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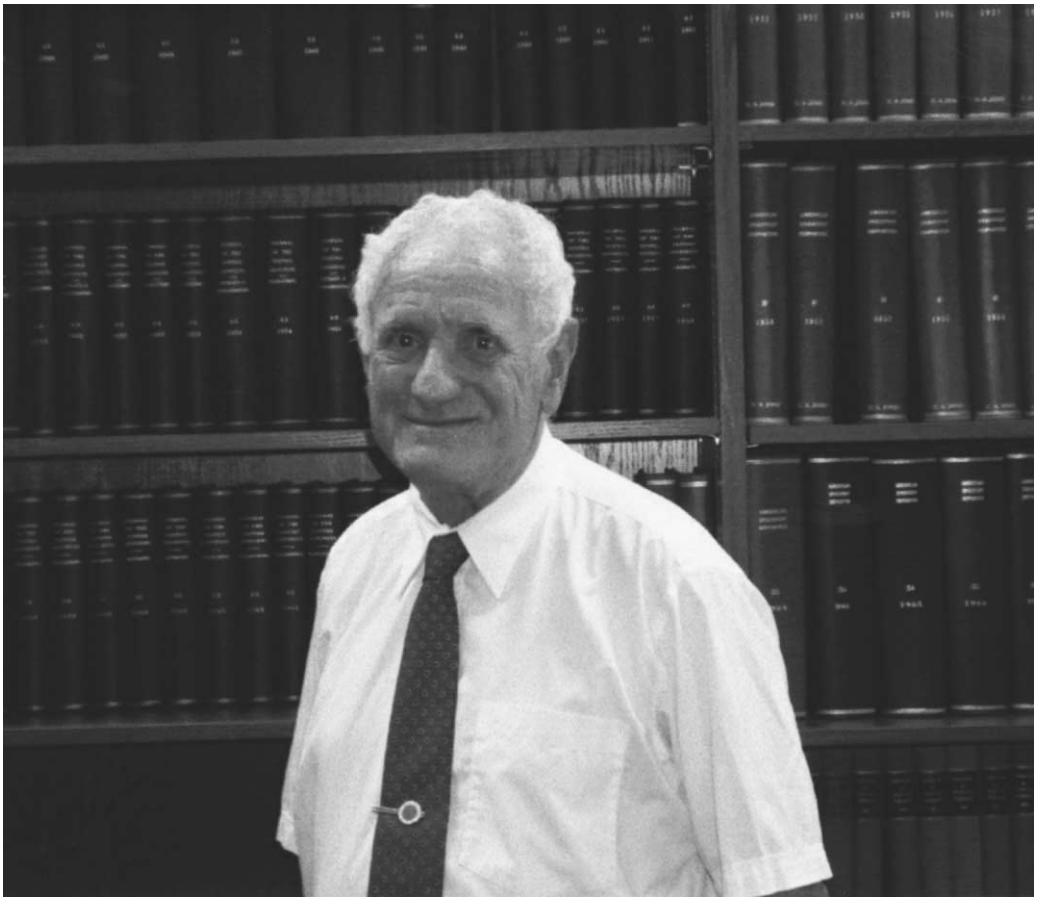
Editorial

In honor of Professor Richard S. Stein on his 75th birthday



Professor Richard S. Stein is known for his seminal contributions to the development of rheo-optical techniques for polymer characterization in the solid state, his profound understanding of how polymeric materials respond to deformation in the melt and solid states, and for his pioneering role in the development of graduate education in polymer science.

Stein graduated from Brooklyn Polytechnic Institute (now Polytechnic University) in 1945, and received his M.Sc. (in 1948) and his Ph.D. (in 1949) from Princeton University under the direction of Arthur Tobolsky — after an initial year with Henry Eyring before his departure for the University of Utah. Stein confessed that he became "fascinated with polymers on a Saturday morning in 1944 when Peter Debye … described his light scattering technique for the study of the molecular weight and size of polymer molecules" [J. Polym. Sci., Part B, Polym. Phys. 37 (1999) 640].

