NATIONAL ACADEMY OF SCIENCES

JACK GORSKI
1931–2006

A Biographical Memoir by
R. MICHAEL ROBERTS

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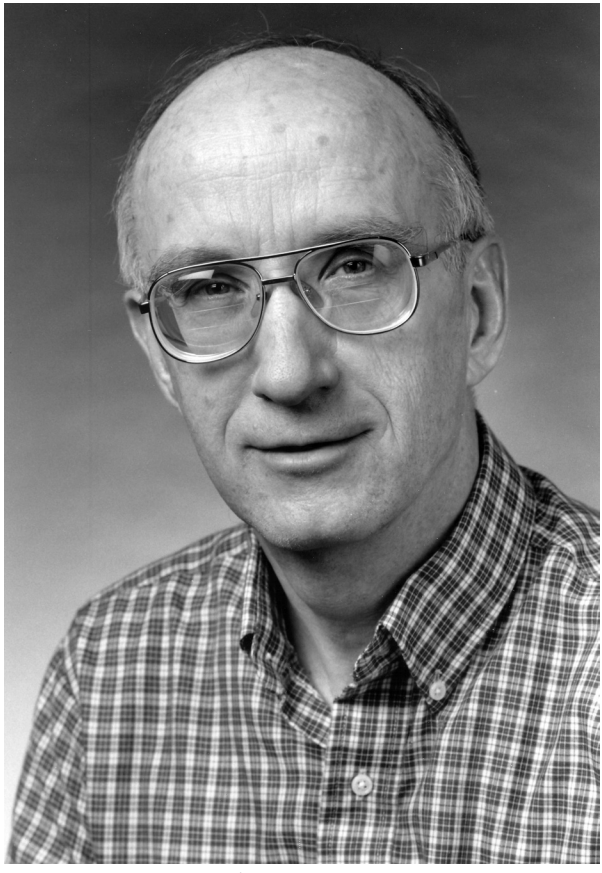
Biographical Memoir



Jack Gorski

JACK GORSKI

May 14, 1931–August 30, 2006

BY R. MICHAEL ROBERTS

Jack gorski was born in Green Bay, Wisconsin, on May 14, 1931, but grew up in Milwaukee. His father, a tailor by early training, was brought up in Poland and came to the United States in his late teens. Jack's mother was also of Polish extraction, though born in the United States. Together his parents ran a small clothing business, which fell apart during the Great Depression. Subsequently Jack's father worked for other clothing firms but never went back into business for himself. His mother was largely a homemaker but during World War II worked for an agency that ran the induction center in Milwaukee for soldiers entering military service. There were no scientists in the family. Jack's eldest brother, Hugo, became a photographer for the *Milwaukee Journal*. His second brother, Richard Michael, an artist, earned an M.S. degree and was for a time chair of the Arts Department at Northern Michigan University. Jack, unlike his brothers, appeared not to have shown artistic gifts or, while in high school, great academic promise at all, despite reading widely. He graduated at around the 33rd percentile of his class with, according to him, "a very spotty record." He had, however, begun to acquire an interest is science through exposure to agriculture, somewhat surprising for a suburban boy with no agricultural roots.

Jack had an aunt and uncle who had a farm and a livestock buying and selling business in northern Minnesota outside Duluth. During the war when he was in his early teens, he would spend time in the summer working on the farm. Later he was encouraged by his father to work on a farm closer to home. Together these experiences led to a growing interest in the cattle business. He started going to the public library to read college textbooks about cattle breeding and nutrition, which became the basis for his interest in science. Jack's choice of college was an applied agriculture school, the California Polytechnic College in San Luis Obispo, California. He did all agricultural activities that most dedicated animal science majors do, such as joining the judging team. He was obliged to find a job to pay his way through school, working 35 hours a week, milking cows three times a day seven days a week for the college dairy herd, and simultaneously managing to carry a full academic load. According to Jack, this schedule "kept him out of trouble." Between milking cows and going to school there was little time for anything else, but for two years he did get to explore California, for which he developed a "special fondness" that lasted his lifetime. His fondness also extended to dairy cows, which Jack continued to own, show, and judge until close to the end of his life. This passion was highlighted by his triumphant ownership of the grand champion Jersey cow at the 2002 Wisconsin State Fair.

