



## Exploration of Light and Carrier Collection Management Solar Cells

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Nanotechnology Applications and Career Knowledge (NACK) Center Penn State University

**Date: Thursday, January 27th, 2011**  
**Time: 2:00 pm-3:00 pm Location: CUTR 102**

A photovoltaic device architecture based on a 2-dimensional array of unit cells with sub-wavelength photonic and plasmonic features will be discussed from the perspective of its impact on light and carrier collection management (LCCM) in a-Si:H photovoltaic devices. The architecture utilized in our fabrication and analysis work is defined by a nano-column element centered in each unit cell. The relative importance of photonic and plasmonic contributions for this architecture will be discussed. Criteria for nano-column height and spacing as well as for absorber thickness are also explored for optimal power conversion efficiency enhancement. This architecture is shown to give the highest efficiency (8.2%) reported experimentally for a-Si:H solar cells utilizing a sub-wavelength features approach for performance enhancement..

### **Dr. Stephen J. Fonash**

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Dr. Stephen Fonash holds the Bayard D. Kunkle Chair in Engineering Sciences at the Pennsylvania State University. His activities at Penn State include serving as the director of Penn State's Center for Nanotechnology Education and Utilization (CNEU), director of the *NSF National Nanotechnology Applications and Career Knowledge (NACK) Center*, and director of the Pennsylvania Nanofabrication Manufacturing Technology Partnership.

Dr. Fonash's research activities encompass the device physics and processing of solar cells, sensors, and transistors. He has published over 300 refereed papers in these areas. He is the author of the book "Solar Cell Device Physics" (2<sup>nd</sup> edition, Elsevier, 2010) and, with his students, author of the solar cell computer modeling code AMPS, which is used by more than 2000 researchers around the world. Dr. Fonash holds 29 patents, many of which are licensed to industry. He is on journal boards, has consulted for a variety of firms, and has co-founded two companies. Prof. Fonash received his Ph.D. from the University of Pennsylvania. He is a Fellow of the Institute of Electrical and Electronics Engineers and a Fellow of the Electrochemical Society.

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