HOWARD ENSIGN SIMMONS, JR.

(17 June 1929–26 April 1997)

Courtesy of the DuPont Company

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Howard E. (Howie) Simmons, Jr., died of congestive heart failure at his home outside Wilmington, Delaware, on 26 April 1997. He was sixty-seven years old and had also suffered from lung cancer.

One of America's leading industrial research scientists, Howie received the National Medal of Science from President Bush and was a longtime member of the National Academy of Sciences. His thirty-seven-year career with DuPont was marked by exceptional research accomplishments, a management style that motivated other scientists to achieve their full potential, and fervent and consistent support for high-quality science and strong fundamental research.

His professional and personal interests were wide-ranging—from various aspects of chemistry, physics, and mathematics to archeology, Mayan culture, and linguistics. He clearly met the definition of that much overused term, Renaissance Man. A lively conversationalist with an active sense of humor, Howie was popular within DuPont's scientific community and was well respected by scientists everywhere.

The Early Years

Howie Simmons was born in Norfolk, Virginia, in 1929, the only child of a family of sea captains and Bavarian entomologists. His father, two uncles, and paternal grandfather had all gone to sea, while his mother's antecedents included Jacob Hübner, the first man to catalog North American butterflies. Howie once remarked that German chemists found him much more famous as a descendant of Jacob Hübner than for his own contributions to chemistry.

Convinced that he wanted to study chemistry, Howie began at age twelve to conduct experiments in a small home laboratory, and often delighted his friends with homemade fireworks. Both parents encouraged his interest in science, although his father may have winced when Howie declined a full scholarship to the University of Virginia—the result of having won the state high school French competition three years running—to attend the Massachusetts Institute of Technology.

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"It had gotten fixed in my mind very early on that I wanted to be a chemist," Howie said many years later. "I truly can't tell you why, except that it sounded like an exciting thing to do. I enjoyed reading about it. I think there was an early recognition, sort of astounding to a child, that the whole world is made of chemicals; it's rationalizable, and presumably we can get control of all these things, if we know enough about them."

At MIT, Howie stood out among a large group of aspiring chemists, many of whom showed exceptional promise. Recognized as an independent thinker who grasped ideas quickly, he graduated first in his class in chemistry in 1951—minoring in physics and mathematics. At the time, MIT required a full year of lab work as a thesis for a bachelor's degree, and Howie worked under John D. Roberts's oversight to do research in organic chemistry on the mechanism of the reaction of silver salts with carboxylic acids. This relationship with Roberts, whom Howie considered his mentor, would continue into graduate school and throughout Howie's life.

Howie wanted to remain at MIT for his graduate work, which was possible only when the head of the chemistry department, Arthur C. Cope, agreed to waive a policy that required MIT undergraduates to do their graduate work elsewhere. He began his graduate thesis by investigating the chemistry of cyclobutenones, but put that research on hold to help prove the existence of benzyne, work that is included in most of today's chemistry texts. All in all, his thesis work resulted in six publications in various fields of organic chemistry.

By 1954, when Howie had completed his doctoral work at MIT, Roberts had gone to Caltech. But rather than join him there, where he was a prime candidate for a postdoctoral fellowship or a junior academic position, Howie instead chose a career in industry. He accepted an offer from Theodore L. (Ted) Cairns—who had cultivated him at MIT and sat in on his Ph.D. oral examination—to join the DuPont Company.

Better Things for Better Living

Howie joined DuPont's Central Research & Development Department (CR&D) in 1954, and was soon regarded as a rising star. Promoted to research supervisor in 1959, he held a series of increasingly responsible positions within central research, becoming DuPont's vice president for CR&D in 1983 and vice president and senior science advisor in 1990. He retired in 1992 after thirty-seven years with the company.

His direct research contributions at DuPont were substantial, involving many accomplishments in organic synthesis, physical organic chemistry, and theoretical studies. His early work featured a general interest in using reactive intermediates for synthesis, and he was the coauthor of the Simmons–Smith reaction, a premier method to convert an alkene to a cyclopropane. (The research began while Howie was reading old German and French technical literature, and came across an 1890s German paper reporting on the reaction of methylene iodide with a zinc-copper couple to produce a gas, possibly ethylene formed by the dimerization of unstable carbene.) He also made important contributions to cyanocarbon chemistry.

In physical organic chemistry, Howie did diverse research on reactive intermediates, reaction mechanisms, and novel structures. He collaborated with another DuPont scientist to synthesize macrobiotic amines, large rings containing hydrocarbon cavities. This work and the concepts regarding crown ethers, developed by DuPont Nobel laureate Charles Pedersen, laid the foundation for a new class of macrocyclic structures for synthetic enzymes and catalysts. While Pedersen was chiefly interested in *what* crown ethers would do, Howie was more interested in the theoretical aspect—*why* they were such powerful complexing agents and how molecules would twist themselves in order to bind to a metal ion.

Whatever the problem, Howie delved into it as deeply as possible. "Howie is always looking to unlock the unknown," a colleague once noted. "He is not satisfied that we have a stable compound; he wants to know what happens if the compound is manipulated."

