

University Faculty Scholars Recognition Program
Nominee: PROFESSOR MICHAEL D. ZOLTOWSKI
Nominator: SCHOOL OF ELECTRICAL & COMPUTER ENGINEERING

The School of Electrical and Computer Computer Engineering nominates Professor Michael D. Zoltowski as a University Faculty Scholar based on the scholarly achievements described below.

Research Area: Smart Antennas. Professor Michael Zoltowski is recognized nationally and internationally as a pioneering researcher and leading expert on space-time signal processing for wireless communications. The combination of multiple antennas and space-time signal processing is referred to as a “smart antenna.” Smart antennas allow an electronic receiver to discriminate and separate multiple information bearing signals overlapping in time and occupying the same frequency band based on their respective directions of arrival. Smart antennas may be employed at a base station in cellular communications or on a personal communication device, for example, to substantially improve both the channel capacity and the quality of wireless communications.

Paper Awards. Professor Zoltowski’s excellence in scholarly research on smart antennas is evidenced by the fact that he has received three prestigious Paper Awards from the Institute of Electrical and Electronics Engineers (IEEE), the largest technical professional society in the world. In 1991, he received a *Young Author Best Paper Award* (requires the author to be under 30 when the paper was submitted) from the Signal Processing Society (SPS) of IEEE for a breakthrough result in two-dimensional direction-of-arrival estimation. He pioneered a rooting algorithm for simultaneously estimating the azimuth and elevation angle of each signal incident upon a smart antenna that averts the high computational complexity and numerical problems of searching a multi-dimensional, multi-modal spectrum. Because the fundamental theorem of algebra does not hold with polynomials in two or more variables, a rooting scheme for two-dimensional direction-of-arrival estimation was previously thought not possible.

In 1998, Professor Zoltowski received the prestigious “Fred Ellersick MILCOM Award for Best Paper in the Unclassified Technical Program” at the *IEEE Military Communications (MILCOM ’98) Conference* for novel work on mitigating multipath propagation effects (reflections off of buildings and other structures) in high-speed wireless digital communications through space-time equalization in subbands. His third paper award was received just last month at the *IEEE International Symposium on Spread Spectrum Techniques and Applications (ISSSTA 2000)*, held 6-8 September 2000, for work on suppressing interference in cellular communication systems based on the widely used multi-user access technique of Code Division Multiple Access (CDMA).

The award winning work presented at ISSSTA 2000 was detailed in a series papers on methods for combating both multipath and interference effects in high-speed wireless digital communications using a smart antenna at the mobile phone hand-set composed of two antennas. This work has received widespread coverage in the popular press including articles in the Los Angeles Times, the Chicago Tribune, MIT’s Technology Review, Wireless Europe Magazine, and Mobile Computing Magazine.

Professional Society Honors. Professor Zoltowski’s international reputation is further evidenced by his election as a Member-at-Large of the prestigious Board of Governors of the Signal Processing Society (SPS) of IEEE in 1996; SPS is one of the largest societies of IEEE with over 15,000 members around the world. Shortly after that, he was elected to the Executive Committee of the Signal Processing Society. The members of both the Executive Committee and the Board of Governors are senior researchers with long-standing and sustained important contributions to the field of signal processing. Professor Zoltowski is currently the youngest member of both bodies and is among one of the youngest persons ever to be elected to these highest positions within the Signal Processing Society.

In 1998, Professor Zoltowski was elected a Fellow of IEEE. The IEEE Grade of Fellow is “conferred by the Board of Directors upon a person of outstanding and extraordinary qualifications and experience in IEEE designated fields, and who has made important individual contributions to one or more of these fields.” One of the youngest persons to receive this honor, his citation reads “for contributions to the theory of antenna array signal processing and two-dimensional direction-of-arrival estimation.”

