

Through the Eye Into the Brain

The eye and the brain are often viewed as separate organs, yet they represent a continuous neurobiological system. While the retina has long served as a readily accessible extension of the central nervous system, growing evidence demonstrates that communication between the eye and the brain is fundamentally bidirectional.

Advances in retinal imaging have transformed the eye into a powerful source of biomarkers for neurodegenerative, vascular, and inflammatory diseases. At the same time, discoveries in visual neuroscience reveal that the brain continuously shapes visual perception through predictive processing, attention, plasticity, and adaptive neural circuits. Vision is therefore not simply captured by the eye—it is actively constructed by the brain.

This evolving perspective is also opening new therapeutic possibilities. Visual stimulation, perceptual learning, retinal and cortical neuromodulation, and neurorehabilitation strategies suggest that interventions targeting the visual system may modify brain function and promote neural recovery. Conversely, understanding brain mechanisms is becoming increasingly important for interpreting ocular disease and optimizing visual outcomes.

This lecture will explore the dynamic dialogue between the eye and the brain, illustrating how the convergence of ophthalmology and neuroscience is reshaping our understanding of both organs. Rather than viewing the eye solely as a window into the brain, we may now regard the eye and the brain as partners in a continuous, bidirectional network that offers new opportunities for diagnosis, treatment, and neurorestoration.