After two years, he decided to return closer to home to finish a bachelor's degree in animal sciences at the University of Wisconsin in Madison, where he graduated in 1953. Then, as now, the University of Wisconsin offered a broad extracurricular education in active politics, which in Jack's case included membership in Americans for Democratic Action and attending a range of political meetings. At one of these he met his future wife, Harriet Fischer. He also became

increasingly "hooked on biochemistry," a discipline he felt could be used to address a range of applied agricultural problems. When he graduated with a B.S., Jack toyed with the idea of going to a college of veterinary medicine, but he lacked the financial resources. It was during the Korean War, and he tried to enlist, but his eyesight was so poor nobody wanted him. As an alternative he did what so many rather aimless but talented young persons choose to do: he decided to go to graduate school and picked the agriculture program at Washington State University to complete a degree in animal sciences.

GRADUATE TRAINING AT WASHINGTON STATE UNIVERSITY

Jack went out to Pullman, Washington, in the fall of 1953, still not focused on a specific research direction, although he was anticipating doing his degree on either the genetic side of animal breeding or reproductive physiology. After a few days, Ralph Erb, Jack's adviser, showed him the kind of work that his students were doing. At that time and even now quantitative genetics in the animal sciences took a statistical approach. Masses of data were run through an old-fashioned calculator, and conclusions inferred from the statistical output. Jack was not impressed and asked Erb what else was going on. Erb then described a project on endocrinology, which Jack "really did not understand at the time," but it "seemed more interesting than the calculators." That decision moved Jack into endocrinology and specifically into a lifelong study of steroids and their action.

Erb, although a hands-off supervisor, was an excellent mentor for those like Jack who could work independently. Jack recalls Erb as "a first-rate scientist, strong-willed, and hard working," who gave his students a great deal of freedom. "He never peered over my shoulders to figure out what I was doing or put any pressure on me; so I learned to be

independent, and I've always tried to do the same thing with my students."

At Washington State, Jack's research project was to examine the steroid hormones of cattle, first by looking at urinary excretion during the estrous cycle of the cow. This was new territory, as assays for distinguishing different estrogens and their metabolites had not been well developed. The laboratory turned to Leo Samuels, chair of the Department of Biochemistry at the University of Utah, who had set up a strong steroid biochemistry program. Jack was invited to become part of a new National Institutes of Health-sponsored training program at Utah, whose goal was to attract young scientists to the study of steroid hormones and their application to medical research. Jack was part of the first class and was the only graduate student; all the rest had their Ph.D.s.

Jack admits that the experience in Utah was "inspirational" and dictated his future career path. It was only a six-month program, but to take advantage of it he "worked night and day, six days a week." On the seventh day folks in the lab took off and explored Utah. That short period was a great social and scientific experience that continued to influence the way Jack, a lover of the outdoors, was to run his own program over the next four decades. There were wonderful senior mentors, many from abroad, including Kris Eiknes, Oscar Dominguez, and Joseph Zander. Walter Wiest, another faculty member, who worked on progesterone action and later moved to Washington University in St. Louis, had a major influence on Jack's career, persuaded Jack to return to Washington State to complete the last year of his dissertation work, rather than remaining in Utah as a steroid biochemist. All of these scientists were great givers of their time and knowledge, and the young graduate student took advantage of all that Utah had to offer.

POSTDOCTORAL TRAINING AT THE UNIVERSITY OF WISCONSIN

Jack completed his Ph.D. at Washington State in 1958, primarily on the chemical identification of estrogens and progestins in the bovine placenta and ovary. It was a productive period, initiating a long and productive career. One notable finding at the time was that the main estrogen metabolite in the placenta was estradiol 17-alpha (1959), in contrast with the human placenta, which produces estriol. Eventually seven papers were published from 1957 to 1960 as a result of the work at Salt Lake City and Pullman. After graduating, he followed Walter Wiest's suggestion and returned close to home to perform postdoctoral work in Gerry Mueller's program in the McArdle Laboratory at the University of Wisconsin in order to investigate the mechanisms of steroid hormone action.

Mueller, according to Jack, "was a person of tremendous vision and tremendous intellect that seldom has been duplicated." He was a pioneer in bringing molecular biology to the study of hormone action. He had initiated work in the late 1950s on the role of protein and RNA synthesis in estrogen-driven tissue growth, especially in the uterus and had introduced the use of puromycin, an antibiotic that blocks protein synthesis in bacteria, to the field of animal-cell regulation. Soon after, he used actinomycin to block RNA synthesis. These novel pharmacological approaches to study molecular events in eukaryotes led to exciting conceptual changes in the whole field of endocrinology. With Mueller, Jack started work that pioneered the concept that new protein synthesis was required for the action of estrogens (1961).

