James Bryant Conant

March 26,1893 - February 11,1978

James Bryant Conant, chemist, educator, administrator, statesman, was a major architect of, and participant in, the phenomenal increase in the power, prestige, and accomplishments of U.S. science that took place during the first third of this century. Prior to his time, American science and American universities suffered by comparison with their European counterparts; during the decades just preceding World War II, however, both U.S. science and the universities - with considerable help from Conant - pulled themselves "up by their bootstraps." U.S. chemistry grew to international stature, partly through the initiation of the series *Organic Syntheses.* Conant strongly supported Roger Adams in his proposal for a regular publication devoted to reliable synthetic procedures; he was a member of the first Board of Editors and served as Editor-in-Chief of Volumes 2 and 9.

His death on February 11, 1978, at the age of 84, brought to a close his remarkable career (or, as he preferred to regard it, careers). His achievements as a chemist were followed by his creative administration as President of Harvard University from 1933-1953, and by his success as U.S. High Commissioner to Germany (1953-1955) and Ambassador to the Federal Republic of Germany (1955-1957). While on leave from the Presidency of Harvard, he served with distinction as Chairman of the National Defense Research Committee and Deputy Director of OSRD (1941-1946); subsequent to his assignment as ambassador, he undertook a massive study of U.S. secondary education; his books on that subject ("The American High School Today," "The Citadel of Learning," "Slums and Suburbs: A Commentary on Schools in Metropolitan Areas," and many others) focused attention on a vital, but at that time somewhat neglected, part of our society. Other obituaries undoubtedly will emphasize his roles as administrator, diplomat, and educator, and record the many honorary degrees and other awards that he truly deserved and received. The chemical community remembers and honors him principally for his original contributions to chemistry, as well as what he did for science (in fact, for all scholarship) while President of Harvard.

Organic chemistry in 1920 was dominated by European scientists: Richard Willstatter,

Leopold Ruzicka, Hans Fischer, Paul Karrer, Heinrich Wieland, Aldolph Windaus, Hans Meewein, Robert Robinson, Arthur Lapworth, and many others. The discipline, then as now, was concerned both with natural products and with fundamental theory, and Conant, almost alone among American chemists, was at the forefront of both major thrusts. Although he himself was most proud of his contribution to the determination of the structure of chlorophyll, his extraordinarily original innovations in physical-organic chemistry had a much greater impact on the development of science. The thirties and forties were marked by what amounted to a revolution in understanding of reaction mechanisms; Conant's ideas and discoveries gave strong impetus to progress in this area. In particular, he and N. F. Hall introduced the idea of "superacidity" for solutions of strong acids in nonaqueous solvents, and with *G.* M. Bramann, Conant illustrated his ideas by showing that both sodium acetate and perchloric acid catalyze the acetylation of p-naphthol in acetic acid; acid catalysis increased the rate a millionfold. Sodium acetate had, of course, often been used by synthetic chemists as a catalyst; the realization that it functions as a strong base in acetic acid was of fundamental importance. Similarly, Conant and G. W. Wheland (and, later W. K. McEwen) initiated the quantitative understanding of extremely weak acids such as cyclopen tadiene, using triphenyl methyl sodium in ether as the needed strong base. These were germinal contributions to the theory of nonaqueous solutions.

Furthermore, Conant originated, or helped originate, several other fundamental aspects of chemistry. He was among the group who applied ^{11}C (it was the only isotope of carbon then available) to a trail-blazing study of a metabolic pathway. He and G. B. Kistiakowsky initiated the measurement of the heats of hydrogenation of organic compounds, so as to improve the precision of thermodynamic data relative to those available from heats of combustion. He and P. W. Bridgrnan were the first to investigate the effects of extremely high pressure on the rates of reaction of organic compounds; they discovered the acceleration of polymerization by pressure. Conant's investigations (with L. F. Fieser, among others) of the reversible oxidation-reduction potentials of quinones, and his studies of irreversible electrochemical oxidations and reductions, were far ahead of their time. In his work with P. D. Bartlett on the mechanism of semicarbazone formation, he distinguished sharply between kinetic and thermodynamic control; that paper alone exerted a powerful influence on developing theory.

One interesting aspect of Conant's work in the biochemical area was the discovery that copper is the essential metal of the prosthetic group in hernocyanin, the oxygen-carrying pigment of crustaceans. In his major biochemical work, Conant and his collaborators discovered the role of autoxidation in the so-called "phase test" for chlorophyll-a complex and previously confusing series of reactions initiated by strong base. Hans Fischer and his many collaborators in Munich were the chief investigators of chlorophyll, as they had been for hemin; in 1935 Fischer suggested an essentially correct solution to the structural problem. Although Conant's part in the chlorophyll story was a minor one, one can only speculate as to what he might have accomplished had he not been appointed in 1933 to the Presidency of Harvard, but had continued in chemistry. The same speculation holds for his investigations of physical-organic chemistry, since he left the field just as it was beginning its exponential growth phase.

Conant's students have built on the ideas he introduced, both in physical-organic

chemistry and in biochemistry. His co-workers included L. F. Fieser, P. D. Bartlett, and me, all of whom (after intervals elsewhere) returned to the Harvard Chemistry Department, and A. M. Pappenhehner, who was appointed in the Biology Department; they also included G. W. Wheland at the University of Chicago, Alsoph Cornin at Hopkins, Robert Lutz at Virginia, Emma Dietz Stecher at Barnard, Jack Astin at Penn State, and several others whose research advanced both mechanistic and biological chemistry. In addition to research, Conant and his collaborators advanced the teaching of chemistry through their writings, including especially "The Chemistry of Organic Compounds," a highly innovative and successful basic textbook, published jointly with his scientific co-worker, A. H. Blatt. Conant gave direction to these works, and through his example to a whole generation of U.S. chemists, the generation that came up to European (and his) standards.

Conant was important not only to chemistry and to science, but also to scholarship through being President of Harvard. An activist president, he introduced scholarships for needy students, promoted geographical distribution in the college, and emphasized general education. But those who see these innovations as his major contributions have missed the point of his presidency. The Emperor Augustus boasted that he found Rome a city of bricks and left it in marble; Conant found Harvard a college and left it a university. In large part the transformation rested on Conant's introduction of the *ad hoc* committees that apply rigid standards to each tenure appointment. But perhaps even more important was the obvious intent of the system. Conant himself was a scholar who loved and honored research. The measures he introduced established research-and therefore teaching at the graduate level-as comparable in importance with undergraduate instruction. And because Harvard was a prestigious institution (and, too, because the time was ripe for such leadership), this upgrading of the graduate school at Harvard served as an example to many other universities.

Conant was able to devote his full effort to Harvard for only a few years; as the Nazi military threat came to dominate the world, Conant became increasingly involved with national affairs. As Chairman of the National Defense Research Committee, he provided effective scientific leadership during World War II. After the war he was appointed the first Chairman of the National Science Board, and in that role helped to initiate the policies that proved so successful in encouraging the development of science, especially in the U.S., but also abroad.

Conant, then, was perhaps the individual most instrumental in bringing the level of U.S. scholarship in general, and of chemistry in particular, up to, and in many cases beyond, the standards previously set in Oxford, Munich, and Zurich. His great achievement was not the solution of some particular problem in reaction mechanisms, or some specific determination of structure, or some generalization with respect to organic chemistry-although he did contribute in all of these areas. His achievement was rather that he raised the level of science here and throughout the world, a monument truly worth having.

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