Dedication of Kolthoff and Smith Halls
University of Minnesota June 2, 1972

THE CHANGING SHAPE OF CHEMISTRY

Professor Max Tishler:

We are witnessing here tonight fulfillment of a dream got some time ago, the climax of a long period of planning, building, and renovation of two halls of learning dedicated to chemistry. This ceremony and the festivities to follow were conceived and implemented by the people of this University to give highest honors to two great men, Izaak Maurits Kolthoff and Lee Irvin Smith. These dedications are fitting tribute to these two great teachers and researchers whose wisdom, vision, and understanding have contributed so much to the greatness of this University.

I deeply appreciate the opportunity to be here today and to participate in this dedication. I come in humble spirit and bring to Izaak Kolthoff and to Lee Smith a tribute from the chemical community they have helped to build. And as president of the American Chemical Society, I also bring to them the greetings and best wishes of our membership and the board of directors. And to talk to Malcolm Moos, president of this University, I bring you thanks from the American Chemical Society for your confidence in the future of chemistry and for honoring two of our most distinguished members.

There is also a very special reason for my wanting to be here today, and I hope you'll forgive me for injecting a very personal note into my remarks. Lee Irvin Smith has been an old friend of my family for over 30 years. We shared with him many of our personal experiences; he gave our family the warmth and joys of friendship. And in those days when I worked on the bench as a chemist for Merck and Company, Lee taught me a great deal about research. As you know, he is a gifted and spirited teacher. I also learned from him humility and the importance of being a human being. His wisdom in technical matters was a beacon in the development of my own career. I regret that Lee did not feel well enough to be here on this special occasion. However, I did enjoy a very pleasant visit with him in his home and had lunch with him.

As I thought of this ceremony and what I should say, I found myself thinking of the trust and the responsibility society places on us whenever we dedicate halls of learning like these. To each of us, this dedication should be a reaffirmation of our belief in the institutions of higher learning, of our hopes that those who came here to seek knowledge will attain noble achievements for society, and of our trust in the faculty who will give life and purpose to the steel and stones that make up these beautiful edifices.

There are many here, I'm sure, who regard these halls of chemistry as the body of the environment where a gifted student will be inspired and go on to make a contribution that will take its place among the landmarks of science. I share this dream with those who hold it and hope that great chemists will be born within the walls of these buildings.

But just now, we should also be concerned with the thousands of science majors who will pass through these buildings to careers in the physical sciences. We should also be concerned with the thousands of undergraduates who will also venture into these halls of chemistry in the process of learning how to become educated men and women before they become lawyers, physicians, manufacturers, politicians, and finally with the countless number of students who will never enter these buildings, but yet will go on to positions of responsibility in society and become involved in making decisions on the use of science for the welfare of mankind.

We must be interested in what happens to all these young people--the science and the nonscience majors, those touched and those untouched by science during their studies on this campus. For attached to study in this and other universities is the inescapable responsibility to shake the world. Whether the young people who pass through the gates of our colleges want to accept or are capable of accepting the responsibility makes no difference. Either by design or by default, whether they like it or not, they will become the leaders and the pace-setters for the political and social progress of our nation. We need to remind ourselves constantly of the role of institutions of higher learning in fashioning the welfare of our nation and to reassess from time to time their methods and objectives.

With this concept in mind, let me remind you what has happened to science since the early 40's. We have set up on the campus, largely with government funds, a system of research which accumulates knowledge at a furious pace--so fast that many elements of society, government, and even the scientific community themselves, are all bewildered. We had expected, with large expenditures of public funds, to buy growth for our economy, military containment of our "enemies," the conquest of space, the conquest of disease, a longer life, and, more recently, control of our environment. With this commitment to science by all sectors of our society--government, industry, and the university--we have created the greatest research and science education organizations the world has ever known.

That research can be harnessed for the benefit of industry and our economy was a new concept and did indeed add new dimensions to our growth as an industrial power. Scientific research, long the exclusive province of the universities, had extended from the campus into the laboratories of industry. Scientists learned that the new home in industry could be congenial and stimulating and could also provide a new sense of fulfillment based on satisfying human needs through the fruits of research. This growth of research in industry was neither accidental nor whim of management. Research was productive--it more than paid for itself--and the chemical industry was a major pioneer in building its own research laboratories and in manning them with its own people. Since chemistry is involved in so many technologies, it pervaded many other industries such as the automotive and the computer industries, where countless chemists were brought into the research and development laboratories.