Jack's initial interest in steroid receptors began when he was still in Mueller's lab. One of his projects was to test a widely accepted hypothesis that steroids were first converted to some special metabolically active compound that actually carried out the relevant biochemistry. Accordingly, he

attempted to find metabolites of estrogen in a responsive tissue, in this case the rat uterus, but never found any, no matter what conditions were tested. The conclusion was that estradiol was likely to be the active agent.

Meanwhile, Elwood Jensen and his associates at the University of Chicago had made [^{3}H]-estradiol of high specific radioactivity. They had injected the labeled compound into animals and found that it was not metabolized extensively but was accumulated and retained in target tissues to a greater extent than it was in nontarget tissues.

UNIVERSITY OF ILLINOIS 1961-1973

Jack was intrigued by Jensen's experiments, and so when he took his first faculty position as an assistant professor in the Department of Physiology and Biophysics at the University of Illinois at Urbana, one of the first topics the laboratory studied was why the labeled estrogen became concentrated in target tissues. These experiments led to the seminal discovery that in the rat uterus, estrogen associated with the nuclear fraction and became bound to nuclear material. That finding, coupled with previous work from Mueller's lab indicating that estrogen produced changes in RNA and protein synthesis, led directly to the concept of a nuclear estrogen receptor and caused Jack's laboratory to focus on the genome and effects of steroid hormones on gene expression for much of the remainder of his career. These three scientists—Jensen, Mueller, and Gorski—laid the groundwork for all the work on steroid hormone receptors that was to follow.

In the 12 years (1961-1973) Jack was at the University of Illinois he published about 50 papers and chapters. In 1966 his group reported the discovery of the key induced protein (E2-IP) (1966,1), later purified after Jack moved his group to Wisconsin (1980), and shortly afterward identified as an isozyme of creatine kinase.[1] E2-IP was to become the standard

biochemical marker of "early" rat endometrial responses to estrogen. Curiously, the role of this metabolic enzyme in uterine biology, and specifically growth of the organ, still remains unclear. A second achievement at Illinois was to characterize a steroid receptor, now recognized as estrogen receptor-α (ERA) (1966,2). To accomplish this isolation the laboratory adopted the then standard technique of centrifugation on sucrose gradients and applied the method to isolate the soluble form of the receptor from the rat uterus, where it existed as a large complex with other proteins. This discovery was followed by the description of the two-stage state of the estrogen receptor, which envisaged estrogen binding to the soluble form of the receptor, which then became associated relatively tightly with chromatin and initiated transcription (1969). These two findings—the first describing the estrogen receptor itself and the second visualizing how it likely operated—paved the way for understanding how other steroid receptors functioned and their roles as transcription factors, as well as the importance of proteins associated with the receptor and its bound ligand.

A third major discovery at Illinois was the demonstration that two nonsteroidal compounds, coumestrol diacetate and genistein, had biochemical effects closely similar to those of estrogen (1963), marking the realization that many naturally occurring compounds in plants and ultimately in industrial chemicals could act as steroid hormone agonists and antagonists (or both) and have disruptive effects on growth and development. The current flurry of concern over bisphenol A can be traced directly back to the 1963 paper by Noteboon and Gorski.

The laboratory continued studies begun with Mueller on estrogen effects on RNA and protein synthesis and overall metabolic effects on the rat uterus in attempts to solve why the growth of rodent uterus is so sensitive to estrogens

(1965), including estrone (1973) as well as estradiol, initiated work on the control of ovarian steroid production by luteotrophic hormones (1968), began studies on the ontogeny of the estrogen receptor during early uterine development (1970), and refined the two-stage model of estrogen action. The laboratory initiated the first experiments on the kinetics and thermodynamics of estrogen binding to the rat uterine receptor. In all these endeavors the Gorski laboratory adapted new technologies to the problem at hand and invariably led the field.

As far as the wonderfully creative stint at Illinois was concerned, Jack attributed much of the success of the laboratory to good fortune rather than to his own special talents. "If you're in the right place at the right time, good things can happen. Going to Illinois when I did and having some special students and postdocs come along who worked with me was one of those lucky events. Having the luck was having those people join my lab."

