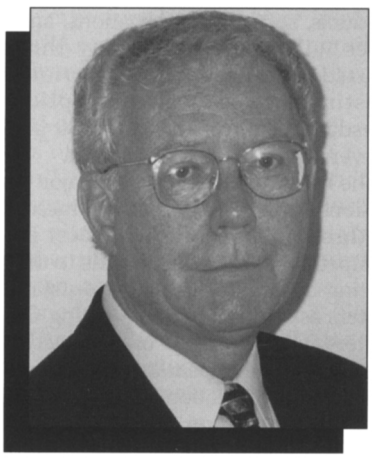
Larry L. Hench to Receive Von Hippel Award for Contributions to the Field of Glass and Ceramics

The Materials Research Society's highest honor, the Von Hippel Award, this year will be given to Larry L. Hench "for pioneering accomplishments in the field of glass and ceramics including the demonstration of the first bioactive glass called Bioglass® and subsequent expansion of the field, demonstration of the feasibility of encapsulating nuclear waste products in glass/ceramic matrices, and development of sol gel processing to produce ultrahigh purity optical and dielectric materials with controlled microstructures." The Von Hippel Award is given annually to an individual in recognition of outstanding contributions to interdisciplinary research on materials.



Larry L. Hench

Hench is currently Professor Emeritus at the University of Florida; professor of Ceramic Materials at Imperial College of Science, Technology and Medicine at the University of London; and associate director of the Interdisciplinary Research Centre in Biomedical Materials at the University of London. After 32 years at the University of Florida, he accepted a chaired position at the Imperial College. During his career, Hench has worked in three multidisciplinary fields with important societal impact: bioactive medical materials, materials for radioactive waste disposal, and sol gel processing of microoptics and optical sensors.

In 1969, Hench discovered Bioglass®, a compositional range of Na_2O-CaO-P_2O_5-SiO_2 glasses, which was the first fabricated material that bonded to living tissues. This discovery created the field now known as bioactive materials and has directly benefited millions of patients worldwide. Today, more than 80 laboratories in 20 countries are investigating bioactive materials for use as medical and dental implants. For over 15 years bioactive glasses, ceramics, and glass-ceramics have been used clinically to replace many different parts of the body, including the middle ear bone, teeth, vertebrae, orbit of the eye, knees, for anchoring of total hip, and for sensory prostheses. Recently, Hench and his colleagues discovered that the most bioactive glass compositions can also enhance bone proliferation to such an extent that it can be used to prevent loss of teeth from periodontal disease and to stimulate repair of bone in revision surgery of failed total hip and total knee replacement.

The safety and reliability of Bioglass® is largely based upon the methodology of basic and applied research developed by Hench and his team at the University of Florida over the last 27 years. His multidisciplinary studies have also involved the collaboration and training of biomedical materials scientists from around the world. He has co-authored papers on this topic with scientists from England, Finland, the Netherlands, Japan, Brazil, China, Germany, Belgium, Italy, and France. When Hench began his work in this new field, no teaching materials existed. Over the years he has helped to fill this void, authoring or co-editing six books that describe advances in the field.

He also contributed to the commercial development of Bioglass® products, including two FDA-approved products: Perioglass® for periodontal repair and ERMI® for filling spaces left from tooth extraction, and MEP® to replace middle ear bones.

Since 1976, Hench has been active in research in the use of glass and ceramic materials for storage of nuclear high-level waste (HLW). Together with colleagues at the University of Florida, Hench identified and categorized the mechanisms and rate of corrosion of glasses containing HLW, applying for the first time new surface analytical techniques to the problem, including the now-standard Auger electron spectroscopy (AES), x-ray photoelectron spectroscopy (XPS), and secondary ion mass spectrometry (SIMS). The corrosion and HLW leaching of glass/ceramics was categorized into five types and the rates modeled as a function of time, temperature, pH, surface-to-volume ratio, and flow rate.

These studies led to the development of the science of entrapment of HLWs in glass/ceramics. Along with this work, Hench worked actively to help establish policies and procedures for the accommodation of multiple forms of HLWs for disposal using this new science. Performance tests were conducted in the United States and collaboratively with Great Britain, Sweden, Belgium, Canada, West Germany, Switzerland, France, Italy, and Japan. Based on the results of these studies, borosilicate glass was selected as the preferred disposal media and adopted by several countries. Hench chaired the 1981 peer review panel that evaluated the data and recommended this decision. A second study in 1980–1982, in which HLW storage reliability was tested under simulated repository conditions, led to an international consensus on the safety of borosilicate disposal.

Toward the end of the 1980s Hench also undertook the commercialization of glass-ceramic products based on sol gel processing of silica. This new research led to the development of a new generation of gel-glass products, including net-shape, net-surface diffractive optics, and porous optical matrices for environmental sensors and hybrid optics. His work led to several patents in this area and enabled him to further develop the routes for technology transfer between the university and industry. He was a founding partner of a small business, Geltech, which developed commercial applications for his sol gel ideas. As a result, 15 million gel silica optical matrices were sold in 1995. Sol gel processing has also produced a commercial sensor used to detect carbon monoxide for human health protection.

Hench has held many national and international positions, has served on the editorial boards of eight professional journals, consulted for 11 governmental/industrial organizations, and has chaired or co-chaired 13 national or international scientific conferences. He holds numerous patents and has edited, authored, or collaborated on 24 books and hundreds of scientific papers. His multidisciplinary studies have involved colleagues from many universities around the world.

In addition to his many achievements in both pure and applied science, Hench is widely admired for his exceptional willingness to spend time and provide support for students and colleagues and to devote the time and effort to organize, manage, and locate funds to create and maintain a productive research group and laboratory.

Hench will accept the Von Hippel Award at the 1998 MRS Fall Meeting in Boston on December 3 at 6:00 p.m., at Salon E, Boston Marriott. Following the awards ceremony, he will speak on "Medical Materials for the Next Millennium." MRS