Now during the same period, we witnessed an enormous growth of our universities. The Eisenhower administration, stimulated by the concept that survival for us as a people depended on our capacity as a scientific nation, pursuaded our universities to place very high priority on educating men and women for careers in science and research. The very concentration of turning out professionals in science had caused us to neglect the peril and necessity of turning out laymen who could understand what the professionals were up to.

While there were warnings against this vast shift in objectives of the university, they went pretty much unheeded. John W. Gardner, formerly Secretary of Health, Education, and Welfare, and founder of Common Cause, pointed out in his book In Pursuit of Excellence, "There is a danger of training scientists so narrowly in their specialties that they are unprepared to shoulder the moral and civic responsibilities which the modern world thrusts upon them." He went on to say that "just as we insist that every scientist be broadly educated, so we must see to it that every educated person become literate in science. In the short run, this may contribute to our survival. In the long run, it is essential to our integrity as a society."

Events of the past few years have demonstrated the wisdom of these prophets, for just as quickly as our star ascended, beginning with Sputnik, the world for the scientist turned upside down. To our distress, we found that many people from government, students, faculty of our universities, and distinguished leaders of the lay public and even of the scientific community had become disenchanted and disheartened with science. Today, scientists feel a bit nettled because they hear no praise about their accomplishments, but rather they are blamed for many of the ills which plague society--for threats posed by nuclear, biological, and chemical weapons, for the contamination of earth, air, food, and water. Somehow, the enormous contributions of science and technology to human welfare seem to have been forgotten.

And on our own field in chemistry, the impact has been violent. Funds for education programs in chemistry have declined sharply, real dollars for research and development in universities, and even in industry, have become critical. In less than three years, chemistry as a profession plummeted from a shortage of chemists to a shortage of jobs. For the first time in my recollection, the feeling of insecurity is sweeping across the chemical community, and cries for limiting the training of chemists are beginning to be heard. There are many, including directors of research, even in corporations, and many distinguished academicians who seem to have lost considerable confidence in the future of chemistry and in what it can yet do for society. The layoffs of chemists in industry, in the university, and, in fact, in nearly all areas where chemists are employed, has evoked a demand on the part of the membership of the American Chemical Society for a greater involvement by the society in the welfare of chemists. In fact, there are some distinct cries for unionism.

Chemistry departments of the universities, being the well-spring of chemists, are confused by the clamor of chemists, by the shortage of research and teaching funds, by the cries of relevance, and by the critical glances of industry. The criticisms leveled at the universities are concerned largely with the so-called indifference of the university to the needs of industry and society as a whole. Many distinguished chemists agree with the concept held by many that faculty members, in training their graduate students, tend to produce scientists in their own image and are still trying to provide chemistry students with training of a kind best suited for producing Nobel laureates rather than equip them for the problems of today's world. In their view, what the student needs today is a blend of competence that will allow him to function well not merely as an academician but in more practical jobs as well.

While I'm sympathetic with these views, they are not convincing to me. Having spent over 30 years in industry and the last two years in the university, I'm beginning to believe that it's not so much what is or is not taught in universities, but rather how it is taught.

University research during the past 10 years has increased enormously the knowledge and understanding of chemistry. In fact, the jump in knowledge level has been so great that I believe those who completed their doctorate studies 10 years ago would have difficulty competing with the fresh Ph.D.'s of today unless they're able to keep abreast of new knowledge on a broad basis. The ability of new doctorates to predict reactions, to determine with dispatch the structure of an absolute configuration of complicated molecules, and to synthesize all kinds of natural products is astounding. In my view, companies are committing a serious error in their long-range planning if they don't hire at least one fresh Ph.D. each year to maintain a continuum of new knowledge.

However, there is a serious criticism that can be leveled at the university and its training of chemists, and that is its concentration on scholarship without regard for the impact that chemistry has on society. During the affluence of the past two decades, departments of chemistry became isolated from society and particularly from industry. Research and teaching of chemistry became an exciting intellectual cult. There was little stimulation to teach students the place of chemistry in our economy or to direct their careers toward making something useful out of chemistry. Careers involving application of chemistry to problems in our economy and positions as chemists in the laboratories of industry came to be regarded as second rate, to be entered only if one had neither the capacity nor the opportunity to become an academician.