Distinguished Lectures. Invited Distinguished Lectures serve as further evidence of Professor Zoltowski's national and international recognition for scholarly achievement. In 1997, he was one of four speakers asked to deliver an *Expert Summary* at the *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)* in Munich, Germany. ICASSP is the premier conference in signal processing. In 1999 alone Professor Zoltowski was invited to speak at four different universities. On 12 May 1999, he gave an invited Colloquium lecture in the "Eminent Speaker Series" at the University of Virginia. On 1 November 1999, he gave a presentation in the "Cullimore Memorial Distinguished Lecturer Series" at The New Jersey Institute of Technology. He also delivered invited presentations in Communications Area Seminars at the University of Illinois at Chicago on 2 June 1999 and at Northwestern University on 12 November 1999. On 1 December 2000, Professor Zoltowski will be delivering an invited Colloquium to the Dallas Chapter of the IEEE Signal Processing Society.

Government Panels and Briefings. Professor Zoltowski's research has been used in high level briefings to oversight committees by the program managers of the funding agencies that support his research. For example, Dr. Jon Sjogren, Manager of the *Signal Processing, Communications, & Surveillance Program* of the Air Force Office of Scientific Research (AFOSR) has highlighted his research at the following advisory board briefings: (i) Annual AFOSR Review in Nov. 1995 (4 Principal Investigators highlighted), (ii) USAF Scientific Advisory Board in Feb. 1996 (2 PI's highlighted), (iii) National Academy of Sciences Review in Feb. 1996 (8 PI's highlighted), and (iv) DDR&E (Pentagon) Review in April 1996 (only 3 PI's highlighted for all of AFOSR Mathematics/Geoscience.) In addition, in April 1995 at the request of Dr. John Cozzens, Program Manager of the *Signal Processing Systems Program* at the National Science Foundation (NSF), Professor Zoltowski organized and chaired an Array Signal Processing Workshop at the NSF Building in Arlington, VA. He compiled and edited a Proceedings of the workshop which is posted at the NSF web site. He was also 1 of 23 researchers from around the country invited to an NSF sponsored Future of Signal Processing Panel Workshop in August 1996, and 1 of 25 researchers from around the world invited to an NSF sponsored Workshop on Wireless Information Technology and Networks in November 1998. In both cases, he contributed to panel summaries posted at the NSF web site. He has also served on numerous proposal review panels for NSF.

Excellence in Education. Professor Zoltowski's excellence in education is indicated by a number of honors. For the 1990-1991 academic year, he received the *Ruth and Joel Spira Outstanding Teacher Award* presented annually to "an individual who has excelled in teaching and inspiring students in the School of Electrical Engineering." Professor Zoltowski has also demonstrated innovation and excellence in distance teaching through the Continuing Engineering Education (CEE) Program. In July 1999, he received a Letter of Commendation from the Dean of Product Planning and Curriculum Development at General Motors which read "In the past, you received a letter of commendation from us regarding your superior teaching performance. We again noted from our student evaluations of Winter 1999 that you provided an outstanding level of instruction in the course you taught that semester as well." His commitment to education is also exemplified by his service as a member of the Standing Committee on Signal Processing Education for the IEEE Signal Processing Society during 1993-1999. In 1999, this committee was elevated to Technical Committee status and he was appointed a "founding member."

University Service. At the University-Wide level, Professor Zoltowski has served on the Minorities Advisory Committee each year since 1997, selecting recipients for Graduate Opportunities Fellowships. At the Engineering-Wide level, he was twice elected by his colleagues to represent the School of Electrical and Computer Engineering on the Committee for Faculty Relations. At the Department level, he has served on numerous committees; he currently serves on the Graduate Committee. In addition, he has presented an overview of the electrical engineering profession to freshmen in ENGR100 each year since 1993, representing the School of Electrical and Computer Engineering.

Summary. Professor Zoltowski is a truly outstanding member of the Purdue Engineering Faculty. Based on his world-class excellence in all aspects of research, teaching, and service, the School of Electrical and Computer Engineering provides its strongest possible endorsement of the nomination of Professor Michael D. Zoltowski as a University Faculty Scholar.