Department

Graduate School grants to faculty members during Calendar year 1974 totaled \$37,405 and were distributed as follows:

<u>Name</u>	<u>Project</u>	<u>Amount</u>
J. Doyle Britton	Crystal Structure Determination by X-ray Diffraction	\$ 3,000
John E. Ellis	Chemistry of Metal Carbonyl Anions	1,200
Paul G. Gassman	Assist in Research Laboratory Establishment	20,000
Gary Gray	Anti-tumor Active Components of BCG Cell Walls	8,500
Edward J. Meehan	Chemical Applications of Light Scattering	1,705
John Overend	Infrared Spectroscopy of Surface Molecules	3,000

RESEARCH GRANTS (CONT.)

New grants to faculty members during Calendar year 1974 from sources outside the University totaled ~~\$648,048~~ and were received by the following professors:

676,048

<u>Name</u>	<u>Project Title</u>	<u>Granting Institution</u>	<u>Amount</u>
Robert G. Bryant	Chemistry of Metal Ion-Protein Interactions	USPHS	\$35,912
	Dreyfus Award	The Camille and Henry Dreyfus Foundation, Inc.	25,000
Sidney E. Buttrill, Jr.	Temperature Dependence of Ion-Molecule Reactions in Hydrogen	Jet Propulsion Lab	3,500
Bryce L. Crawford, Jr.	Infrared Optical Studies on Molecular Relaxation Process in Liquids	NSF	54,400
John S. Dahler	Kinetic Theory of Polyatomic Fluids	NSF	35,400
John E. Ellis	Undergraduate Research Program	NSF-URP	15,420
Paul G. Gassman	Vincristine & Vinblastine Derivatives & Models	USPHS	27,506
	Highly Strained Nitrogen Heterocyclics	USPHS	83,183
	Chemistry of Bent Bonds	NSF	61,300
	Matching Funds	NSF	16,000
	Postdoctoral Research Fellow - Cue	USPHS	3,000
	Postdoctoral Research Fellow - Amick	USPHS	3,000
I. M. Kolthoff	Polarography with Albumin & Cancerous Human Blood Sera	USPHS	25,457

RESEARCH GRANTS (CONT.)

<u>Name</u>	<u>Project Title</u>	<u>Granting Institution</u>	<u>Amount</u>
Maurice M. Kreevoy/ Harold S. Swofford, Jr.	Electrochemical Generation Ventron of NaBH_4		\$ 5,000
Rufus W. Lumry	Systems Approach to Protein Functions	NSF	44,000
	Matching Funds	NSF	8,000
	Molecular Details of Direct Water Participation in Protein, Membrane & Whole- Cell Function	ACS Fed.	75,000
Wilmer G. Miller	Measurement of Solvent Penetration in Thick & in Backed Rubber	ACS Fed.	6,270
Albert J. Moscowitz	Magnetic Circular Dichroism of Forbidden Transition in Organic Molecules	NSF	62,000
Victor G. Mossotti, Jr.	Information Structure of Analytical Flames	NSF	24,900
Wayland E. Noland	Unrestricted	Hoffman-LaRoche Co.	3,000
Stephen Prager/ T. E. Hutchinson	Permeation Through Monolayers & Thin Films	NSF	50,300
Frederic A. Van-Catledge	Spectroscopic Studies of Homoconjugated & Quasi- Conjugated Hydrocarbons	ACS Fed.	8,500

PLACEMENTS OF GRADUATES FROM THE GRADUATE CHEMISTRY PROGRAM

On the following pages is a compilation listing students who obtained their graduate degrees during 1974 as well as the title of their theses and the names of the advising professors. The position which the student obtained after graduate is also indicated.

DEGREE	NAME	DATE REC'D	THESIS TITLE	ADVISER	POSITION
Ph.D	Hassid, Aviv	7/74	Acid Catalyzed Hydrolysis of Diphenyldiazomethane Derivatives and the Relation Between Rate and Equilibrium Constants	Kreevoy	University of North Carolina Department of BioChemistry
Ph.D	Tien, Chao-Fong	7/74	Syntheses and Conformations of Polyphenylazetidines	Dodson	College of Pharmacy University of Minnesota
MS	LaBoda, Mark	8/74	The Average Dipole Moment in Excited Vibrational States	Overend	Dow Midland, Michigan
Ph.D	Lin, Juei-hua	8/74	Vibrational Anharmonicity in Cyanogen Flouride	Overend	Honeywell Twin Cities
MS	Wallace, Edwin	8/74	The Reaction of Carboxylic Acid Anhydrides with Cyanide	Fenton	University of Minn Department of Plant Pathology
MS	Abdallah, Joseph	12/74	Studies in Electron Atom Scattering	Truhlar	Computer Sciences Corporation Silver Spring, Maryland
Ph.D	Carver, Richard	12/74	The Synthesis and Biosynthesis of pinidine	Leete	Dept of Med. Chem University of Wisc., Madison
Ph.D	Erdmann, Duane	12/74	The Effect of Particle Size on the Refractive Index of Lead Sulfide Hydrosols	Meehan	DuPont Rochester, N.Y.
Ph.D	Etter, Margaret	12/74	Solid-State Chemistry and Crystallography of the Two Polymorphs of 1-Methoxy-1,2-Benziodoxolin-3-one	Gougoutas	postdoc University of Minn Department of Chemistry

DEGREE	NAME	DATE REC'D	THESIS TITLE	ADVISER	POSITION
Ph.D	Gleason, William	12/74	Dinitroxides and the Point Dipole Approximation	Borch	Instructor Carleton College, Northfield
MS	Jachimowicz, Anthony	12/74	Non-dissertation master's degree	Mossotti	University of Minn Law School
Ph.D	Kim, Kangjin	12/74	Low Energy Electron Impact Spectra of Some Saturated Hydrocarbons.	Lipsky	Radiation Laboratory University of Notre Dame
MS	Louters, Laurence	12/74	Biosynthesis of Azetidine-2-Carboxylic Acid	Leete	EC School 7600 Macon Road Cordova, Tennessee 38018
Ph.D	Madhusoodanan, Sunder- esan	12/74	The Rearrangements of cis- and trans-2-4-Diphenylthietanel,1 Dioxides	Dodson	College of Pharmacy Medicinal Chem University of Minn
Ph.D	Numrich, Robert	12/74	Interaction of Ionic and Covalent Configurations for Sodium Hydride, Potassium Hydride, and Magnesium Monohydride Cation	Truhlar	Department of Chemistry U of Cape Coast Cape Coast, Ghana, Africa
MS	Patel, Harilel Laljibhai	12/74	non-dissertation master's degree	Noland	Environmental Research Corporation
MS	Sirvio, Larry	12/74	Amidino Nitroxides: Potential Spin Labels	Barnett	3M St. Paul