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## 7. Richard S. Stein

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## Personalities in Polymer Science



Richard Stephen Stein

### Honoring Professor Richard S. Stein on his 75th Birthday

In the last three decades few polymer personalities have influenced polymer science in this country, especially **physical chemistry** and **solid state properties of polymers** more than has Richard S. Stein. His scientific contributions on **optical properties of polymer solids by x-ray, neutron and light scattering** are numerous and well recognized. He has also been a guiding beacon in the scientific development at the University of Massachusetts.

Richard Stephen Stein was born on August 21, 1925 in Far Rockaway, Queens, N. Y., as the only son of Isidor and Florence Stein, née Lewengood; he had one sister, Marjorie, who was 8 years older. Young Richard went to Elementary School PS 39, Queens and then to Brooklyn Technical High School, graduating in 1942. His sister supported the family after their father died in 1941.

At the Polytechnic Institute of Brooklyn (now Polytechnic University), he was introduced to polymer science by Herman Mark. He carried out his thesis work toward a B.S. degree in Physical Chemistry under Paul Doty and Bruno Zimm on "Light Scattering from Cellulose Acetate Solutions", and, in 1945, obtained his B. S. (Magna cum Laude).

Richard Stein started his work toward a Ph.D. at Princeton University under the guidance of Professors Henry Eyring and Robert Rundle, but both left Princeton University during his dissertation. Stein finally worked with a Textile Research Institute Fellowship (1945-9) under Professor Arthur

V. Tobolsky on a thesis entitled "Relationship Between the Stress and Mechanical Properties of Polymers" and received his Ph.D. in 1949. The work used birefringence and x-ray diffraction.

In 1948-9, Richard Stein studied at Cambridge University (England) as a National Research Council Fellow. He worked with Sir G. B. M. Sutherland on *Infrared Spectroscopy of Solid Polymers*, where he learned the infrared dichroism technique. Returning from England, Stein spent 1949-50 as a Research Associate with Professor Tobolsky at Princeton University.

In 1950, Richard Stein joined the Department of Chemistry, University of Massachusetts, in Amherst, MA as Assistant Professor. In 1957, he was promoted to Associate Professor, and, in 1959, to Full Professor. In 1961, he became Commonwealth Professor and, in 1981, he was named Charles A. Grossmann Professor of Chemistry. In 1991, Richard Stein retired. As a Professor Emeritus, he still continues to be active and conducts research.

In 1961, Richard Stein founded the Polymer Research Institute. In 1965, he and William J. MackKnight proposed the Polymer Science and Engineering Program, which has evolved into the Department of Polymer Science and Engineering, one of the leading institutions of its kind in the U.S.A. Otto Vogl and Richard Stein were responsible for the creation of the Center of University of Massachusetts/Industry Research on Polymers (CUMIRP), and they were the first co-directors.

In the early 1960's, Richard Stein and Robert Rowell proposed the Computer Science Department and the Computing Center which was accomplished shortly thereafter.

Richard Stein, inspired by his former coworker, a Greek, at a meeting on the beautiful island of Capri, Italy, became one of the movers for the construction of a National Center of Polymer Research at the University of Massachusetts. He became a key Member of the Planning Committee for the Polymer Center and served from 1986 until the completion of the building. He was also the Vice-Chairman of the Technology Board of the Massachusetts Polymer Center of Excellence from 1986-1991.

Richard Stein has had interactions with polymer scientists world wide. In the late 50's, he had two young Japanese scientists from Kyoto University as his scientific associates, Hiromichi Kawai [Polymer News, 22(7), 280 (1997)] and Shighara Onogi [Polymer News, 22(5), 170 (1997)]. They later became influential scientists in the polymer community in Japan. These led to

the first US-Japan Symposium on Polymer Physics, which was held in Kyoto in 1965. Several of Stein's star students and coworkers became Professors at Japanese Universities. As a consequence, he was invited as a Visiting Professor at Kyoto University; in 1968 as Fulbright Professor, and again in 1972, 1976 and in 1984.

Richard Stein was also a Visiting Professor at Syracuse University, N.Y., College of Environmental Science, in 1978, and at Laval University, Quebec, Canada in 1982. He was also a Visiting Professor at the Ecole Supérieure de Physique et Chimie of the City of Paris in 1986, at the University of Ulm, Germany in 1989, and at the University of Akron in 1992.

Stein's research has been concerned with the development of the small-angle light scattering for the study of solid polymers, along with the use of birefringence, infrared dichroism, small-angle x-ray and neutron scattering for studying deformation mechanisms of polymers. Recent efforts have involved studies of polymer blends, model networks, and liquid crystal polymers.