It is now clear that the universities must become much more involved in teaching what chemistry has done for man's welfare and give to students an understanding of the chemistry related to these achievements. Students must be made to feel that jobs in industry based on chemistry and all its facets can be equal to the best of university posts in dignity, excitement, challenge, and satisfaction.

Now whenever I think of the future of chemistry, I find myself optimistic. The situation we are facing today--unemployment--I believe is a result of too rapid a growth of chemistry as a profession and of the general turmoil of our times. No one can really believe that chemistry in the university, in government, and in industry is in jeopardy and that chemistry as a science has passed its greatness because, as some have put it, all the important things in chemistry have already been done. The present apprehension to me is reminiscent of the outlook in the late 30's, and had we, in 1937, to predict the future of chemistry, we would have failed miserably.

Could one have predicted in 1937 space travel, moon walks, nylons, nuclear power, polyethelene, television, synthetic rubber tires, or jet planes? Or in my own field, the pharmaceutical field, could one in 1937 have guessed the availability of synthetic vitamins on a very large scale, the sulfa drugs, the tranquilizers, the antibiotics, oral polio vaccine, gamma globulin? And when I think of the scarcity of jobs for chemists in today's environment, I find myself going back to the gloom and the despair of the 1930's. No one--and I remember those days very well--could have predicted that in the next 30 years we would see the largest upsurge in chemistry, the greatest impact of chemistry on society, and the most tremendous need for chemists that the world has ever experienced. Having lived through all of this, I have inordinate faith for the future of chemistry and of its chemists.

I speak with such optimism because I believe the world will need more research and better technology if it is to support the demands of the year 2000. If life for all people of all nations is to be better tomorrow than it is today, we shall require more science-based technology and not less. If we are to meet our commitment to raise the standards of the people now living under substandard conditions in this country, and in all nations around the world, we shall need many, many more researchers and technologists and not less. There simply is no other way we can go toward the year 2000. Science is the only instrument by which man can make these dreams come true.

Very recently, the nation's first Presidential message on science and technology went to Congress, affirming much of the philosophies held by the scientific community. Perhaps one of the long-lasting impacts of this message is its recognition of science as a national asset. Let me quote from an editorial in the April 29 issue of Science, written by Dr. Edward E. David, Jr., science adviser to President Nixon. "The message is a landmark. It represents the foundations for a coherent science policy for the United States and a clear-cut recognition that science policy is an integral part of our overall national policy. It states clearly that we as a society require more rather than less technology to improve both our standards of living and quality of life."

For the first time, goals for science and research will be assessed and secured, and under these policies, discovering what can be done will not be enough; research and development will be focused on what needs to be done. The message, therefore, is of great consequence. New areas for governmental financial support will be tied into the concerns of our nation such as energy, transportation, environment. The new thrust of research and development will be directed toward a solution of problems that threaten our welfare and our ecology. The message is strongly pro-science and pro-technology and recognizes that one can't restrain scientists in their search for knowledge any more than Einstein could have been stopped from establishing his famous equation $E = mc^2$.

Notwithstanding the intent of this new national policy, however, a word of caution is essential, because tying basic research into national goals has the seeds to limit it in areas concerned only with the achievement of national objectives. A national science policy must clearly recognize basic research in terms of repaying the debt to learning. It is my conviction that our capacity to discover new benefits for society through research and development is rapidly falling behind our accumulation of basic knowledge. In the past 40 years, discovery and invention have occurred at such a high rate that we are beginning to exhaust that we had once believed to be an inexhaustible fund of basic knowledge. Therefore, when we speak of support of basic research, namely the search of new basic knowledge, let us be sure that this kind of research is unfettered and unstructured and not necessarily tied into specified national goals.

