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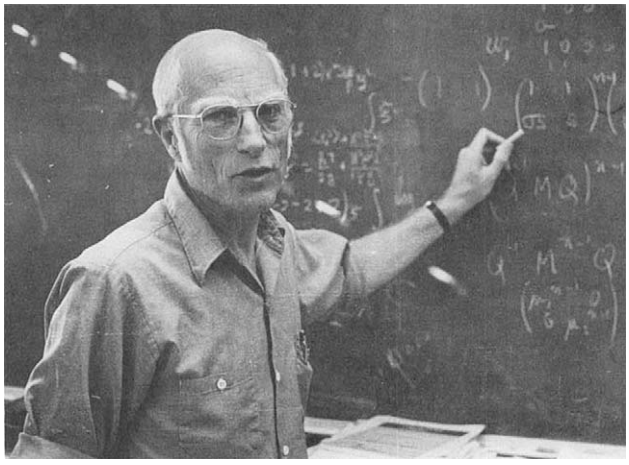
Obituary

Bruno H. Zimm (1920–2005)



Professor Bruno Hasbrouck Zimm, one of the greatest biophysical and polymer chemists of the 20th century and a valuable member of the editorial board of Biophysical Chemistry, died on November 26, 2005 in La Jolla, California. Zimm was Professor Emeritus of the Department of Chemistry and Biochemistry at UCSD and a leading physical chemist in the field of biological and synthetic macromolecules. With his passing, the field of biophysical chemistry lost one of its founding fathers and one of its most eminent luminaries.

Creativity, depth, and technical strength are the traits one associates with Zimm's scientific work, both in mathematical theory and in laboratory experiments often using instruments and methods he invented.

There is a long list of Zimm's significant scientific accomplishments highlighted in two festschrifts that contain extensive coverage of his work and its further development in polymer science and in biophysical chemistry, respectively [1,2]. To the chemistry community at large, his most influential work is in polymer dynamics. Most polymer scientists in the last half of the 20th century, especially those with some interest in polymer dynamics, would rate Zimm's contributions, together with those of Paul Flory in polymer statistical theory with the most important pioneering work that initiated the field of polymer science — a subject that now has a profound influence on every aspect of modern life. In a remarkable tour de force, Zimm tackled the initially very formidable problem of polymer internal dynamics, pushed it over the hydrodynamic interaction hump, elucidated the contribution of internal motions to the dynamic viscosity [3,4].

Many readers of Biophysical Chemistry have, or should have, read Zimm's beautiful work on the cooperative helix-random coil transitions exhibited by polypeptides and DNA, following the initial study by John Schellman [5,6]. The celebrated Zimm–Bragg theory still plays a fundamental role in understanding the physical chemistry of the peptide helix and in developing algorithms for protein structural predictions [7,8]. The Jacobson–Stockmayer ring entropy that was first incorporated into the theory of melting large DNAs by Zimm [9] is still in use today. Bruno was a superb theorist, a tradition he inherited from his Ph.D. advisor Joe Mayer, a creator of the modern statistical mechanics of fluids. His theoretical work started in the light scattering of fluids including polymer solutions and in the theory of critical phenomena, and continued into important areas such as polymer statistics and dynamics, viscoelasticity, polyelectrolyte theory and counterion condensation, DNA twisting and bending dynamics, and gel electrophoresis. DNA was Bruno's favorite biopolymer; but in the last several years of his life, he had also become interested in proteins and their folding and aggregation [10].

Zimm was equally brilliant as an experimentalist. Only half of Zimm's papers are theoretical. One of his earliest papers is his pioneering work, with Paul Doty and Herman Mark, on determining absolute molecular weights of polymers by light scattering [11]. His experimental work was always characterized by novel design and the development of new methods and instruments. He was among the first to measure the intensity of scattered light using a photomultiplier tube, and to perform measurements at different angles to measure the "dissymmetry" of the light scattering. The use of Zimm plots to obtain the radii of gyration and second virial coefficients, as well as the molecular weights, of polymers under different conditions remains one of the main tools in the arsenal of polymer scientists today. He also made enduring contributions to other methods for studying macromolecules, including transient electric birefringence, low shear viscometry, relaxation viscoelastometry, and non-linear rheology. Many of these methods became standard practice for studying DNA and proteins in biophysical chemistry, as well as for studying synthetic polymers. Many consider that Zimm deserved a Nobel Prize

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for the pioneering work he accomplished in macromolecular sciences that included both biological and synthetic macromolecules.

For his scientific achievements, Zimm was elected to the National Academy of Sciences at the young age of 38, and was a member of the American Academy of Arts and Sciences. He received numerous of honors and awards that included the National Academy's Award in the Chemical Sciences in 1981, the 1963 American Physical Society High-Polymer Physics Prize, and the 1960 Bingham Medal of the Society of Rheology.

Scientists like Bruno are rare at any time; he was also an exemplary person. He was modest almost to a fault, if that is possible. Bruno was unassuming and had a very sweet disposition, and was always friendly and extremely supportive of young people. His interests outside of science were very diverse, and included playing the clarinet, reciting limericks, and sailing.

Although we have each known him at different stages of his life, and had different kinds of relations with him, we all feel truly fortunate to have known such an extraordinary and exemplary teacher, friend, and colleague. We were all saddened to learn that he is no longer with us; he will be fondly remembered. The generation of biophysical chemists represented by Zimm and his cohorts built an immense field essentially from scratch. It is our duty to carry this rich scientific inheritance into the post-genomic 21st century.

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Elliot L. Elson
Department of Molecular Biophysics and Biochemistry, Washington University School of Medicine, USA

Hong Qian
Department of Applied Mathematics, University of Washington, USA
E-mail address: qian@amath.washington.edu.

J. Mickey Schurr
Department of Chemistry, University of Washington, USA

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