tifr TATA INSTITUTE OF FUNDAMENTAL RESEARCH
1, Homi Bhabha Road, Colaba, Mumbai 400 005
School of Natural Sciences

Telephone: 022 2278 2000 Fax: 022 2280 4061

WEDNESDAY COLLOQUIUM

HOW TO REATTACH THE RETINA

Speaker: Subrata Tripathi
Tata Institute of Fundamental Research

Date and Time: 29th February 2012 at 4.00PM
Place: Lecture Theatre AG66

Detachment of the retina, a problem afflicting millions, leads often to severe and permanent loss of vision. Photoreceptors of the mammalian retina are critically dependent on a single layer of adjacent cells, the retinal pigment epithelium (RPE), for their survival. Separation of the retina, in a radially inward direction, occurs at this interface. Avulsion of the RPE is rare. Two processes play pivotal roles in keeping the volume of the space between the photoreceptors and the RPE to a minimum: *a.* absorptive (radially outward) transport of water by the RPE[1] pumps down the space and brings the complementary membranes of the photoreceptor *outer* segment and the *inner* (apical) membrane of the RPE into apposition whereupon *b.* the photoreceptors and the RPE are bridged by cell adhesion molecules[2].

The cornerstone of our understanding of water transport by epithelial cell layers like the RPE was laid exactly 50 years ago[3], predicated on coupled flows in irreversible systems[4]. The Tata Institute of Fundamental Research has developed a method for detecting water flow across the living bovine RPE with a *volume flow* detection stability of 0.01% over several hours (steady state). The RPE has a *low* water permeability[5]. Heavy metal ions double the *passive* water permeability of the RPE and accelerate *active* NaCl absorption by the RPE *simultaneously.* These new results of dramatic and sustained stimulation of water absorption by the RPE for hours in the radially outward direction indicate that *in vivo* the retina would be brought into apposition with the RPE. It establishes proof of principle on how to reattach the retina and is potentially therapeutic.

Subrata Tripathi studied medicine and physiology and built the Membrane Biophysics Laboratory at the Tata Institute. His research interests are in the coupling of solute and water fluxes in biological membranes, membrane channels, and across layers of epithelial cells that constitute organs like the intestine, kidneys, and the eye.

References: [1] Hughes B, Miller S & Machen TE *J Gen Physiol* **83**, 875-899(1984) [2] Nandrot EF, Anand M, Sircar M & Finemann, SC *Am J Physiol (Cell Physiol)* **290**,C1256-1262, (2006) [3] Curran PF & MacIntosh JR *Nature* 193, 347-348, (1962). [4] Kedem O & Katchalsky A *BBA,* **27**,229, (1958). [5] Tripathi S & Boulpaep EL *Exp Physiol* **74**, 385-417, (1989).

Secretary NSF