UNIVERSITY OF WISCONSIN 1973-2008

Jack returned to Madison in 1973, with appointments in the departments of biochemistry, dairy science, and animal sciences. The work begun so productively at the University of Illinois continued and for the rest of Jack's career became centered around four aspects of estrogen action: (1) regulation of estrogen receptor interaction with nuclear components; (2) physical structure of the receptor following estrogen binding; (3) estrogen regulation of chromatin structure at specific genomic sites; and (4) estrogen regulation of DNA synthesis in normal and hyperplastic tissues. He also began to pay more attention to a different estrogen-responsive organ, the pituitary gland, and the cells and cell lines that could be derived from it, focusing especially on the role of estrogen in regulation of cell growth, differentiation, and

the production of prolactin and other hormones from the highly specialized endocrine cells that populate the anterior lobe of the gland.

With regard to the first two above, the early model of estrogen binding initially to a cytoplasmic receptor had gradually become modified even before Jack moved his group to Madison when it was realized that the amount of receptor-bound estrogen in the cytoplasm was small and that the transfer from the cytoplasm to the nucleus, if it occurred at all, appeared to be very rapid. These observations led to the concept that nuclear receptors predominated over cytoplasmic receptors (1976), and ultimately to a model in which even unoccupied estrogen receptors were predominantly localized in the cell's nucleus (1984) and were in essence transcription factors. The Gorski laboratory established that the model held equally well for progesterone and glucocorticoid receptors in pituitary cells (1985), and there was the recognition that the DNA-associated receptor underwent fundamental changes in conformation when it bound estrogen and anti-estrogens, such as tamoxifen (1986). This change, characterized by the loss of hydrophobic surface of the steroid-binding domain led to "tighter" binding to chromatin and the interactions with the transcriptional machinery (1992).

The realization that estrogen stimulated prolactin synthesis in whole animals, and isolated cell populations from the pituitary gland provided an ideal model for studying direct estrogen targeting of a specific gene (i.e., no. 3 above). These studies chronologically led first to cell-free translation of preprolactin mRNA (1977), cloning of its cDNA (1979), identification of estrogen response elements in the prolactin gene (1988), and insights into how chromatin became modified close to where the estrogen receptor bound to the promoter (1989).

Over the years the Gorski group, beginning at the University of Illinois, studied the affect of estrogen on DNA synthesis and growth of tissues. Initially the focus was on the rat uterus, a complicated and still not-well-understood model system. However, an important observation was the extreme sensitivity of the process compared with many other estrogen-responsive events. Different groups had used a range of biological systems to study growth responses to steroid hormones, because many cancers, including that of the breast, require a source of growth-promoting steroid to progress and can be most readily treated by removing the source of the steroid or antagonizing its action. In Jack's case he began to move his focus away from the uterus to pituitary lactotrophs, the cells that grow and produce prolactin in response to estrogen. Although prolactin synthesis is essentially the main reason these cells exist, lactotrophs can form tumors and are a common cause of pituitary cancer. Different strains of rat are more prone to form lactotroph tumors than others, providing a means of identifying the genes responsible for tumor growth, a topic Jack had begun to emphasize before he finally decided to close his laboratory (1990).

ADMINISTRATIVE AND OTHER ACTIVITIES

Jack had a close relationship with the Endocrine Society from the time he was at Utah, culminating in his election to its Council in 1988 and to the presidency in 1990 at a time when the society was in a rapid growth phase, overspending its income and in danger of splitting because many members thought that there had been too little attention paid to the clinical aspects of endocrinology. Of particular concern was that a newly launched society journal, *Molecular Endocrinology*, should survive. Under Jack's leadership and through a number of key appointments, the administrative structure of the society was changed to provide more continuity, the income

stream improved through increases in fees and sponsorship and displays at the national meeting, and clinicians made more of an inclusive part of the organization. However, when asked about whether he enjoyed his year as president, Jack said that while it was "very interesting" and "it was nice to play at being an administrator," he realized that "he didn't have the temperament for that sort of thing." Even though Jack never became a department chair or occupied other positions "he was not cut out for," he was widely consulted by industry because of his broad perspective and integrity. He served on many national review and advisory panels and editorial boards of multiple journals, and made extensive constructive contributions to University of Wisconsin governance as a member or chair of numerous campuswide, college, and departmental committees.