He also made seminal contributions to the theory of structure and bonding in organic molecules. As the years went by, he became increasingly interested in applying the mathematics of topology to structural chemistry. Along with Richard E. Merrifield, a contemporary at MIT and a physical chemist at DuPont, he uncovered deep relationships in molecular systems, and new mathematical relationships. The pair coauthored a book entitled *Topological Methods in Chemistry.*

In all, Howie received thirteen patents and published seventy-six scientific papers.

Howie maintained his hands-on approach to science even while climbing DuPont's managerial pyramid, and long had a research group reporting directly to him—unusual for someone in his position. Later in his career, he and a research assistant published the *Bulletin of the Society for Heightened Interest in Topology*, which Howie explained was named solely to create the (irreverent) acronym.

In terms of research success, Howie was reported to have a "green

thumb," a sixth sense about where the most important findings might be uncovered, and to focus on areas where others were not looking. He was accessible and well liked, although he did not suffer fools gladly.

Howie believed that his primary role as head of Central Research was to create an environment in which scientists could do their best work and supply DuPont with a constant flow of new ideas, new science, and new processes—which would lead ultimately to new business opportunities. Unwavering in his belief that DuPont should hire very high-quality people, he remained intimately involved in the hiring process and was proud of his recruiting record.

His beliefs, and the consistency with which he espoused and followed them, proved extremely helpful to DuPont during the late 1970s and early 1980s, a time when DuPont undertook a series of bold initiatives into new and promising business areas. Howie's challenge as head of CR&D was to expand the staff at DuPont's experimental station to reflect these thrusts into the life sciences, materials sciences, and other areas, and he was superbly equipped to succeed in this endeavor. As another former DuPont chairman put it: "He was a scientist's scientist, representing the best of what science is about. He had a phenomenal depth and breadth of interests, an extraordinary knowledge of technical fields."

Under Howie's leadership, the company developed top-quality scientific capabilities in biotechnology and genetics as well as imaging and electronics. Such a capability was likewise established in the materials sciences, including polymers, optical and electronic materials, and ceramics. At the same time, DuPont maintained a strong core effort in organic chemistry, physical chemistry, and catalysis. From 1975–79 to 1985–87, the experimental station doubled the average number of its annual scientific publications from one hundred to two hundred, with major growth coming in the biological and materials sciences.

Examples of the innovative contributions that emanated from the experimental station under Howie's leadership included replacements for ozone-depleting CFCs, Group Transfer Polymerization, new electronic materials, high-temperature superconductivity materials, a major advance in DNA-sequencing technology, and supercomputer applications. In fact, DuPont was the first company to obtain a Cray Supercomputer.

Defender of Basic Research

As director and later vice president of central research, Howie was an enthusiastic and persistent defender of the role and importance of

fundamental research. He fought hard to protect the freedom researchers need to be creative and productive. During his later years, a period when the research function in most U.S.-based corporations was undergoing increasing scrutiny, Howie guided DuPont's transition to a more pragmatic and business-oriented research strategy.

But to Howie, some colleagues say, the choice was not so much between fundamental and applied science as between *good* science and bad—good science being marked by ingenuity, creativity, and very high standards. He understood very well the value of performing fundamental research within existing businesses, and a DuPont analysis showed that those businesses most supportive of central research were also the most profitable.

Thus, while he never stopped regretting the reality that the company needed to become more pragmatic, he recognized that reality and guided his organization effectively through this difficult period. And throughout it all, he maintained the high standards that he felt good science required.

Howie also spoke out at the national level on the need for fundamental research, urging a long-term federal commitment while at the same time cautioning scientists to "become more objective and realistic about the expectations for basic research."

Recognition and Professional Involvement

Howie's role in science and industrial research was recognized frequently and at high levels. In 1992, President Bush presented him with the National Medal of Science—this nation's highest honor of its kind. Howie was cited "for his fundamental contributions to synthesis, molecular structure, and the theory of organic chemistry, and for his productive management of the premier industrial chemical research program in the United States." He also received the Priestley Medal, the American Chemical Society's highest award for service to chemistry (1994); the Lavoisier Medal, DuPont's highest award for technical achievement (1994); and Columbia University's Chandler Medal for achievements in chemistry (1991).

In 1975, Howie was elected to the National Academy of Sciences, where he served on many committees and made particular contributions to laboratory safety and mathematics and science education. With his combination of academic credentials, scientific achievements, and a leading position in industrial research, Howie was a valuable contributor, and was called upon frequently. Former NAS president Frank Press credits a call from Howie—explaining how AIDS could spread

beyond homosexual and needle-user groups—with his decision to establish an NAS committee on this topic, which in turn led to a presidential commission and legislative approval of research funding.

Howie was also nominated by President Bush and confirmed by the Senate as one of three chemist members of the National Science Board, the twenty-five-member policy-making body of the National Science Foundation.

