

# INSTITUTE COLLOQUIUM

Division of Physical and  
Mathematical Sciences



INDIAN INSTITUTE OF  
SCIENCE

## NEW WAYS TO PROBE ELECTRONS IN SEMICONDUCTORS



**V. VENKATARAMAN**

*Professor*

Department of Physics,  
Indian Institute of Science,  
Bengaluru 560012, India

### ABSTRACT

The revolutionary effects of advances in semiconductor technology on our everyday lives continue unabated. We constantly interact with billions of computational, memory and imaging devices where tiny packets of electrons are pushed around every nanosecond inside slivers of silicon. As these devices move away from traditional circuit boards into flexible electronics, new materials, physics and processing technologies are being explored to replicate their functionality on non-silicon substrates. This brings about different experimental challenges to understand how electrons fundamentally behave in novel semiconductor materials. In this colloquium I will use the prototypical MOS device structure to first illustrate the storage of electron charge in non-volatile memory devices. I will then describe the challenges in fabricating such devices using new materials and our approach to probing the stored charges during read-write operations. In the latter part, I will discuss recent proposals to incorporate magnetic semiconductors for storing information using electron spin. This poses extra challenges to measure the magnetic properties of electrons in such materials. I will then describe two novel experimental techniques developed by our group to probe spin magnetism in semiconductors.

### ABOUT THE SPEAKER

V. Venkataraman obtained his B.Tech in Electrical Engineering in 1988 and PhD in 1993. He joined the faculty of IISc in 1994 and is now a Professor in the Department of Physics. He is currently the Chair of the Physics Department as well as the Centre for Cryogenic Technology (CCT). His main research interests are Semiconductor Physics, Microfluidics and Device Technology.

**WEDNESDAY,  
29 NOVEMBER 2017**

Faculty Hall,  
Main Building, IISc

**4:00 pm to 5:00 pm**

Professor Anurag Kumar,  
Director, IISc will preside

Tea at 5:00 pm

All are welcome