AWARDS

Jack's first significant award was a senior fellowship from the National Science Foundation that allowed him to spend 12 months (1966-1967) of research leave from Illinois in Arthur Pardee's laboratory at Princeton. Pardee at that time was one of the top molecular biologists around but mostly working with prokaryotes. It exposed Jack to a great scientific environment and to the nascent science of molecular biology. According to Jack, "It was really an interesting year for me. It was also interesting to live back East; especially for a Midwestern boy who had spent a lot of time in the West. It was interesting for us as a family, and it convinced us we didn't belong out there," thereby possibly explaining why Jack was so little tempted to move away from the Midwest during the rest of his academic career.

Subsequently, Jack's major contributions to biomedical sciences in the area of molecular endocrinology brought him wide recognition. He was made a fellow of the American

Academy of Arts and Sciences in 1986 and was elected to the National Academy of Sciences in 1993. According to Jack, being elected to the NAS "gave recognition as to where one stands in the science community, and I appreciated that. However—once one is in—you find out that it seems to be more about further electing people, and one's influence in the organization is limited," a common sentiment among members.

Based on his distinguished leadership in research, teaching, and in the training of scientists, the Endocrine Society honored him with the Ernst Oppenheimer Memorial Award (1971), the Robert H. Williams Distinguished Leadership Award (1987), and ultimately the Fred Conrad Koch Award (1995), the highest honor awarded by that society. Jack was especially proud of the Women in Endocrinology Mentor Award he received from the Endocrine Society in 2001, well deserved as his female trainees have had a remarkable record of achievement in their own careers. In addition, Jack won the Gregory Pincus Medal (1986) from the Worcester foundation and an honorary degree from the University of Bordeaux (1999). He received a MERIT Award from the National Institutes of Health in 1986, and the University of Wisconsin honored him with a WARF professorship and the Hilldale Award in the Biological Sciences.

WHAT MADE JACK GORSKI A SPECIAL SCIENTIST?

This question is not easy to answer. Earlier I cited Jack's belief that his success was largely luck, but clearly this was only a contributing factor to his success. As a high school student he demonstrated little potential except a willingness to read widely. His animal science background and even steroid biochemistry training, though excellent, were quite widely divorced from the topics he eventually studied. Jack also cited the quality of his mentors and their emphasis on

cutting-edge technologies as crucial to his development. The following quote articulates this point.

I think having had strong mentors was more important than having mentors know some specific area of biological sciences. What you need to be trained in—or to be trained as—is somebody that can keep on the frontiers of science. What you learn in your PhD may set your directions, but doesn't carry you very far. Now, in the current world, this is even more important. What specific science the students learn in their PhDs is practically irrelevant. They will have to be trained to be independent thinkers who can move on to the next technology as it comes along. I think science is technology driven, especially the frontier areas of science. The successful person will take on the new technology and apply it to his/her problem. Then, when she/he moves as far as they can with that technology, they must be willing and able to take on the next technology. This can be very difficult sometimes. It's hard to keep up, and science is changing faster and faster. That's my philosophy.

Jack, by applying this approach to his laboratory and to the undergraduates, graduate students, and postdoctoral trainees under his guidance, was able to get the best out of them and create a veritable "school" of steroid biochemistry. His personal integrity, devotion to his students and their careers, emphasis on experimental design, and instinct for asking the right questions, along with his insistence on new ways of tackling questions, kept his group on the frontiers of science for almost three decades.

PERSONAL ASIDES

Jack Gorski, Paul H. Phillips Professor Emeritus in the departments of biochemistry, dairy science, and animal sciences at the University of Wisconsin-Madison, died of leukemia on August 30, 2006, at 75 years of age. Jack Gorski was an unassuming, modest man, but he left a considerable legacy of trainees; 100 graduate students and postdoctoral fellows had passed through the laboratory from the time he accepted his first academic position at the University of

Illinois in 1963 to the time he retired from full-time research in 1997. To my relief when I explained that I had volunteered to write a memoir on behalf of NAS Section 61, Jack's and my own section at the National Academy of Sciences, just about everyone I contacted was willing to expound on Jack and answer my questions, because they truly liked and admired him. The immediate conclusion I drew from these conversations and e-mails was that mentorship, as we now call it, was a consuming part of Jack Gorski's career. The success of his trainees was his success. This relationship to his students made writing this memoir much easier than I had imagined. I am especially grateful to Fern Murdoch and Linda Schuler, who sent me a transcript of a long oral interview Jack had conducted with Dr. Adolph Friedman on November 2, 2000, on behalf of the Endocrine Society oral history collection. All the unattributed quotes in the prior text were lifted from that interview.