He was a fellow of the American Association for the Advancement of Science (1981) and the New York Academy of Sciences (1972). He received an honorary doctor of science degree from Rensselaer Polytechnic Institute (1975), where he was also the Rauscher Memorial Lecturer, and from the University of Delaware (1993). He was also very active in the American Chemical Society, Society of Chemical Industry, Gordon Research Conferences, Franklin Institute, Los Alamos National Laboratory, Chemical Heritage Foundation, and Beckman Center for the History of Chemistry. He also served on the editorial boards of many technical publications.

His university associations were much too numerous to record in detail. He served on visiting committees, boards of overseers, and advisory committees at MIT, Princeton, Harvard, and the universities of California, Chicago, and Maryland.

He was particularly active at the nearby University of Delaware, where he taught advanced courses, served on committees that made hiring and tenure decisions, and even trained one doctoral candidate. For nearly thirty years he held the rank of adjunct professor. He was also an advisor to the College of Marine Studies, chaired the university's Research Foundation, and in 1994 joined the university's board of trustees.

During the last decade of his life, his counsel and advice to the chair of the Department of Chemistry and Biochemistry guided an investment of nearly $46 million in infrastructure, faculty recruitment, and the general advancement of the department in a very successful drive for excellence in chemical education and research.

In addition, Howie supported education at the elementary and secondary levels, pushing the need to strengthen mathematics and science education and serving on the board of the Independence School outside Wilmington. He served on countless scientific and other committees, where he was seen as quiet but influential; not obtrusive but listened to for what he had to say. Those who served with him laud his ability to move a group from polarization toward consensus. "When he spoke," says one Nobel laureate, "it felt like a reflective consensus judgment."

The Personal Side

Howie is survived by Elizabeth Warren Simmons, who was born on a nearby street in Norfolk, and along with Howie graduated from Maury High School. She later earned a degree from William & Mary. They were married in 1951 and had two sons, Howard E. Simmons III and John W. Simmons, both of whom are Ph.D. research chemists at DuPont's experimental station in Wilmington. There are three grandchildren.

Howie's personal interests were as many and diverse as his professional associations. He was an accomplished linguist who knew French, German, Latin, Greek, and ancient Mayan. He also taught himself some Russian and Swahili, and learned Spanish in order to read a book on Mayan hieroglyphics. During a lecture at the University of Heidelberg in the 1960s, a time when anti-business sentiment ran strong, Howie not only delivered his lecture in German but held his own when responding in German to student hecklers.

He developed a lifelong love of the sea from his father, and kept a power cruiser in the Bohemia River, off the Chesapeake Bay. He often went there to be alone, to read, and to putter about. All his boats were named "Ahau," after the Mayan sun god. Ruins and hieroglyphics were among Howie's lifelong interests, and they took him to Tikal, Guatemala, in 1965 with his colleague Bill Phillips. A leftist government was being overthrown at the time, but Howie refused to let the coup's gunfire keep him from seeing the ruins he had come to see.

Howie was also a voracious and eclectic reader—of mysteries, Civil War history, science, archaeology, mathematics, boating, whatever caught his interest. He would sit at the kitchen table, reading late into the night, and was able to exist on only a few hours' sleep—which he was famous for recapturing during research reviews. Typically, he would read everything a favorite author had written, in the order he had written it; then, with that author or topic exhausted, he would move on to something else.

His sons remember carting six or seven pickup-truck loads of books from one house to another when their parents changed residences, and estimate that there were fifteen thousand to twenty thousand books in Howie's home when he died. He kept enlarging his den, eventually confiscating the home's biggest bedroom and converting that into a repository for his books.

There were many other hobbies, each of which had its day—the French horn, accordion, and piano; big bands, then blues, then jazz; stamps; and coins. Howie grew tadpoles into frogs in a bedroom tank.

Over the years, he amassed twenty-five or thirty calculators but little computer paraphernalia. His interest had waned when computers became easy to use.

A Summing Up

When you ask those who knew Howie best to define his distinguishing characteristics, the same few points arise. All agree he was among the brightest people they knew—a superb scientist and scholar with unusual intellectual stamina. He had an exceptional ability to explain complex topics in an easily understandable way. His interests were wide, deep, and intense, and he quickly mastered any subject that drew his attention. He once confessed to "no little chemical dilettantism" in his career, explaining that he found chemistry "too exciting to be satisfied with only one or two tastes of its wonders."

He had a mischievous sense of humor, tinged with irony. He was a resolute defender of good science and basic research; as one person put it, he was very cerebral in a product-oriented age. And he was popular among and accessible to the scientists, technicians, clerks, janitors, and others who worked in central research.

An article in *Chemical & Engineering News* captured an important aspect of Howie's character: "He much prefers the speed of power to any challenge of sail, saying, 'In a sailboat, you look at the same 10 miles of shore every weekend.' He avoided marinas and is always searching out new anchorages where he can drop anchor to read and write."

Howie spent his life "searching out new anchorages" in science, language, literature, and anything else that caught his interest. Those of us who knew him gained a great deal from the opportunity to join him sometimes in that search.

Elected 1994

Edward G. Jefferson
Former Chairman and CEO
DuPont Company