



Stanley Backer

STANLEY BACKER

1920–2003

Elected in 1992

“For enhancing the understanding and engineering of fibrous materials to improve their performance in ocean and other engineering applications.”

BY SUBHASH K. BATRA
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STANLEY BACKER, professor emeritus, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, succumbed after a prolonged illness on January 18, 2003, at the age of 82. Born on February 9, 1920, he was the second of three sons of Harry Backer, an immigrant from Lithuania, who owned the Central Clothing Company of Boston, MA. Stan, to his friends and to his students in their later life, attended Boston Latin High School and then entered MIT in 1937. He received his B.S. in engineering and management in 1941.

Upon graduation, Stan joined the military, where his supervisors soon recognized his talents and appointed him technical officer in the Materials Section of the U.S. Quartermaster Corps (QMC). In addition to his duties as a soldier, Stan engaged in research on problems related to textiles used by QMC and was soon promoted to the rank of major.

In 1944, when he completed his military service, he decided to stay on with QMC as a civilian, helping to organize and then direct the Laboratory for Fibrous Materials—a position he held until 1949. During that time he also completed the requirements for an M.S. in textile technology and received his degree from MIT in 1948.

In 1949, Stanley Backer married Esther Ross, a graduate of Radcliffe College with degrees in economics and social work. Esther Backer played a pivotal role in Stan's career. She was not only mother to his children but also a friend and a very gracious host to his visitors and associates; in some ways, she helped raise/mentor some of his students and/or their spouses.

Stan and Esther had two sons, Richard, now an attorney in the San Francisco area, and John, now professor of molecular pharmacology at Albert Einstein Medical School, in New York. John married Amy Ehrlich, an assistant professor of gerontology and director of the Outpatient Clinic at Montefiore Hospital. The couple's three sons, Samuel, Jacob, and Saul, were a source of much joy and pride to Stan in his later years.

When Stan left QMC, he spent a sabbatical year in the United Kingdom, after which he joined MIT as an assistant professor. In addition to teaching, he pursued research under Edward R. Schwarz to complete the requirements for an Sc.D. in mechanical engineering in 1953. He was one of a select group of individuals from around the world dedicated to raising the *craft* of textiles to the *science* of textiles and fibrous materials. The members of this group considered fibers engineering materials and textiles engineered structures.

Some among them, including Stan, approached problems in textile processing as machine-material interactions to be analyzed as engineering problems. These themes became Stan's passion in teaching and research for the rest of his life. Thus, although Stan never joined the family business, his curiosity about fibers and textiles remained the driving force in his teaching, research, and work as a consultant to the government and industry.

Stan's contributions to the understanding of the mechanics of yarns and fabrics, as well as the engineering fundamentals of fiber processing, were acknowledged on both sides of the Atlantic. John Hearle (UMIST), Percy Grosberg (Leeds), Joel Lindberg (Sweden), Joachim Lunenschloss (Aachen), Gerhard Egbers (Denkendorf), and many other contemporaries in Europe became his collaborators in research and related professional activities. Others came to MIT from Australia,

Japan, and Ireland to work with him as research associates. In 1962, his achievements earned him the rank of professor of mechanical engineering, as well as head of the Fibers and Polymers Laboratories at MIT.

Peter Popper, a former student, described Stan as a teacher: “His love of fibers, his technical knowledge, and his ability to make complex problems understandable made him a truly great teacher. Over the years he taught *fiber technology* to several hundred students. Of these, many joined academia, and each of them probably taught well over 100 more. So, Stan’s methods have been taught to thousands of ‘grand-students’ [Stan’s invented term].”

Ron Postle, who was visually impaired and who spent a semester at MIT as a visiting professor during the early 1970s, commented: “My strongest impression is the way Stan formulated and articulated basic concepts of textile engineering problems. These strengths are well documented in his publications, such as *Structural Mechanics* (coauthored with Hearle and Grosberg). Stan presented his work in such a clear and lucid manner that I could fully appreciate his presentations and ideas without the benefit of being able to see his visual aids.”

Victor Li, a colleague, expressed similar sentiments: “Although not widely known, Stan has had a significant impact on the safety and durability of civil infrastructure systems through his involvement in synthetic fiber reinforced concrete material. This has led to a metal-like ductile ECC material recently recognized in *Popular Mechanics* and *Architectural Records*. ECC is now in earthquake resistant buildings and durable bridge decks.”

Stan was one of the first to recognize the interdisciplinary nature of the problems in textiles.

In the mid-1960s, under the sponsorship of the U.S. Department of Commerce, he undertook the Textile Information Retrieval Project, a massive project to develop a comprehensive thesaurus of textile terms and phrases (8,000 keywords and 72,000 related terms). The thesaurus was translated into seven languages and became the foundation for the first online

information retrieval system, allowing simultaneous access to a database of textile information by 25 separate users on two continents. The project involved numerous students, research associates, and corporate and university librarians over many years in seven nations. Throughout this project, the third floor of his house was a repository for files and papers arranged in systematic stacks.

