

ACOUSTICAL SOCIETY OF AMERICA

GOLD MEDAL



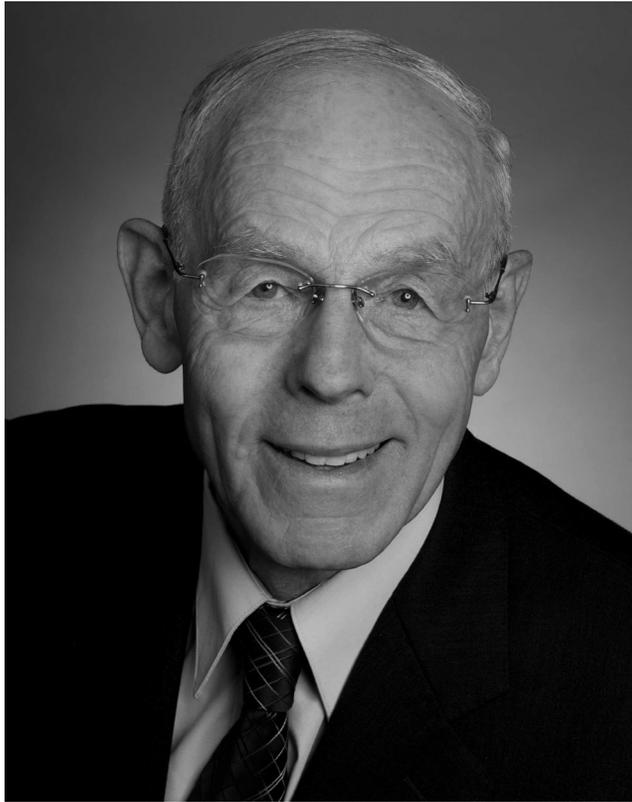
Gerhard M. Sessler

2015

The Gold Medal is presented in the spring to a member of the Society, without age limitation, for contributions to acoustics. The first Gold Medal was presented in 1954 on the occasion of the Society's Twenty-Fifth Anniversary Celebration and biennially until 1981. It is now an annual award.

PREVIOUS RECIPIENTS

Wallace Waterfall	1954	Ira J. Hirsh	1992
Floyd A. Firestone	1955	David T. Blackstock	1993
Harvey Fletcher	1957	David M. Green	1994
Edward C. Wentz	1959	Kenneth N. Stevens	1995
Georg von Békésy	1961	Ira Dyer	1996
R. Bruce Lindsay	1963	K. Uno Ingard	1997
Hallowell Davis	1965	Floyd Dunn	1998
Vern O. Knudsen	1967	Henning E. von Gierke	1999
Frederick V. Hunt	1969	Murray Strasberg	2000
Warren P. Mason	1971	Herman Medwin	2001
Philip M. Morse	1973	Robert E. Apfel	2002
Leo L. Beranek	1975	Tony F. W. Embleton	2002
Raymond W. B. Stephens	1977	Richard H. Lyon	2003
Richard H. Bolt	1979	Chester M. McKinney	2004
Harry F. Olson	1981	Allan D. Pierce	2005
Isadore Rudnick	1982	James E. West	2006
Martin Greenspan	1983	Katherine S. Harris	2007
Robert T. Beyer	1984	Patricia K. Kuhl	2008
Laurence Batchelder	1985	Thomas D. Rossing	2009
James L. Flanagan	1986	Jiri Tichy	2010
Cyril M. Harris	1987	Eric E. Ungar	2011
Arthur H. Benade	1988	William A. Kuperman	2012
Richard K. Cook	1988	Lawrence A. Crum	2013
Lothar W. Cremer	1989	Brian C. J. Moore	2014
Eugen J. Skudrzyk	1990		
Manfred R. Schroeder	1991		



ENCOMIUM FOR GERHARD M. SESSLER

... for the development of electret and silicon-based micromachined microphones

PITTSBURGH, PENNSYLVANIA • 20 MAY 2015

Gerhard M. Sessler received his Ph.D. from the University of Göttingen in 1959 under the supervision of Professor Erwin Meyer. Upon graduation, he moved to the United States where he joined the technical staff in the Acoustics Research Department at Bell Laboratories. There he worked on acoustic transducers, room acoustics, and studies of transducer materials until 1975 when he returned to academia in Germany. He served as Professor of Electrical Engineering at the Darmstadt University of Technology from 1975 to 1999 and as Professor emeritus from 1999 to the present. He continues to be active in research.