- Optical properties of polymer solids
- X-ray, neutron and light scattering from polymers
- Orientation of polymeric solids
- Thermodynamics and kinetics of phase transitions of polymers
- Morphology of the crystalline and liquid crystalline state
- Microstructure of polymer networks

Recently, Richard Stein chaired a Committee of the National Research Council study of the state of Polymer Science and Engineering in the United States, resulting in the publication of the Report, "Polymer Science & Engineering.—The Shifting Research Frontier". Current efforts are concerned with education, principally at the secondary school level, with production of CD-ROMs and the organization of short courses, workshops and video conferences.

Richard Stein has had a sizable research program with over 100 students and Post Doctoral Research Associates. He published his work in over 400 scientific publications and review articles. He was a member of 5 Editorial Boards, including a Member of the Polymer Journal (Japan) and the Editor of the former Macromolecular Edition, CHEMTRACTS.

Richard Stein's scientific and professional contributions have been recognized by the scientific community. He received awards from the American Chemical Society, the American Physical Society, the Rheology Society, the Society of Plastics Engineers, the

Society for Polymer Science, Japan and the Materials Research Society.

From the Society of Plastics Engineers, he received the International Award in 1969. From the American Chemical Society, he received the Award in Applied Polymer Chemistry in 1972 and the Award in Polymer Chemistry in 1979. From the American Physical Society, he received the Award in Polymer Physics in 1976. From the Society of Polymer Science, Japan, in 1988, he received the Award for Distinguished Service in Advancement of Polymer Science; and in 1993, he was elected an Honorary Member of the Society. From the Rheology Society, he received the Bingham Medal in 1977, and in 1993 he was elected to the Plastics Hall of Fame. In 1993, he was appointed a Visiting Scholar at the Cavendish Laboratory, University of Cambridge, UK.

The University of Massachusetts awarded Richard Stein the Chancellor's Medal in 1978, and the Gordon Research Conferences (Polymers, West) presented him with the Maurice Huggins Award in 1987. He received the Von Hippel Award of the Materials Research Society in 1999.

In 1990, Richard Stein was elected to the National Academy of Sciences, and in 1991 to the National Academy of Engineering and the American Academy of Arts and Sciences.

Richard Stein was awarded honorary doctoral degrees (*honoris causa*) from the University of Ulm, Germany in 1989, from the University of Massachusetts in 1992 and from Polytechnic University, his alma mater, in 1999.

Richard Stein was a Member of the First Delegation in Chemistry to the Peoples Republic of China, a Co-Chairman of the Program Committee of the First U.S.-China Polymer Symposium, a U.S. Coordinator of the First (in 1965) and Second U.S.-Japan Seminars in Polymer Physics. He was also the Whitty Lecturer at the University of Akron in 1985.

Richard Stein was a Member of the National Academy of Sciences Panel on Polymers, and the Committee on Major Facilities for Materials Science (Steir Committee). He was also a U.S. Coordinator of the NSF Bilateral Research Programs in Polymers with Japan and Poland, a Member of the Site Selection Committee of the National Center for Small-Angle Scattering Research of the Oak Ridge National Laboratory, and a Past Member of the Advisory Committee of the NSF Division of Materials Research. He was also a Past Member of the Advisory Committee on Materials, of the Department of Energy, a Member of the Steering Committee for Advanced Neutron Source, an Invitee of the Technical Expert Invitation

Program of the Japan External Trade Organization of the Ministry of International Trade and Industry (MITI), Japan, and a Past Member of the Committee on Science and Technology, Polysar Corporation, Sarnia, Ontario, Canada.

Richard Stein was also the Chairman of the National Research Council Committee on Polymer Science and Engineering, a Member of the National Research Council Solid State Sciences Committee and, most recently the Project Director for the production of the videotape, *Troubled Waters*, on plastics in the marine environment.

Dick Stein enjoys a second home at nearby Lake Wyella, where he has entertained many friends and polymer scientists.

Richard Stein and Judith Balise married in 1951; they have four daughters, Linda, Anne Marie, Carol and Lisa, and six grandchildren.

This article was prepared by **Otto Vogl**, Herman F. Mark Professor Emeritus, Department of Polymer Science and Engineering, University of Massachusetts, Amherst, MA, 01003, USA and **Judith Balise Stein**, Berkshire Terrace, Amherst, MA. [see also *Polymer News*, 8(3), 242 (1987)].

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