

Introducing Robert F. Miller, the 2008 Recipient of the Proctor Medal

I am delighted to have the opportunity to introduce the recipient of the 2008 Proctor Medal, Dr. Robert F. Miller. For more than three decades, Bob Miller has been widely recognized for his research on the electrophysiology, synaptic pharmacology, and neuroanatomy of the retina.

Bob made his first contribution to retinal research while still a medical student at the University of Utah under Tom Ogden. Then, as a postdoctoral fellow under John Dowling in the Wilmer Institute at Johns Hopkins, Bob obtained the first recordings from Müller cells of the vertebrate retina. Miller and Dowling reported this finding at the 1970 ARVO meeting. Although the Müller cell is a glial cell, not a neuron, Miller and Dowling showed that it generated an electrical response to light. This remarkable finding stands as a landmark in the study of the retina.

At the Physiology Department at SUNY Buffalo, Bob pioneered in developing the superfused retina preparation for intracellular recording. Up to that point, it was generally believed that intracellular recording would not be feasible in superfused preparations. Miller showed that the problems could be overcome, not only in lower vertebrates but in the mammalian retina as well. This opened the way for applying the power of intracellular recording to analyze synaptic mechanisms in single retinal neurons.

His first major finding with this approach was quite unexpected, showing that a chloride-free superfusate produced a selective loss of the response of ON pathway. In other work, Miller and his colleagues provided the first direct evidence for the conclusion, now widely accepted, that GABA and Glycine are the primary inhibitory neurotransmitters in the inner retina.

At the Department of Ophthalmology of Washington University, wide-ranging and provocative research was done on retinal function. Miller and his colleague, Malcolm Slaughter, discovered that the GLUR6 agonist, APB, selectively blocked the response of the ON bipolar cells. Over the years and to this

day, this seminal finding has been confirmed and extended by workers around the world, with a wide range of implications from basic retinal circuitry to the interpretation of the human ERG.

Since 1987, Bob has held the 3M Cross Professorship in Physiology, Neuroscience and Ophthalmology at the University of Minnesota. His contributions to the University of Minnesota have been monumental—in the Medical School, the Graduate School and the Undergraduate College of Biological Sciences. He served as Head of the Physiology Department for 10 years and took on additional duties as Director of the Neuroscience Program of the Graduate School. He has been an inspiring and enthusiastic teacher to undergraduates, medical and graduate students. In spite of the heavy administrative duties and teaching, he maintained a large and highly productive laboratory. The research included the role of ionic conductances in ganglion cells, the action of NMDA in the inner retina, synaptic mechanisms of movement-sensitive cells, studies of amacrine cell dendrites, and the first evidence for the role of D-serine in retinal circuitry. Throughout his entire career, Miller's approach has been unusually bold in applying a very wide range of new emerging techniques, including whole cell recording, voltage clamp, activity dependent dyes, HPLC, HRP injection for cell morphology and tracing, two-photon microscopy, computer modeling and software, calcium imaging, and genetic knockouts.

Over the years, Miller has been a major contributor to the ARVO meetings, and some exceptional graduate students and postdoctoral fellows have worked under Bob and gone on to make substantial contributions to retinal research and ARVO. He is a stimulating and very supportive mentor, warmly regarded by his former students. His generosity and encouragement to students and colleagues is extraordinary. His enthusiasm for neuroscience and retinal research is unbounded. With Bob, the glass is never half full or half empty; it's always full!

I've only touched the surface of Bob's research and many contributions, but some of these will be found in the paper that follows. It is a great pleasure to introduce, my friend and scientific colleague of four decades, the Proctor Medalist for 2008, Robert F. Miller.

Dwight A. Burkhardt