Paul Mead Doty

(1920–2011)

Chemist and arms-control advocate who unravelled the structures of biomolecules.

Paul Mead Doty, who died of heart failure at home on 5 December 2011 at the age of 91, leaves three legacies: his revelation of the structures of numerous proteins and nucleic acids; his contribution to our very survival through his tireless activity on behalf of arms control and disarmament; and the many successful scientists and policy figures whom he mentored.

Doty was born on 1 June 1920 in Charleston, West Virginia, and was schooled in Pennsylvania. His exceptional talent was recognized at high school, where a chemistry teacher asked him to take over the class. Doty earned a Bachelor's degree in chemistry at Pennsylvania State University (then Pennsylvania State College) in University Park in 1941 and a PhD in chemistry at Columbia University in New York in 1944. He was renowned for being late. On the first day of classes at Columbia, as the students were seated in alphabetical order, he missed his place. So Doty sat at the end, and thereby made the acquaintance of Bruno Zimm, a friendship that lasted a lifetime and would lead to seminal scientific collaborations.

During his doctorate, Doty measured the electron affinity of bromine. He moved into the new field of polymer science and, with Bruno Zimm, pioneered the theory and use of light scattering to characterize polymer molecules in solution. A postdoctoral position at the Polytechnic Institute of Brooklyn, New York, brought Doty into contact with founders of polymer science, such as Herman Mark, and alerted him to the unusual chemistry and physics of macromolecules. During a second postdoc, at the University of Cambridge, UK, Doty learned, mainly from Max Perutz, about the X-ray diffraction of protein crystals, which allowed their structures to be determined.

BIOLOGICAL MACROMOLECULES

After briefly joining the faculty at Notre Dame University, Indiana, Doty accepted an assistant professorship at Harvard University in Cambridge, Massachusetts, in 1948. He remained at Harvard for the rest of his life. During his tenure there, he founded the Department of Biochemistry and Molecular Biology and the Center for Science and International Affairs.

Doty's research focus shifted at Harvard to large biological molecules. Realizing that proteins could not be random polymers, because they could be crystallized and had unique structures, he established a programme to study synthetic polypeptides. These chains of amino acids allow structural transitions, such as from helix to random coil, to be followed by a technique called optical rotatory dispersion. By tracing structural transitions induced by changes in temperature, he was able to estimate the fraction of each protein that was helical. These results laid the foundations for modern studies of protein folding.

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He then, in the 1950s, turned to nucleic acids, a step made possible by the availability of synthetic polynucleotides. Out of this work came the discovery that DNA structure could be altered using heat, that the melting temperature of DNA from various bacteria differed according to the fraction of G and C nucleotides in it, and that RNA contains regions of secondary structure. These observations are the basis of much modern biotechnology, including DNA sequencing and the polymerase chain reaction.

Doty's strength lay in identifying important scientific issues with conceptual and practical implications that could be resolved by devising simple model systems. He was adept at finding the right person for a particular job, hiring Jacques Fresco for the polynucleotide work, for example, and Julius Marmur for studies using DNA. He was discriminating in how he worked with his students, balancing a laissez-faire attitude with specific guidance according to each student's needs. As PhD students, we both benefited from this style of mentorship.

PUBLIC AFFAIRS

His most important choice of associate was a graduate student, Helga Boedtker, whose thesis on the structure of collagen in solution became a landmark. They married, and Helga became the mainstay of the laboratory for more than 40 years until her death in 2001. When Doty was absent from the lab during his trips abroad to promote arms control, a quiet word to Helga brought urgent matters to his attention.

Very early in his career, Doty became active in science and public affairs, with a focus on US–Soviet relations. He chaired the Federation of American Scientists and the US Pugwash Committee, worked on disarmament plans under President Dwight Eisenhower's science adviser James Killian, and was a member of President John F. Kennedy's Science Advisory Committee. Doty co-chaired the Soviet–US disarmament committee (now the Committee on International Security and Arms Control of the National Academy of Sciences), helped to arrange the first visits to Moscow of US secretaries of state Henry Kissinger and Cyrus Vance and played a key part in developing the basis for the US–Soviet Anti-Ballistic Missile Treaty.

As noted by molecular biologist Matthew Meselson, Doty "surely helped to avoid catastrophe". ■

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