Distinguished Visitor Programme

Prof Murray Sachs
Director, Whitaker Biomedical Engineering, John Hopkins University School of Medicine

Biography

Prof Murray B. Sachs is Massey Professor and Director of the Department of Biomedical Engineering at the Johns Hopkins University School of Medicine and Director of the Whitaker Biomedical Engineering Institute at Johns Hopkins University. His present appointments at Johns Hopkins University School of Medicine also include Professor of Neuroscience and Professor of Otolaryngology.

Prof Sachs was educated at the Massachusetts Institute of Technology and received his PhD in Electrical Engineering and Auditory Physiology in 1966. From 1968-1969 he was a Postdoctoral Fellow at the University of Cambridge, United Kingdom. Prof Sachs' current professional activities include membership of the Board of Scientific Counselors, National Center for Research Resources, National Institutes of Health, as well as of the Ad-Hoc Program Advisory Committee, Cochlear Implant Program, Massachusetts Institute of Technology.

Prof Sachs joined the faculty of Johns Hopkins University in 1970, the same year the biomedical engineering department was formed. Research by Prof Sachs and his colleagues at Hopkins led to the establishment of the Center for Hearing Sciences at Johns Hopkins in 1986. The Research and Training Center for Hearing and Balance was subsequently set up in 1991 at the Johns Hopkins School of Medicine.

In 1999 Prof Sachs was awarded the Association for Research in Otolaryngology's highest honor, the Award of Merit, for his groundbreaking research on the "encoding" of sounds in the inner ear and the brain. He was also awarded the Year 2000 Whitaker Distinguished Lectureship from the Biomedical Engineering Society, in recognition of his outstanding achievements in biomedical engineering. In February 2002, Prof Sachs was elected to the National Academy of Engineering, one of the highest professional distinctions that can be accorded an engineer, for contributions to the understanding of the neural encoding and signal processing of complex sounds, and for leadership in bioengineering education.
Lecture Abstract

13 March 2002

"Bioengineering: At the Heart of Modern Biology and Medicine"

The twentieth century revolutions in engineering, biology and computer science have placed biomedical engineers at the leading edge of twenty-first century biology and medicine.

This public lecture, by Professor Murray B. Sachs, will focus on new approaches to understanding the normal functioning of the human heart through bioengineering and applications of the knowledge to the treatment of a major medical problem, heart disease. His lecture will explore the efforts of bioengineers in designing technologies that will ultimately link the massive amount of genetic information being assembled in relation to the human genome to the effects of genetic errors on the function of organs like the heart, as well as the developments in stem cell engineering which hold open the hope that we will somehow be able to replace damaged parts of the heart or even the whole heart with what have come to be known as "engineered tissues". The lecture will also consider how biomedical engineers are working to unravel the mysteries of human hearing and to restore hearing to the deaf. NO is also synthesized in the central nervous system, where it acts as a neuromediator with several physiological functions, including the formation of memory. In the peripheral nervous system, NO is now known to be the mediator released by a widespread network of nonadrenergic, noncholinergic nerves that mediate some forms of neurogenic vasodilation and regulate certain gastrointestinal, respiratory and genitourinary functions. All these physiological actions of NO are mediated by activation of the soluble guanylate cyclase in target cells.

In addition, NO is generated in large quantities during host defence and immunological reactions. When NO is released in this way it contributes to the development of certain pathologies, including septic shock and some forms of inflammation.

One way in which NO may be transformed from a physiological mediator to a pathophysiological agent may be through its actions on mitochondrial function. At low, physiological concentrations NO inhibits cell respiration in a reversible manner which is competitive with oxygen. At higher concentrations it irreversibly inhibits enzymes in the respiratory cycle, either directly or through interaction with superoxide anion leading to the generation of peroxynitrite. Increased understanding of the biochemical actions of NO and the role it plays in mitochondrial function and gene expression will doubtless lead to novel therapeutic applications.