We must continually keep asking ourselves the following questions: 1) To what source of intellectual activity shall we look for new basic concepts? In other words, from whence will flow new discoveries and inventions? 2) Can we be sure that the organization of science on the basis of national goals will bring forth such fundamentals as a quantum theory, Gibbs' phase rule, the theory of relativity, antibiosis, antimetabolites, and the molecular biology of the gene? Where shall we find such scholars as Einstein, Stanley, Fermi, Schrodinger, Pauling, Krebs, Hodgkin, who have made a permanent imprint on discovery and invention? Do we dare to tamper with the system that has produced such giants of science?

These questions tell you why I'm concerned with the concept of tying basic research into national goals. So much of what we know came from scholarship and learning in the most classical sense. We now need to revitalize this well-spring of new knowledge and give it once again dignity and broad-scale support.

This is why I find myself coming back to the debt that society owes to learning. And here I come back to the cradle of research, to the natural nuturing shelter of our freedom of inquiry--the universities and the colleges of this country. As yet we have no substitute for the halls of sciences such as Smith Hall and Kolthoff Hall. The future of the university is the future of the people. For without scholarship, society, and particularly this nation, will be unable to sustain its capacity to discover.

This is a proud, yet humbling occasion for Izaak M. Kolthoff and for Lee I. Smith. We came here to tell them our hearts are brimming with joy for the honor the University has bestowed on them. We wish them happiness in the years ahead, knowing their hearts are in these buildings and that their names and spirit will inspire faculties and students who will occupy these buildings. We are also here to honor and to praise their university, not for the journey of the past but for its faith in the journey ahead.

As we place these edifices at the disposal of the generations of students to come, our thoughts should turn to guiding principles that are indispensable to their welfare. They are as simple as they are demanding.

First, the university must be mindful that these halls of chemistry were built not as temples to commemorate victory of knowledge, but as places to do battle against the burden of ignorance, and in this spirit it must destroy the false concept engendered on many campuses that scientists and engineers--science and technology--are responsible for the ills and inequities in our society.

Second, the university must teach chemistry with a sense of social responsibility and create educated men and women in John Gardner's definition--namely, that every educated person be literate in science and every scientist broadly educated.

Third, the university must continue to provide our faculty and students a climate of freedom which will encourage them to follow scholarship wherever it will take them.

Fourth, the university must attack with vigor the problem of better understanding and cooperation with industry. It must introduce courses which will demonstrate the usefulness of chemistry to society and develop a high esteem for chemistry as an essential basic discipline in our economy.

Fifth, departments of chemistry should introduce better courses designed for education of those who are not soliciting chemistry as a career, but who need to be literate in chemistry. And chemistry must do more in servicing other disciplines and other departments as well.

Sixth, departments of chemistry must assume greater responsibility in problems of waste disposal of chemicals. Chemists, through the manufacture and use of chemicals, have created severe environmental problems, largely because chemistry faculties never concerned themselves with the environmental hazards of chemicals and how to prevent them.

Seventh, the chemistry departments of the universities must expand their activities in the continual education of chemists. The extension-type program like the one at the University is a major step in the right direction. However, universities must convince industry of the need to bring education into the chemical laboratories in industry as a means of preventing the costly phenomenon of obsolesence of its technical people. This is a useful and a natural opportunity for the University.

We could go on and lengthen this list, but all this means that our times and the years that lie ahead demand innovation, not only in chemistry but in all things and in all institutions. We need innovation, and human perspectives, and human relationships, and ways to raise the standard of living of all people, and ways to overcome the depletion of natural resources, and ways to remedy social and political inequities. Chemistry is vital to societal innovations, and more than ever, a major reorientation of the curriculum of chemistry is essential to meet the enormous needs of the future.

Let me say in closing that I am hopeful for the future. I think that we as people, as a nation, and as a community of nations, are at last beginning to understand the warning signals of an era that is on us. And if we listen carefully to the protests of youth, we must conclude that they may have found the will not only to correct our mistakes, particularly those our generation has made, but to build a better world with the tools we passed on to them. I believe with all my heart that they will do this. But the university must so educate its men and women that the main fruits of that education will be, as once described by Robert Maynard Hutchins, "An intellectual discipline that fits a man to solve new problems as they arise, to grasp new facts as they appear, to meet new needs as they present themselves, and to remold the environment to make it conform to the inspiration of the human spirit."

END OF SPEECH

IZAAK MAURITS KOLTHOFF

Professor David N. Hume:

It's an interesting challenge to be asked to summarize the significant achievements of Pete Kolthoff in 15 minutes. I am not sure that I shall, but I shall try.