To close this memoriam I have decided to provide remarks from Jack's past trainees. More than anything I could have written, these anecdotal comments give insights into the man and his science and why his laboratory was so successful.

Frank Gannon in a memorial essay for *EMBO Reports*:

> Jack did not mentor in a formal sense, he was simply himself: decent, caring, driven by science rather than by ego, and taking care of those in his laboratory at all times. He was extremely critical of data, modest and friendly to everyone, and he promoted the careers of all who worked with him. His intrinsic decency has had a life-long and important influence on me and his other students. Those scientists who have had similar mentors now have the responsibility to pass this message on to the next generation: research is about the excitement of discovery and understanding; it is not a matter of winning at all costs. Even without formal mentoring, being a good role model can be crucial in making science an attractive choice for young students, and in preparing them for productive and influential careers.

David Toft commented in an e-mail:

I was a rather naïve graduate student and I did not realize that several other labs were trying to do the same work. Our major competitor, Elwood Jensen, was more oriented toward the biology and medicine side of things and it was great to meet him because there were so few people with the same interest. Jack was probably more concerned with the competition than I, but he didn't show it. In retrospect, he did push his students, but in a friendly way. He wanted students to get out of his lab as soon as possible, but to do this they had to be quite productive. Jack was always a good friend to his present and past lab members. He would get us all together for dinner at the Endocrine Meetings and he sent out an extensive Christmas letter to each of us telling what everyone else was doing. Thus, I managed to know and interact with many investigators who were his students or fellows during the 70s, 80s and 90s. It was a large family.

David also pointed out that

no one is perfect. Jack kept a messy office. He sometimes avoided conflict when he shouldn't; a few students would flounder in the lab with his hands off style, and he was not always a very attentive car driver even though he drove quite fast. However, he was a terrific scientist and person with a wonderful family and many friends.

Roger Stone recalls an incident that typified Jack's sensitivity to others and their problems:

One morning our hippie-in-residence (K) failed to show up for work. People around the lab gave little notice. However, knowing that K was diabetic, Jack found someone to check on him. Sure enough he was in trouble. Seems K had increased his insulin by a few units thinking he was meeting friends for beers. When they failed to show K had one beer and went home.

Rita Manak recalls Jack with particular fondness.

Jack was a very special mentor and friend to so many. He had the ability to make most of those who passed through his lab feel uniquely special to him. He made an effort to select people that he thought shared his values. As a result, those in the lab respected and worked well with each other. But beyond that, those who passed through his lab felt a family-like relationship with others that preceded or followed them. Most of all, even as we had

fewer opportunities to talk, I always felt he was there, a point of reference as my own career took its twists and turns. I think it would be safe to say that others felt that way, too. I didn't realize how very much that meant until we no longer had him.

Margaret Shupnik felt similarly.

He was one of my favorite people in the world and most certainly the one who has had the most influence on my career. I was Jack's first PhD student to enter and finish at Wisconsin—but number 53 among his exactly 100 trainees. I know that because Jack's trainees formed an extended family. That cord of memory and experience tied together hundreds of scientists. At each scientific meeting, particularly that of the Endocrine Society, we would gather around him and organize a dinner. That finally ended when no restaurant was large enough to hold us, but we still managed to see and speak with him. Jack used to send out a Christmas letter to all of us—decorated with holly-bedecked cows—giving us all the news. When he retired, we all went to Madison for a symposium, and when he received the Women in Endocrinology Mentor award around 2000, we showed up en masse. Jack, as you know, was a sharp thinker, but very down to earth. Receiving a check with his Mentor award, he turned to me and said, "Wow, this is substantial—I can buy a cow!" Jack was very involved, and yet hands-off at the same time. He always wanted to see how you would do by yourself, but had a deep well of compassion for those in need. I remember how I once splashed chromic acid on my face, and after my bout at the eye-wash Jack went and stayed with me at the emergency room for several hours as a precaution. Until shortly after that point, I had not known that he himself suffered from glaucoma. He remembered everything about everyone's family, and liked to see that we all liked each other. We always knew he was in our corner—and I suspect he wrote more references that can even be imagined. As you can tell, I really loved the man, as all of us did.

Although there are many other anecdotes worth telling, Margaret seemed to me to provide the final analysis on the man and how he will be missed.

NOTE

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