Introducing Richard H. Masland, the 2010 Recipient of the Proctor Medal

Dr. Richard H. Masland is one of the most distinguished retinal neuroscientists of our time. For more than 30 years, Dick has made brilliant and seminal contributions to our understanding of the retina as a system that processes images and transmits them to the brain. His contributions are broad in both their focus and in the techniques that he has used, and they continue to have an enormous impact on shaping the field of vision science and the thinking within the vision community. It is astonishing when one considers this body of work as a whole. It includes:

**ACETYLCHOLINE AND DIRECTION-SELECTIVITY**

From 1980 onward, Dick focused on the cellular localization of acetylcholine and identified cholinergic amacrine cells. Their identification exemplifies his great talent for developing new techniques. Here, he combined radioautography with selective uptake of a fluorescent dye (DAPI), to identify two populations of cholinergic cells (displaced and nondisplaced) and describe their retinal distribution. His next step, together with Masaki Tauchi, was to inject these DAPI-labeled cell somas in a fixed retinal preparation with the fluorescent dye Lucifer yellow (LY). This new approach revealed the “starburst” dendritic morphology for which the cells are named. This technique has been widely adopted throughout the vision and neuroscience community to examine neuronal morphology and replaced the popular, but capricious, Golgi method. In a series of very elegant physiological experiments, recording ganglion cell light responses in the in vitro rabbit retina, Dick and his co-workers showed that cholinergic amacrine cells are the key players in generating direction selective light responses. **DIVERSITY OF NEURONAL CELL TYPES IN THE RETINA**

During the past 10 years, the study of neuronal diversity in the retina has dominated Dick’s research activities. Through his work, we now know that there are between 50 and 70 different cell types in any mammalian retina. In pursuit of this question, Dick introduced another very elegant anatomic method: photofilling. By this method, the morphology of cells that accumulate a dye in their somas is completely revealed on irradiation under the fluorescence microscope. Using this technique, he showed that there are more than 20 amacrine cell types in the rabbit retina.

**THE MOUSE RETINA AS A MODEL FOR RETINAL DISEASES**

As early as 1998, the Masland laboratory recognized the potential of the mouse as a new model organism because of the ability to manipulate its genome. This new work is producing results that are key in understanding neural diversity and retinal development. In particular, he found that ganglion cells have an innate program that specifies dendritic tree shape and size. Dick and his colleagues were among the first to use expression of the green fluorescent protein (GFP) for the study of retinal cell types, their circuitry, and the synaptic expression of transmitter receptors. Using these mouse models, the Masland laboratory has begun to address questions related to the degeneration of photoreceptors, to glaucoma, and, most recently, to the restoration of visual responses after complete photoreceptor degeneration by rendering ganglion cells light sensitive through the expression of melanopsin.

*Heinz Wässle*