

Helmholtz-Rayleigh Interdisciplinary Silver Medal in Psychological and Physiological Acoustics, Speech Communication, and Signal Processing in Acoustics: Blake S. Wilson

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ACOUSTICAL SOCIETY OF AMERICA

HELMHOLTZ-RAYLEIGH INTERDISCIPLINARY

SILVER MEDAL

in

Psychological and Physiological Acoustics,
Speech Communication, and Signal Processing in Acoustics



Blake S. Wilson
2017

The Silver Medal is presented to individuals, without age limitation, for contributions to the advancement of science, engineering, or human welfare through the application of acoustic principles, or through research accomplishment in acoustics.

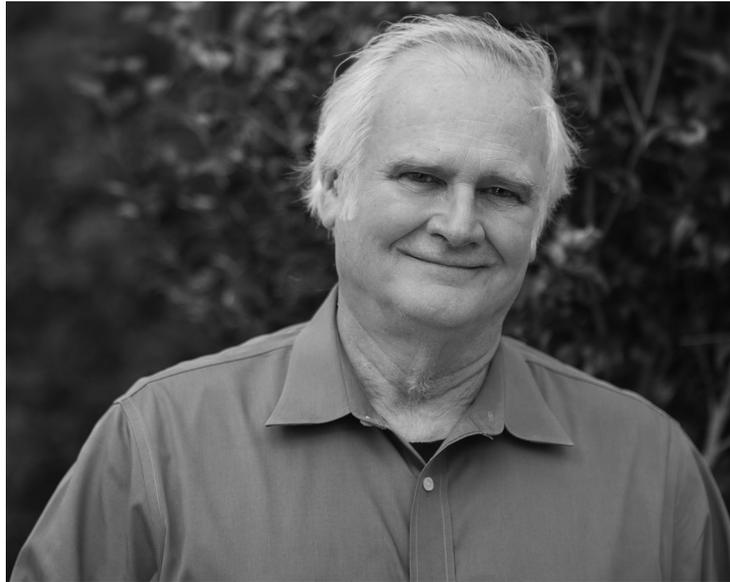
PREVIOUS RECIPIENTS

Helmholtz-Rayleigh Interdisciplinary Silver Medal

Gerhard M. Sessler	1997	Edwin L. Carstensen	2007
David E. Weston	1998	James V. Candy	2008
Jens P. Blauert	1999	Ronald A. Roy	2010
Lawrence A. Crum	2000	James E. Barger	2011
William M. Hartmann	2001	Timothy J. Leighton	2013
Arthur B. Baggeroer	2002	Mark F. Hamilton	2014
David Lubman	2004	Henry Cox	2015
Gilles A. Daigle	2005	Armen Sarvazyan	2016
Mathias Fink	2006		

Interdisciplinary Silver Medal

Eugen J. Skudrzyk	1983
Wesley L. Nyborg	1990
W. Dixon Ward	1991
Victor C. Anderson	1992
Steven L. Garrett	1993



ENCOMIUM FOR BLAKE S. WILSON

... for contributions to the development and adoption of cochlear implants

BOSTON, MASSACHUSETTS • 27 JUNE 2017

Blake S. Wilson directed the Neuroscience Program, then the Center for Auditory Prosthesis Research, at Research Triangle Institute in North Carolina, over a 20+ year period beginning in 1983. During this time, Blake and his research teams developed a suite of highly effective signal processing strategies for cochlear implants—devices that restore hearing and speech understanding to infants born deaf and to adults who have lost most, or all, of their hearing. Today, the signal-processing strategies developed by Blake and his teams, or direct descendants of those strategies, are the heart of the cochlear implants used worldwide by over 400,000 individuals ranging in age from a few months to over 100. Cochlear implants are the first and most successful neural prosthesis for a sensory system and have been described as one of the most significant medical developments in the second half of the twentieth century. Blake's work has been central to this remarkable achievement.

Blake received a B.S. in Electrical Engineering from Duke University in 1974 and probably set a record for the number of humanities courses, predominately English, taken by an EE major. Having educated both sides of his brain, he immediately went to work down the road at the Research Triangle Institute (now RTI International) where he stayed for 33 years working his way up from Research Engineer to Senior Fellow. He became Chief Strategy Officer for MED-EL GmbH, a manufacturer of cochlear implants, in 2007, and in 2008 he founded the Duke Hearing Center, with Debara L. Tucci, M.D. The next year he became director of the MED-EL Laboratory for Basic Research.

