Mulliken

Robert S. Mulliken: Life of a Scientist. An Autobiographical Account of the Development of Molecular Orbital Theory. BERNARD J. RANSIL, Ed. Springer-Verlag, New York, 1989. xviii, 256 pp., illus. $49.50.

This brief autobiography will be of interest to the many friends and colleagues of the late Robert Mulliken. It depicts his early life in Newburyport, Massachusetts, and the family background that directed him toward science. His father, Samuel Mulliken, a professor of organic chemistry at the Massachusetts Institute of Technology, employed him in preparing charts and proofreading for his books. In high school, Robert had a variety of scientific interests, and at his 1913 graduation ceremony he presented an essay entitled "Electrons: What they are and what they do." I found this of great interest since one of my first impressions of Mulliken came from a lecture on "what are electrons really doing in molecules?" that he gave about 1960.

As an undergraduate at M.I.T. Mulliken did research in synthetic organic chemistry, and until the end of World War I he worked on chemical warfare for the Bureau of Mines. After the war he went to graduate school at the University of Chicago, where he worked under W. D. Harkins on separating isotopes. On the side he read the papers of G. N. Lewis on "what electrons are doing in molecules."

Mulliken worked on isotope separations during two National Research Council postdoctoral fellowships. When the NRC suggested he find another project, he decided to look at isotope effects on electronic spectra of diatomic molecules. This decision finally led him to his famous work on the interpretation of the electronic structure of molecules via molecular orbital theory.

At first, however, Mulliken collected and assigned spectra from bands previously assigned to BN. He showed that these were really ^{10}BO and ^{11}BO. More important, from the isotope shift he showed (in 1924) that the vibrational energy of BO is never less than one-half of a quantum. In 1925, while attempting to explain the electronic spectra of some diatomic molecules, he adopted a united-atom molecular orbit model similar to the atomic orbit models built on the Bohr model. After the development of the "new" quantum theory by Schrödinger, Hund put this model onto a more solid theoretical footing.

In his autobiography, Mulliken remains adamant about the essential differences between his original approach and the valence-bond "atoms in molecules" approach of Heitler, London, and Pauling. The later work of Lennard-Jones, who proposed the linear combination of atomic orbitals (LCAO) description of molecular orbitals, the introduction of configuration interaction (in MO theory), and the introduction of resonance including ionic structures (in VB theory) eventually led most scientists away from these early sharp distinctions.

In the early 1930's Mulliken extended his ideas to explain the electronic spectra of several polyatomic molecules. These papers were the basis for his rather belated Nobel Prize in 1966.

This book will be of some interest to historians for the insights it gives into the early development of molecular orbital theory. It will not be of much use to psychologists of the creative process, since Mulliken says little about how he worked or how he was led to his important insights. It is also not a complete account of his life, since he omits many details about his private life. The book accidentally gives an interesting view of the superstructure of big science. Mulliken's life was full of travels and visits within the national and international scientific community. In fact, it is hard to see how he ever found time to do science during the latter part of his life.

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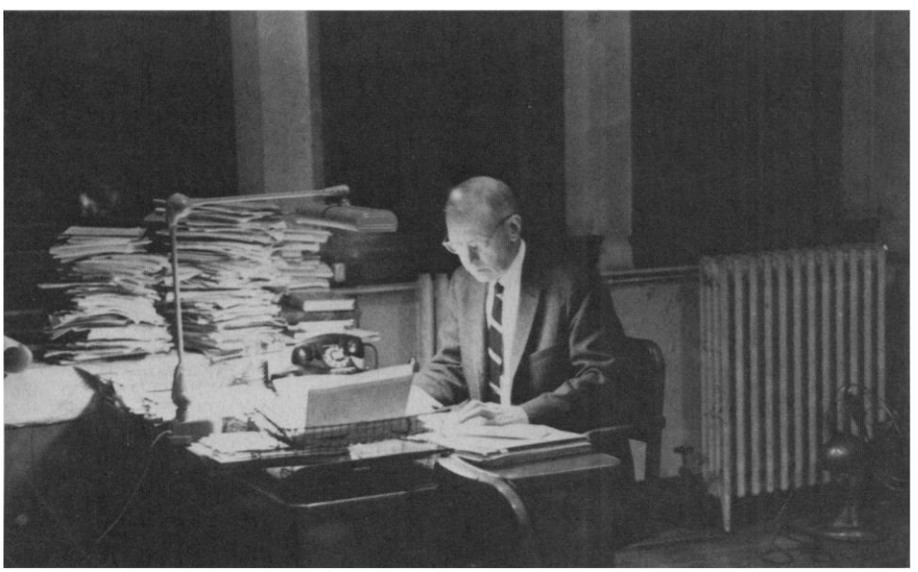

Robert Mulliken at the University of Chicago, 1959. [From *Robert S. Mulliken*; M. Yoshime]

Peptide Biology

Regulatory Peptides. J. M. POLAK, Ed. Birkhäuser Boston, Cambridge, MA, 1989. xii, 406 pp., illus. $168. Experientia Supplementum, vol. 56.

The modern era of peptide biology was born two decades ago with the isolation and characterization of thyrotropin releasing hormone (TRH), a tripeptide amide, virtually simultaneously in the laboratories of Guillemin and Schally—an accomplishment for which they were eventually to share a Nobel Prize. It is true that over the previous 40 years a number of important peptides had been identified, among them insulin, the missing hormone in type I diabetes mellitus; substance P, a sensory neural peptide involved in pain perception; vasopressin, the antidiuretic hormone; and gastrin, produced in the stomach and important in stimulating hydrochloric acid production by that organ. These appeared as isolated, uncoordinated events, however, until the recognition of this tiny hypothalamic releasing factor, which mediates the regulation of the thyroid gland by the brain. This event did two important things. It established the legitimacy of Harris's portal vessel chemotransmitter hypothesis on how the brain regulated the endocrine system, and it initiated the development of technology for peptide purification and identification that was critical to the cascade of developments