The biography, of course, is well known--some of it is in the program. Everyone knows he was born in Holland and educated there, got his Ph.D. in Utrecht in a remarkably short time, and there followed a meteoric rise to

spectacular fame in the field of analytical chemistry. In 1927, when he made a lecture tour of the United States, the University of Minnesota was smart enough to spot a good thing and promptly appoint him, ignoring all the usual intermediate steps, professor of analytical chemistry, professor of physical chemistry, head of the Division of Analytical Chemistry of the Department of Chemistry, and kept him here right through some ten years beyond his retirement.

Professor Kolthoff is renowned. If one seeks to put one's finger on what the renown is, one finds that it takes more than two hands. First of all, he has been a prodigious research worker--there is a certain fascination in the mere numbers of it. Before he got his Ph.D., he had published 33 research papers. This didn't, evidently, result in any slighting of his thesis, because he got another 19 out of it alone. By the time, as a man in his early 30's, he came to Minnesota, he already had three times as many papers as most highly productive chemists have in their lifetimes. I made a recent estimate of 865 total--this is certainly on the low side, because I know I've missed some--together with however many you want to count in books, but let's say 11 as a nice round number. What this means is that he has on the average per year published 11 research papers. Most of us feel we're doing very well when at the peak of our productivity we have an 11-paper year. He has averaged 11 from the day of his birth to 10 years after his so-called retirement. Now, to produce, in order of magnitude, more publications than ordinary mortals is quite an achievement, but it is not his greatest achievement. After all, that's merely a superhuman achievement and not necessarily important.

If we look at the publications, we discover first of all that they are very broad, for he is an outstanding specialist in not only one or two, but at least half a dozen fields--to lump a number of them together for brevity: classical analytical chemistry, electroanalytical chemistry, colloid chemistry, emulsion polymerization, nonaqueous solvents. These are sub-disciplines so sufficiently apart that many of the experts in them claim that they can't communicate with the experts in the other fields.

And if one looks at the quality of the papers, because quantity is by no means everything, one is astonished. I note that since his so-called retirement, Pete has continued to produce papers of a breadth and a quality and in such quantity that had he been starting as a young assistant professor when he retired, he would now be clearly eligible for tenure.

But breadth and quality are not all we have here. This is still not what is, in my mind, the really great contribution he has made. We have to look back to what chemistry in general and analytical chemistry in particular were like at the beginning of the Kolthoff era. The analytical chemist then was more, perhaps, an artist than a scientist--an extremely skilled practitioner--but he usually didn't know much about the theory. For that matter, neither did anyone else; much of the theory just hadn't been discovered yet. There was a beginning of the transfer of physical chemical theory to analytical chemistry, a recognition that the theoretical principles did indeed have bearing. But Pete Kolthoff, more than any other individual, combined the two and made them an organic unity. His motto has always been "theory guides, experiment decides." And he has combined the theory, developing it when necessary, with the practice in a manner which lays the proper course, I would say, for everyone. There is no compartmentalization there.

If we look back to the chemistry of his young days, we discover that there are a lot of things we take for granted which we perhaps shouldn't. The young people of today assume, sort of naturally, that there always was air-conditioning in the summer, there always were antibiotics when they got sick, there always were jet planes to take them hither and yon, and they don't realize that just a few years ago we had to get along without those things. Well, we take it for granted that Ph was always a useful tool, that basic physical chemistry was known and clearly understood, that we could do the things in chemistry that we wanted to. But if we look back to those days, we find that it wasn't so, and it's simply astonishing to see how many of the everyday fundamentals that we take for granted were either created or recreated in the work of Pete Kolthoff.

Take this matter of Ph acid-base titration--the use of indicators with understanding, that is--the use of electrodes for measuring Ph. This was virtually undiscovered territory when he published his first paper in the field. And his characteristic approach in that field, as well as in half a dozen others to follow, was to tackle the fundamentals, find out what the theoretical basis is, get it straight, explain it so that other people could understand it, and then apply it, improving old methods, developing new methods, ending up with a workable, integrated, fairly tidy but by no means complete body of science, and to characteristically write the definitive monograph on the subject and then keep it up to date with a succession of later editions. This was true in that field, in iodometry, in much of electrochemistry. Now, conductometric titrations was one of the very first of the instrumental titrations. Guess who did a great deal of the early work on it? Guess who wrote the definitive monograph which was published, I believe, in 1923, wasn't it? It is still pretty good. I mean, the hardware is out of date, but, by golly, the chemistry is there, and it still is a good place to look to see if it can or can't be done for a given system.