Blake's first paper was on "pinna reflections as a cue for localization." (*J. Acoustical Soc. Am.* 56, 957-962, 1974). Other early publications reported results on bat biosonar and the effects of microwave action on the auditory system. His introduction to the problems resulting from deafness came from a project in which the outputs of speech analyses were sent to LED displays mounted on the frame of eyeglasses worn by the deaf in an effort to disambiguate visual information about speech.

This experience led to a successful bid on a contract from the Neural Prosthesis Program at the National Institutes of Health (NIH) in 1983 to design signal-processing strategies for cochlear implants. At this point in the development of cochlear implants, despite the presence of as many as 22 electrodes in the cochlea, speech-understanding scores were very poor. What was missing was a highly effective signal-processing strategy. In 1989, Blake and his team invented and began to test such a strategy--the continuous interleaved-sampling strategy or CIS, building on previous work at the University of San Francisco by Michael Merzenich, at Stanford University by Robert White and Blair Simmons, and at the Massachusetts Eye and Ear Infirmary by Donald Eddington and William Rabinowitz. In this strategy, speech is filtered into a number of bands, the energy in each band is estimated and pulses, proportional to the energy in the band, are output to electrodes in the scala tympani. Two aspects of this strategy were critical to its success. First, the pulses were sequenced over time in an interleaved fashion across electrodes so that vector summation of electric fields, that would arise from simultaneous pulse outputs, was minimized.

Second, the rate of stimulation was much higher than had been used before and, as a consequence, both spatial information about place of cochlear stimulation and temporal information were represented. The results of the first clinical test of this strategy were published in 1991 in *Nature* (*Nature* 352: 236-238, 1991). Scores on tests of sentence understanding in quiet improved significantly with the majority of the patients achieving scores of greater than 90% correct. This paper heralded a new era in the field of sensory prosthetics and is the most cited paper in the field of cochlear implants. Later work by Blake and his research teams produced multiple variants of this strategy, all of which are used in cochlear implants today.

Blake has been the recipient of many awards as is fitting for a person making discoveries that have restored functional hearing for deaf infants and deafened adults. These include the Lasker-DeBaakey Clinical Medical Research Award (2013) “for the development of the modern cochlear implant” and the Fritz J. and Dolores H. Russ Prize from the National Academy of Engineering (2015) “for engineering cochlear implants that allow the deaf to hear.” As befits his multidisciplinary work, he was awarded two honorary degrees in medicine in 2015, one from Uppsala University, Sweden, and one from the University of Salamanca, Spain.

Two aspects of Blake’s career are critical to an appreciation of his achievements. First, his discoveries with respect to signal processing for cochlear implants came when he was armed with only a baccalaureate degree in EE. He did not have a Ph.D. program to teach him the research enterprise, or a postdoctoral fellowship in an important laboratory to sharpen his skills. He made his discoveries by building a multi-disciplinary research team and then spending decades of long hours in the laboratory. Having made the odd discovery or two, he then acquired a D.Sc. degree from the University of Warwick in the U.K., a Doctor of Engineering degree from the University of Technology, Sydney, and a Ph.D. in EE from his Alma Mater, Duke University.

Second, early on in his tenure at RTI, Blake, working in conjunction with the RTI administration, made the well-considered decision to place all of his work in the public domain and, in doing so, to relinquish rights to his intellectual property. This decision was made in order to speed the adoption of his work by manufacturers of cochlear implants. A conservative estimate of the value of his intellectual property rights is 10’s of millions of dollars.

Given his long time residence in the Raleigh Durham area, it is no surprise that Blake is an avid fan of Duke basketball and Coach K. Indeed, it was Duke basketball that gave Blake his largest audience. Several years ago, during a nationally televised game, the TV camera was panning over the audience and settled on Blake, who looked very comfortable in the ‘standing room only’ section. He is a tennis fan, as well as enthusiastic player, and can regularly be seen poring over scientific texts while sporting the colorful shoes of his on-court heroes.

There is no question that Blake’s pioneering research on cochlear implants has linked auditory physiology with auditory perception, and speech perception and spoken-language processing in adults and children. His life’s work has made a major contribution to improving the quality of life for many profoundly deaf individuals. For these reasons, we are pleased to congratulate Blake Wilson for being awarded the ASA Helmholtz-Raleigh Interdisciplinary Silver Medal in Speech Communication, Psychological and Physiological Acoustics and Signal Processing in Acoustics.

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