

# CURRICULUM VITAE

**Dmitriy V. Melnikov**

## **Address**

Beckman Institute for Advanced Science and Technology  
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## **EDUCATION**

Ph.D. in Physics, June 2001.

Lehigh University, Bethlehem, PA.

Advisor: Professor W. Beall Fowler.

Dissertation Title: "Properties of the Polaron Confined in a Spherical Quantum Dot".

M.S. Degree in Physics, February 1995.

Moscow State Engineering Physics Institute (Technical University) (MEPhI), Russia.

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## **PROFESSIONAL EXPERIENCE**

### **Positions**

Post-Doctoral Associate, work with Prof. Jean-Pierre Leburton,

Beckman Institute, University of Illinois at Urbana- Champaign (July 2003 – present)

Research Associate, work with Prof. Y. Saad,

Department of Computer Sciences, University of Minnesota (2002).

Visiting Researcher, work with Prof. James Chelikowsky,

Department of Chemical Engineering and Materials Science, University of Minnesota  
(2001-2003).

Graduate Student,  
Department of Physics, Lehigh University (1997-2001).

Teaching Assistant (part-time),  
Department of Physics, Lehigh University (1997-2001).

Post-Graduate Student,  
Department of Physics and Technical Applications of Superconductivity, MEPhI (1995-1997).

## **Research Activities**

### Current Interests:

- *ab initio* study of electronic and optical properties of semiconductor clusters and quantum dots;
- *ab initio* modeling of defects and doping in semiconductor nanostructures;
- spintronics and quantum computation;
- multi-scale modeling of coupled quantum dots in electric and magnetic fields, electron addition spectra;
- electron-phonon interaction, bound polarons and polaron excitons in nanostructures.

### Modeling and Methods:

- *ab initio* pseudopotential density functional theory (DFT);
  - high-scale real space methods for pseudopotential DFT on parallel platforms;
  - time-dependent density functional theory (TDDFT);
  - self-consistent solution of Poisson and Kohn-Sham equations for modeling of coupled quantum dot circuits;
  - canonical transformation techniques for calculation of polaron (polaron exciton) energies.
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## **PUBLICATIONS**

[1]D.V. Melnikov, J.R. Chelikowsky “Electron affinities and ionization energies of Si and Ge nanocrystals”, Phys. Rev. B., submitted (2003).

[2]D.V. Melnikov, J.R. Chelikowsky “Quantum confinement in phosphorus-doped silicon nanocrystals”, Phys. Rev. Lett., submitted (2003).

- [3] D.V. Melnikov, J.R. Chelikowsky "Ab initio absorption spectra of germanium nanocrystals", Solid State Comm. **127**, 361 (2003).
- [4] D.V. Melnikov, W.B. Fowler "Electron-phonon interaction in a spherical quantum dot with finite potential barriers: The Frohlich Hamiltonian", Phys. Rev. B **64**, 245320 (2001).
- [5] D.V. Melnikov, W.B. Fowler "A Bound Polaron in a Spherical Quantum Dot: The All-Coupling Variational Approach", Phys. Rev. B **64**, 195335 (2001).
- [6] D.V. Melnikov, W.B. Fowler "A Bound Polaron in a Spherical Quantum Dot: Strong Electron-Phonon Coupling Case", Phys. Rev. B **63**, 165302 (2001).
- [7] D.V. Melnikov, A.I. Podlivaev "Lateral Running Wave as a Possible Form of the Transition Process in Resonant Tunneling Diode", Semiconductors **32**, 227 (1998).
- [8] D.V. Melnikov, A.I. Podlivaev, I.A. Rudnev, S.S. Shmelev "Effect of Spacers on Static Current Voltage Characteristics of Resonant Tunneling Diodes on AlAs/GaAs Heterostructures", Physics of Low-Dimensional Structures **8/9**, 109 (1998).
- [9] V.F. Elesin, D.V. Melnikov, A.I. Podlivaev "Generation in Resonant Tunneling Diodes", Physics of Low-Dimensional Structures **6**, 23 (1996).
- [10] V.F. Elesin, D.V. Melnikov, A.I. Podlivaev "Generation and Amplification Region in Resonant Tunneling Diodes", Semiconductors **30**, 337 (1996).

### Conferences

"Bound polaron in a spherical quantum dot", D.V. Melnikov, W.B. Fowler, APS March Meeting, Seattle, 2001.

"High-Frequency Characteristics of Resonant Tunneling Diodes", V.F. Elesin, D.V. Melnikov, A.I. Podlivaev, International Workshop on Physics and Computer Modeling of Devices Based on Low-Dimensional Structures, Aizu-Wakamatsu, Japan, 1995, 74.

Proceedings of the International Workshop on Physics of Nanostructures, St.Petersburgh, Russia, June 25-29, 1995, 240.

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## AWARDS

Sherman Fairchild Fellowship (1999-2000, 2000-2001).  
F. J. Feigl Memorial Award (1997).  
M.S. Diploma with Honors, February 1995.  
Moscow Mayor Scholarship (1994-1995).

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## PROFESSIONAL SOCIETY MEMBERSHIP

American Physical Society

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## RECOMMENDATIONS

### **Prof. W. Beall Fowler**

Department of Physics  
Lehigh University  
16 Memorial Drive, East  
Bethlehem, PA 18015  
E-mail: wbf0@lehigh.edu

### **Prof. Michael Stavola**

Department of Physics  
Lehigh University  
16 Memorial Drive, East  
Bethlehem, PA 18015  
E-mail: mjsa@lehigh.edu

### **Prof. James Chelikowsky**

Department of Chemical Engineering and Materials Science  
University of Minnesota  
Minneapolis, MN 55455  
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### **Prof. Jean-Pierre Leburton**

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