

Twin Cities Campus

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October 21, 2003

Faculty Search Committee
Department of Physics
Indiana University
Swain Hall West 117
Bloomington, IN 47405-7105

To Whom It May Concern:

It is my understanding that **Dr. Dmitriy Melnikov** has applied for a position in your department. He has asked me to write on his behalf. I am happy to do so.

I first became aware of Dmitriy when Beall Fowler at Lehigh contacted me about him. Beall wrote to me that he had a good student who would be in the Minneapolis area. He said Dmitriy would be going to the University of Minnesota along with his wife (she was getting a position at the Institute for Mathematical Applications on our campus). Beall wrote me a very positive note about Dmitriy. I trusted Beall's judgment and I was impressed with Dmitriy's credentials. However, I had no funds for a postdoctoral position at that time. As such, I wrote to Beall and Dmitriy that while I would be pleased to have him in the group, I could not pay him. Despite this rather severe financial constraint, Dmitriy appeared in my office in the fall of 2001 and asked if he would work in my group. This says a lot about Dmitriy's dedication to the field. (I am not sure that I would work for free, even though I like doing science.)

The first project that I gave to Dmitriy was on quantum dots. He had some expertise in this area, but he was not an expert on numerical methods such as pseudopotentials. Despite this limitation, he picked up the techniques very quickly and produced a number of results.

In particular, he compared the electronic structure of hydrogenated silicon and germanium quantum dots. Most of his efforts have been targeted at addressing the questions about higher excitations in these systems, i.e., excitations above the band gap. In several joint papers, we compared these results to recent experimental measurement on these systems. We found that we were able to quantify the role of quantum confinement and demonstrate that higher energy excitations scale differently with the size of the dot than does the excitation energy for fundamental gap. We also examined whether the character of the optical gap in Si and Ge is different as a function of dot size. This is a contentious issue. Some workers have argued that the lowest excitations in Si and Ge resemble bulk features for larger dots and as the dots get smaller the ordering of these features reverse. Other workers have argued that the ordering of the features are the same. Our work supports this latter view. Some of this work is published in *Solid State Communications* (SSC 127, 361 (2003)). We have also submitted a short paper in this area to *Physical Review B*.

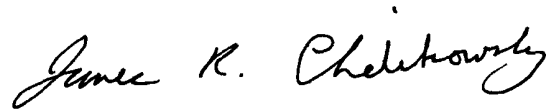
Most recently, Dmitriy has examined the role of doping quantum dots. He examined the properties of P in Si dots, calculating the hyperfine splitting. To my knowledge, this is the first time anyone has attempted to explain the hyperfine splitting in these systems. Dmitriy compared his results to recent experiments to his calculations and found very good agreement. This work was recently submitted to Physical Review Letters.

I should stress that Dmitriy worked in my group for a short time, i.e., slightly more than a year, before moving to his present position in Illinois. Despite this abbreviated time frame, he has accomplished a considerable amount of work. In addition to the papers on quantum dots, he knows how to run our codes based on real space methods and he is quite capable of applying these codes to a variety of problems not involving dots. Also, he has worked closely with my collaborator, Professor Yousef Saad. Yousef is a first rate computer scientist at Minnesota. Dmitriy did some numerical studies to improve our diagonalization methods with Yousef. As such, Dmitriy knows computer science in addition to physical science.

In terms of his working habits and interpersonal skills, Dmitriy has a number of quite positive attributes. He works hard and is conscientious in doing his work. He is easy to talk to and has a quiet demeanor. Although I have not heard him speak in a formal setting, I suspect he does well in such activities.

I hope these comments are useful to you. If I can be of more help, just let me know.

Sincerely,

A handwritten signature in black ink that reads "James R. Chelikowsky". The signature is written in a cursive style with a prominent loop at the end of the last name.

James R. Chelikowsky
Institute of Technology
Distinguished Professor