At Bell Labs, Gerhard's major contribution was the development of the electret microphone in the early 1960's, together with James E. West. The electret microphone has dominated the microphone market for over 40 years, with recent production rates of more than 2 billion per year, for applications ranging from toys to cell phones to professional studio and measuring microphones. Electret microphones allowed, for the first time, practical directional arrays ranging from a simple differential transducer to broadband higher-order arrays with toroidal and other polar characteristics. Companies such as Brüel & Kjær utilize electret transducers for high precision measuring microphones with good thermal stability.

The research that led to the electret microphone forged lifelong personal relationships that resulted in collaborations leading to many new concepts in transducers, room acoustics, physical acoustics, electroactive transducer materials, and atmospheric acoustics. These included measuring the very low frequency sound generated from rockets launched in Florida that reached Murray Hill, New Jersey after travelling through the atmosphere for a distance of about a thousand miles.

Despite the dominance of electret microphones, Gerhard realized that even smaller transducers would be necessary, as communications devices were destined to become smaller. He also realized that techniques similar to those used for integrated circuit production could be used to make transducers that had the potential to become the microphones of the future. With this vision he began a rigorous program at the Technical University of Darmstadt on silicon based transducers using techniques developed for micro-electro-mechanical-systems (MEMS) sensors. Gerhard and his students were the first to introduce an integrated silicon condenser microphone (1983), and later he showed that the small air gap typical for these transducers drastically reduced the required bias voltage to levels available in integrated circuit systems. MEMS microphones are now in production and have begun to replace electret microphones in cell phones and other applications where space is restricted and the matching of microphones for array processing is important. Today, more than a billion units per year are produced based on the principles first published by Gerhard and his students.

Professor Sessler is a successful university professor. All of his former Ph.D. students are working in acoustics and three are professors at universities in Germany. One graduate student, Jens Meyer, together with Gary Elko, invented a small spherical microphone array based on new technology that drastically reduced both the size and signal processing required to form directional beams. They further developed this technology and later formed a company to produce a spherical array known as the Eigenmike.

Recently, Gerhard investigated cellular polypropylene films poled by breakdown charging the air voids resulting in a charge separation within the voids resembling dipoles. The poled films, also referred to as ferroelectrets, have piezoelectric coefficients higher by an order magnitude than found in other polymer materials. These high values make this material ideal for flat panel loudspeakers, with applications in mobile and smart phones, but also for microphones, ultrasonic, and electromechanical transducers, and for energy harvesters.

Gerhard Sessler also contributed to the introduction of digital signal processing for the evaluation of small and large auditoriums and concert halls. These methods were first used

for the evaluation of the acoustics of Philharmonic Hall in New York, directed by Manfred R. Schroeder. Later on, together with Jim West, he discovered what is known as the seat dip effect, the frequency dependent attenuation due to the spacing between seat rows, and improved knowledge influencing concert hall design.

It is important to note that Gerhard is not only an engineer inventing new technical devices, he is also a careful physicist who cares for the basic understanding and the physics behind his inventions. For example, he systematically examined the charge storing mechanisms in many electret materials and piezopolymers as well as in the new ferroelectrets. He is author of more than 150 articles in peer-reviewed journals including 21 in the *Journal of the Acoustical Society of America*, and of several textbooks on acoustics and charge storage in polymers. His books on charging effects, distributed all over the world, have become the basic textbooks on this topic. He was also co-author with Ning Xiang of a memorial volume published in 2014 in honor of Manfred R. Schroeder, his friend and collaborator at Bell Laboratories. Gerhard holds over 100 international patents and 21 U.S. patents. The first one on the electret microphone with James E. West, was issued on January 14, 1964.

Gerhard Sessler is Fellow of the Acoustical Society of America, the Institute of Electrical and Electronics Engineers, and the American Physical Society. His professional achievements have been honored by numerous prestigious scientific awards including the Callinan Award of the Electrochemical Society, the Senior Award of the IEEE Group on Audio and Electroacoustics, the Thomas W. Dakin Award of the IEEE Dielectrics and Electrical Insulation Society, the Helmholtz-Rayleigh Interdisciplinary Silver Medal of the Acoustical Society of America, the Benjamin Franklin Medal in Electrical Engineering of the Franklin Institute, and the IEEE Maxwell Award (IEEE and Royal Society of Edinburgh), several of these together with Jim West. He was inducted into the US National Inventors Hall of Fame in 1999.

Gerhard Sessler has devoted most of his adult life exploring new ideas in acoustics, and undoubtedly he will continue contributing to the advancement of this field of science. In recognition of his extraordinary contributions to acoustics, we congratulate Gerhard M. Sessler for being awarded the Gold Medal of the Acoustical Society of America.

REINHARD LERCH
JAMES E. WEST