I could go on and on, but I'm not permitted to, describing a similar situation in other areas, not only of analytical chemistry but such things as branches of physical chemistry and even colloid chemistry. Pete is an authority on emulsion polymerization, which is something most of us keep discreetly quiet about if it's mentioned because we just don't know anything about it. Pete, more than anyone else, changed the whole style of analytical chemistry from emperical practice to an approach based on sound physical-chemical principles and careful research. This alone would give him a place in the Hall of Fame, but there is more yet.

In addition to everything else, Pete has always been an outstanding teacher. He has it clear in his own mind, he can express it clearly in a variety of languages, and he does and he gets it across to his students. The monumental so-called elementary textbook by Kolthoff and Sandell, now by Kolthoff, Sandell, Meehan, and Bruckenstein, was indeed a landmark in education. Here was a textbook which was not a collection of traditional recipes. It was an exciting introduction to what was going on now, how you do things the way they're done, who did them. It had footnotes with current literature references. How many elementary textbooks go beyond suggested readings in secondary sources at the end of the chapter? Nobody but the

proofreader ever reads those. But in Pete's textbook, the student immediately gets the feeling of 'Here I am, doing something which is still alive, still growing, and I am being taught by a man who had a finger in practically everything in the book." Nowadays, we take it more or less for granted that books ought to be somewhat like that, at any rate, follow the pattern. It was not always thus; Pete changed it.

Dr. Tischler spoke of the changing basic chemistry; we're in the presense of a great changer. To say that he placed his mark on the profession of analytical chemistry is a great understatement. He changed it radically. More than any other person, he transformed analytical chemistry from a rather unimaginative, conservative art to a dynamic, innovative science. He swept the profession along with him, and I'm happy to say, passed momentum on to his students. So widely is his style of approach now used that again we tend to take it for granted. And we forget, if we ever knew, what the source was.

But if you think I have been exaggerating, go back. Read his research papers, his monographs, and his textbooks, and compare them with those of his competition in the 20's, the 30's, and the 40's, and it's plain to see who the leader was. Today we do him honor by naming a building after him. There is another honor being done: we are honoring our alma mater by placing his name on her building. For thereby, generations of students to come will be reminded that the great things which he did were done here at the University of Minnesota.

Pete, I want to end on a personal note--I might say a collective personal note--I'm speaking for everyone now. The Kolthoff years at Minnesota were a marvelous period for young analytical chemists. I know I speak for all your former students and co-workers in saying that it was a privilege for us to work with you, to draw upon your wisdom, to respond to your enthusiasm, to savor your rare qualities as a human being, and to enjoy your friendship. We have here a little momento of the occasion, and I would like to present to you, on behalf of all of us, a little collection of greetings, congratulations, and well wishes for all you have done for us.

LEE IRVIN SMITH

Professor Robert B. Carlin:

In talking about Lee Irvin Smith today, I shall try to set the focus on those of Professor Smith's qualities and achievements that identify him as Lee Irvin Smith, not to be confused with anyone else--and anyone who knew him never confused him with anyone else. It's only fair to add that this effort is based on my own observations made at close range for a period of approximately 6 years and then for 30 years more with increasing comprehension and understanding, though from a more remote post. The impressions and appraisals, then, are my own. Where I am in error, only I am to blame.

First to be considered is Lee Irvin Smith, scientist and scholar. The bare bones of his achievements in this area are his published research papers, and they, of course, have their own story to tell. His major efforts were directed to the chemistry of the polyalkylbenzenes and the acids in rearrangement, the reactions of clinomes with metallic emolates, and--probably his crowning research achievement--the chemistry of vitamin E, and cyclopropane synthesis, structure, and properties. All of these and a number of shorter-term ventures in the other areas of organic chemistry are a matter of published record. These investigations might have been undertaken by almost any of Professor Smith's contemporaries, but they would not have been conducted by anyone else as he conducted them.

