

Wireless Integrated MicroSystems (WIMS): Coming Revolution in the Gathering of Information

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This paper traces the development of silicon sensor technology from its roots at Stanford in the mid-60s through microelectromechanical systems (MEMS) to the recent emergence of wireless integrated microsystems (WIMS). The process technologies that have made an impact on the field are reviewed along with the resulting device structures. Discrete passive sensors have been replaced by devices incorporating active electronics for addressing, signal conditioning, and multiplexing, with resulting impacts on packaging, testing, and cost. Today, sensors are being merged with low-power circuitry, wireless interfaces, and wafer-level packaging to form button-sized information-gathering modules that will revolutionize information gathering. These microsystems are targeted at a size of 1cc, a power dissipation of <1mW, and a range from 1cm to 1km. Such devices will be built on generic platforms that are digitally compensated and self-testing. Recent progress will be illustrated by two microsystems: a chronically-implantable neural prosthesis that represents an electronic interface to the central nervous system, and a wristwatch-size environmental monitor containing an integrated gas chromatograph for applications in pollution control and homeland security.

Kensall D. Wise received the B.S.E.E. degree from Purdue University, West Lafayette, IN, in 1963, and the M.S.E.E. and Ph.D. degrees in electrical engineering from Stanford University, Stanford, CA, in 1964 and 1969, respectively. From 1963 to 1965 and from 1972 to 1974 he was a Member of Technical Staff at Bell Telephone Laboratories. In 1974 he joined the Department of Electrical Engineering and Computer Science at the University of Michigan, where he is now the William Gould Dow Distinguished University Professor and the J. Reid and Polly Anderson Professor of Manufacturing Technology. He is currently serving as Director of the NSF Engineering Research Center for Wireless Integrated MicroSystems. He is a fellow of the IEEE and the AIMBE and a member of the United States National Academy of Engineering.