

VT School of Neuroscience Faculty Recruitment Seminar

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“Tickling the Retina: Charting the Future of Bionic Sight Restoration”

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11:00am – 12:00pm

Biocomplexity Institute Conference Room

As human life expectancy increases, blindness and visual impairment due to degeneration of the light responsive cells of the eye – photoreceptors – becomes ever more significant. Hundreds of laboratories are pursuing solutions to this problem. To date, one of the most successful approaches has been the implantation of devices – like Tuebingen’s Alpha-AMS implant – to electrically stimulate the remaining neuronal cells of the eye. Responding to input from an electronic camera these neurons then communicate visual information to the brain. Thus the natural vision that has been lost to blind patients is replaced with bionic vision.

The thin network of neurons lining the inner surface of the eye, called the retina, has many parallel information processing channels. As a result, the ganglion cells which pass information to the brain consist of dozens of different functional types. Ensuring that bionic retinal implants fully exploit this diversity of information channels has been a long-term goal of bionic vision research. To pursue this goal, we have applied the methods of linear system analysis to electrical stimulation of the retina.

In this presentation, I will describe the status of the Alpha AMS retinal implant. Then, through a systematic evaluation of the electrical stimulus parameter space, I will discuss the responsiveness of the retinal network to prosthetic stimulation. Next, I will describe how the Experimental Retinal Prosthetics Group in Tuebingen has developed a linear system-based method for more efficiently probing retinal responses to electrical stimuli. Finally, I discuss the near future of these efforts and their potential impact on blind patients suffering from degenerative diseases such as retinitis pigmentosa and macular degeneration.

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