A careful reading of his published work discloses much more than just the imagination you can see in these investigations and the accumulated knowledge and skill required to carry them forward to a satisfactory conclusion. To my mind, the quality that sets them apart is the passionate insistence on excellence of method and scrupulous attention to accuracy in every detail. Lee Irvin Smith didn't publish until he was satisfied that the work which he was committing to the record was done not just adequately, but elegantly. When Lee Smith published it, it was as he said it was, and the work would be repeated in any laboratory of organic chemistry.

The same passionate devotion to excellence characterized his teaching both in and out of the classroom. His reputation in the classroom was unrivaled, first, because he had a priceless gift for communicating, to even a large class, not only his encyclopedic knowledge of organic chemistry, but also, and most important, the fascination it held for him. He prepared for every classroom lecture with the same driving thrust of perfection that characterized all of his activities. An hour before he was scheduled to appear before a class, he shut himself away with his notes, always on five-by-eight cards, for final concentrated preparation. Any student incautious enough to intrude on these periods of preparation experienced the full force of the legendary Smith wrath. And a generation of students came and went before anyone committed this misdeed again.

Lee Smith once told me that he had never faced a class before beginning a lecture without suffering stage fright. He gave his students only the best that he had to offer, and he demanded that they give him their best in return. It was a rare student who failed to respond.

To his role as supervisor of predoctoral thesis research and postdoctorate research, Lee Smith brought the qualities that made him outstanding as a scientist, as a teacher, and as a decidedly mortal, but nevertheless superior, human being. He liked to give his students plenty of room to use their own imagination and ingenuity in their approach to the solution of a chemical problem. But he insisted on diligence in pursuit of the objective, on scientific fidelity of the highest order, and above all of this, on a certain style and elegance. Like Vince Lombardi, Lee Irvin Smith knew the young men and women who were members of his team, and he would tolerate from each nothing but the best performance of which he was capable. Also like Vince Lombardi, Lee Smith could register his displeasure of a slovenly performance in terms that left the hair singed and the skin reddened. When this experience befell me, I knew I had it coming, and I was also sure I didn't want to suffer that searing blast again.

Lee Irvin Smith recognized the vital and delicate relationship between the training of graduate students and the scientific work proper training produces. He never lost sight of the fact that as a professor his primary product was trained men and women. Research was an important and even essential by-product, but a by-product nonetheless. He understood that if a professor does a proper job of training his graduate students, good research will be produced. But the converse is by no means necessarily true. Professors can, and unfortunately sometimes do, bring good research from graduate students without training them properly.

I am not and have not been in the position to know at first hand and in detail all the contributions that Lee Irvin Smith has made for the betterment of the university. By the accounts of others, I know the list is long and imposing. I was privileged, though, to be present as an undergraduate and then as a graduate student during the time the department was emerging from comparative obscurity on its pathway to renown. I think that all of us who were on hand at the time recognized the process and perceived in its midst the figure of Lee Irvin Smith, who knew what a fine department was and how to build it, and who persuaded and cajoled, led and drove his colleagues, students, and administration, until the amorphous mass crystallized into the shape of greatness.

He wanted his students to be excellent even in their pursuit of fun. If they went out to get drunk, they should do so gloriously and with style.

Finally, in my opinion, Lee Smith's most remarkable gift was his ability to convey all the priceless components of his approach to his profession and to living without talking about them explicitly. He didn't lecture about the pursuit of excellence; he didn't preach about indispensability of highest standards of personal and professional ethics and conduct. For the most part, he conveyed his standards by the example of his own scrupulous and self-disciplined adherence to them. They were so deeply embedded in his character that he seemed not even conscious of it. He may, therefore, be unaware to this day of his subtle and priceless capacity to communicate these indispensable habits of mind and character.

And so it seems to me most exquisitely appropriate that these ceremonies are being conducted in this building, rich as it is in the department's traditions and history, much of which was wrought by Lee Irvin Smith. Some will tell you that even its physical atmosphere continues to contain traces of his clinomes.

In any case, to many of us and I think to all of us who emanated from 490--and I think emanated is the right word--this building has long been Smith Hall. We congratulate the University on its decision to give this name the formal recognition it so richly deserves. Thank you.