# Physics Colloquium

## Michigan Technological University

**Thursday, September 6, 2012**
**at 4:00 pm**
**Room 139 Fisher Hall**

### Physics and Application of Electronic Effects in Chalcogenides

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**Abstract:** Present solution of “More than Moore” problem seems to go two complimentary ways:

- multifunctional combination within Si technology is provided by the integration of many isolated technologies on a single CMOS substrate.
- extensive studies of materials (alloys) demonstrating intrinsic increased functionality of the same bulk unit with simple interconnections configuration.

Chalcogenides present one of possible candidates on the role of materials with fundamentally wide functional diversity. In the talk the fundamental electrical and optical properties of chalcogenide glasses will be reviewed together with possible applications and with technology compatibility issues. Increasing the functionality by effects of S-type Negative Differential Conductivity (S-NDC), by electric instabilities and current filamentation will be stressed. Possible mechanisms and their characteristic parameters will be discussed and compared to existing experimental data. Finally some peculiarities of the chalcogenide glasses electronic band structure and defects nature will be considered together with pros and cons of the existing switches and phase-change nonvolatile memory.

**Biography:** Dr. Kostylev is a leading expert on electronic and optical devices. He was Head of the department of Semiconductor Electronics and Functional Elements of Control Systems at the Institute of Technical Mechanics Academy of Sciences of Ukraine. In 1991 he first moved to Energy Conversion Devices, Inc., and then to Ovonyx Technologies to investigate electronic properties of chalcogenide-based devices. Dr. Kostylev has co-authored more than 200 papers, 80 granted US and international patents, and books on "Electronic switching in amorphous semiconductors", "Semiconductors with bulk negative conductivity in microwave fields", and "Current transfer phenomena in thin-film Gallium Arsenide structures".

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