During his undergraduate studies at Brooklyn Poly, he had the opportunity to work with Paul Doty and Bruno Zimm, and was involved in the first measurement of the size of a polymer molecule in solution using light scattering. Herman Mark was one of his teachers. For his doctoral thesis, he used birefringence to study stretched polymers. The first measurements were made on amorphous polymers but soon his attention greatly focused on polyethylene. This same system also led him to his first X-ray experiments on oriented polymers. He then worked for a year with Sir Gordon Sutherland at Cambridge University where he initiated studies of the orientation of solid polymers using

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infrared dichroism — he was the first to show how the infrared doublet of polyethylene at 720/730 cm^{-1} can be used to determine the degree of crystallinity of polyethylene. In January 1950, he joined the Department of Chemistry of the University of Massachusetts at Amherst, where he spent his entire career before formally retiring in 1990. This was the impetus for the development of one of the most vigorous polymer education and research programs in the United States.

The program led to the establishment of the Polymer Research Institute of UMass in 1961, housed in Goessmann Laboratory, to coordinate the polymer efforts occurring in the various departments on campus. In 1966, Stein and William MacKnight, also a former student of Tobolsky, proposed the establishment of a Polymer Science and Engineering (PSE) Department, which now consists of 14 faculty members and about 150 researchers (mostly graduate students and post-docs). Following the growing international reputation of the PSE Department, as initiated by faculty members Frank E. Karasz and the late Roger S. Porter, the National Science Foundation (NSF) funded the establishment of a Materials Research Laboratory in 1973, which became the Materials Research Science and Engineering Center in 1994 under the continuing sponsorship of NSF. Stein, together with MacKnight proposed the formation of a Center for Polymer Research in Amherst and he was one of the key elements in gathering the necessary funds for the construction of the Sylvio O. Conte Building, which was completed in 1996 and hosts the PSE Department. Together with Otto Vogl, Stein also proposed the establishment of the Center for University of Massachusetts–Industry Research in Polymers (CUMIRP), a collaborative Center with industry and initially co-funded by NSF, but now in its 21st year and primarily funded by industry.

Stein's contributions are based on the use of various optical techniques, including small-angle and wide-angle light scattering, small-angle neutron and X-ray scattering, wide-angle X-ray diffraction, birefringence and infrared dichroism, to study the structure formation and deformation of polymers and, in particular, of amorphous and semi-crystalline polymers as well as polymer blends. In a series of papers published in the early 1960s in the Journal of Applied Physics, Stein developed the fundamental theory of light scattering by spherulitic and other superstructures in solid polymers, and demonstrated its quantitative agreement with experiment. When neutron scattering became available in the early 1970s, Stein was among the first to apply this novel method to the deformation behavior of polymer chains, thereby further enhancing and extending the basic understanding of both the melt and solid-state structures. He used the same technique to study phase separation in polymer blends in the early 1980s. In parallel, he applied small-angle X-ray scattering to study the internal morphology of spherulites and the crystalline/amorphous interfaces in miscible blends containing a crystallizable component. These various studies served as a principal guide for numerous groups throughout the world and his seminal papers are still frequently cited.

Throughout his career, Stein has advised over 140 Ph.D. and post-doctoral students who are presently located in the industrial or academic arenas in more than 20 countries! He has received numerous awards, including the Bingham Medal from the Society of Rheology in 1972, the Polymer Physics Award of the American Physical Society in 1976, the Polymer Chemistry Award of the Polymer Division of the American Chemical Society in 1979, the Award for Distinguished Service in the Advancement of Polymer Science of the Society of Polymer Science of Japan in 1988, and the Von Hippel Award of the Materials Research Society in 1999, to mention just a few. He has also made visits with presentations at scientific meetings in more than 10 different countries and has served as a visiting professor in eight, and he received several doctorates Honoris Causa.

On a more personal note, many of us have wonderful memories of the time spent with Professor Stein, his wife Judy and his family at their summer house on Lake Wyola. It was not only an additional opportunity for his students to discuss the amorphous and crystalline phases of polymers (the water of the lake and the soil of the land, respectively), but also a unique opportunity to meet, in a casual atmosphere. Many of the world's top polymer scientists have been entertained on these same premises.

Articles for this special issue of Polymer were solicited from and contributed by Professor Stein's former students and collaborators at the occasion of his 75th birthday. They represent a tribute to an enlightening teacher and formidable researcher who not only inspired us during our years of studies in his laboratory but also continues to inspire us in our work today.

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