In the early 1970s, Stan worked with MIT colleagues, T. Y. Toong, who was knowledgeable in combustion; G. C. Tesoro, who was knowledgeable in the chemistry of flammability of textile materials; and N. A. Mousa, a graduate student, interested in the problem. Menachem Lewin of the Israel Fiber Institute, Hebrew University of Jerusalem, and Polytechnic University of New York, described the collaboration “Backer’s famous paper published in the form of a small book, *Textile Fabric Flammability*, co-authored with Tesoro, Toong and Mousa (MIT Press, 1976), is an ingenious paper. A unique contribution of this paper was the effect of fabric structural parameters, such as density of weave, fabric weight, distance from the skin (in apparel), on the temperature of the flame, on the rate of propagation of the flame and on the burn injury suffered.”

Stan was always quick on his feet, as was evident to technologists and engineers in DuPont, Burlington Industries, and other companies for which he was a consultant. Paraphrasing Sam Winchester of DuPont, when Stan was “given a description of product-performance or a processing problem, he immediately began defining a plausible model. If given additional facts that called into question the assumption of the model, he easily formulated a revised model to achieve the same goal.” As Peter Popper described him, “Stan helped formulate and execute literally hundreds of research programs related to new fibers, spunbond fabrics, composites, specialty materials, and innovative processes. His consulting style always stimulated new ideas and energized all who came in contact with him.”

Similarly, for Salim Ibrahim of DuPont: “Stan’s creativity and knowledge of engineering materials, processes and mechanics fitted perfectly with the developments of new generics (polyesters, nylons, acrylics, aramids, spandex, spunbond and

spunlaced materials) as well as new yarn and fabric structures (texturing, open-end spinning, bulk-continuous yarns) that required entirely new knowledge to optimize their properties for applications in apparel, homes, industry, and the military. He was able to distill complicated problems into basic elements in a way that enabled even less knowledgeable participants to understand them and therefore contribute to their solutions. One rarely left a meeting with Prof. Backer without getting an insight and a direction of where to go next. His gift for enabling his audience to understand complex concepts made him a very popular lecturer and his lecture rooms were always full.”

Stan was extensively involved in professional societies, journals, and governmental committees. He was member of the Society of Rheology (1957-1995), American Academy of Mechanics (1978-1995), TAPPI (1984-1990), ASME (1957-), and the Textile Institute (1954-). He joined the Fiber Society in 1950, later served as a member of the Governing Council and as president; he remained a mentor throughout his life to those who followed. He inspired the formation of the Textile Information Users Council (TIUC). He was named an honorary member of ASTM in 1972 and served as member and chair of the Committee D-13 (1975-1979); in addition he was a member of the ASTM Howard DeWitt Smith Award Committee for many years. He served on the editorial boards of the *Journal of Composite Materials* (1966-1971), *Textile Research Journal* (1972-1999), and Marcel Dekker, Fiber Series (1978-1997) and was a consulting editor for *Fiber Science and Technology Journal* (1968-1985) and the *International Journal of Mechanical Engineering Education* (1981-1988).

His public service included several years as chair of the National Research Council (NRC) Quartermaster Advisory Board, Committee on Textile Fabrics (1957-1966), chair of the NRC ad hoc Textile Research Committee (1961-1962), public member for Massachusetts on the New England Governors Textile Committee (1958-1961), member of the NRC ad hoc Committee on Personnel Selection for Army Laboratories at Natick (1972-1973), member of the NRC Advisory Board on Military Personnel Supplies, Commission on Socio-Technical

Systems (1974-1977), and member of the NRC Committee on Renewable Resources for Industrial Materials, Fiber Panel (1975-1976).

His achievements are reflected in his more than 90 papers, contributions to three books, and seven patents. For his scholarly publications and lectures and his public service he received numerous honors and awards: Harold DeWitt Smith Medal; ASTM D-13 (1962); first Academic Fiber Society Lecturer (1964-1965); Honorary Member, ASTM (1972); Honorary Life Member, European Council of Textile Research Directors (1972); TIUC "Backer" Award (1972); Honorary Fellow, Textile Institute (1973); the first Kenneth L. Hertel Lecturer (1976); Edward E. Schwarz Memorial Lecturer, ASME (1979); Gossett Lecturer, North Carolina State University (1981); Honorary Member, The Fiber Society (1986); Member, National Academy of Engineering (1992); the first Carothers Medal, Textile Institute, UK (1992).

After a long and distinguished career in teaching and research, at the age of 69, Stan retired to become an emeritus professor and senior lecturer in the Department of Mechanical Engineering. This remarkable, brilliant, unforgettable person and man of honor respected all others and helped many to pursue their education, careers, and even personal lives. His love for his colleagues and students is apparent in his last publication, *100 Years of Textiles at MIT*, a volume that contains brief biographies of most of those who were touched by him.

He is survived by his wife, Esther Backer; his sons, Richard and Jonathan Backer; his grandsons, Samuel, Jacob, and Saul Backer; and his brother, Morton Backer.

