Journal of Electroceramics, 8, 85, 2002

Special Issue Editorial

This Special Issue of the Journal of Electroceramics is dedicated to Professor Robert E. Newnham, Alcoa Professor Emeritus of Solid State Science at the Pennsylvania State University. Dr. Newnham is one of the world's foremost authorities in the field of electroceramics and has been conducting research at Penn State's Materials Research Laboratory for over 35 years. During this time he has authored or co-authored over 500 papers and served as thesis advisor for 37 Ph.D. students, 39 M.S. students and 43 B.S. students. He is a Distinguished Life Member of the American Ceramic Society. A more comprehensive biography can be found in the August 1999 issue of *Ceramic Bulletin*. A thorough accounting of his career accomplishments, awards, bibliography, and a listing of his graduate students can be found on his personal web page at *http://www.personal.psu.edu/staff/r/e/ren1/index.htm*

Many of the contributing authors of the papers in this issue can trace his or her academic lineage back to Dr. Newnham. He was the Ph.D. advisor to Ahmed Amin, Ahmad Safari, Bill Carlson, Jim Tressler, and Rattikorn Yimnirun. Maureen Mulvihill obtained her masters under his guidance. Kenji Uchino was a Research Associate for Prof. Newnham in the late 1970s, as was Rich Meyer in the late 1990s.

Dr. Newnham is one of the pioneers in the study of piezoceramic-polymer composites. In 1989 he was inducted into the National Academy of Engineering "For contributions to the development of composite materials for electronic applications." Most of the papers in this issue can be related back to Dr. Newnham's seminal work on connectivity and its relationship to composite performance. Ahmed Amin discusses the importance of connectivity in his development of 1-3 arrays for infrared cameras. Kim Benjamin describes his methods of constructing a doubly-curved 1-3 conformal array as well as a conical 2-D conformal array for underwater imaging applications. Sun and Carlson report on their work utilizing solid freeform fabrication to construct new 1-3-0 composite designs for enhanced hydrostatic piezoelectric response. By exploiting the product property of composites, Ryu et al., describes the improvement in the magnetoelectric effect in laminate composites as compared to single phase materials. Allahverdi and his co-authors from Prof. Safari's group at Rutgers report on a novel technique to more easily fabricate complex net shape electroceramic actuators, not only from conventional PZT piezoceramics, but from new high-strain single crystal ceramics as well. Mulvihill and her collaborators discuss the development of a multilayer actuator capable of high displacement at cryogenic temperatures for use in the next generation space telescope.

In the mid- to late 1990's, Prof. Newnham and his students focused on a new type of composite transducer design, the so-called 'moonies' and 'cymbals'. The 'moonie' design, with its high receive sensitivity and hydrostatic pressure tolerance, was commercialized as an underwater hydrophone for use in oil exploration. At the time, it was Penn State's most lucrative patent. The 'cymbal' is detailed in two papers in this issue. Meyer and his colleagues provide an in-depth analysis of the mechanical performance of the cymbal actuator in order to provide insight into improved manufacturing techniques. Tressler and Howarth compare the underwater acoustic performance of cymbal-based electroacoustic projectors to 1-3 piezocomposite materials.

Newnham's most recent Ph.D. graduate, Rattikorn Yimnirun, reports the apparent electrostrictive coefficients of several common dielectric materials and describes the instrumentation used to obtain these results.

The editors would like to commend Professor Newnham on his many accomplishments in the field of electroceramic composites and dedicate this Special Issue as a tribute to his work.

James F. Tressler
Kenji Uchino
Guest Editors