

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Plant Biology

265 Morrill Hall
505 South Goodwin Avenue
Urbana, IL 61801-3707



Biocomplexity Faculty Search Committee,
c / o Prof. Rob de Ruyter van Steveninck,
Department of Physics,
Indiana University,
Swain Hall West 117,
Bloomington
IN, 47405-7105

Dated: December 3, 2004

Dear Search Committee,

It is a great pleasure to write this letter of reference on behalf of Professor Vladimir Shinkarev. I wish to express my strongest possible support for him. I know Vladimir (Vlad for short) for over 10 years, since he has been working at the University of Illinois at Urbana-Champaign. During this period of time, he has successfully collaborated with me on many research projects. Thus, I know him quite well.

Before coming to Urbana, Vlad's work was well known and recognized not only in Russia, but also among international scientific community. He has been a recipient of several awards in Russia. In 1986, he was a winner of Moscow Scientific Society Award for the best work in Natural Science for his 1984 book "Electron Transfer in Biological Systems".

Vlad received his formal education in the Moscow State University, which ranks #1 in Russia. He has formal background in biology/biophysics (MS), biophysics (PhD) and in applied mathematics (MS). As recognition of his academic achievements, he was offered tenured position at the Department of Biophysics immediately after he obtained his graduation. He was visiting University of Illinois at Urbana-Champaign at the time the Soviet Union (USSR) was disintegrating. Soon after that U.S. government issued him a 'green card' as 'alien with extraordinary abilities in science'.

Vlad has wide interests in different areas, but his main research is focused on the structure and function of membrane proteins and protein complexes involved in energy transduction in respiration and photosynthesis. To study specifics of protein-ligand and protein-protein interactions in these systems, he develops and employs different methods, including kinetic absorbance and fluorescence spectroscopy, Fourier transform infra red

(FTIR) spectroscopy, near-field scanning optical microscopy (NSOM), atomic force microscopy (AFM), electrometric measurements, electrochemical methods, protein engineering, mass spectrometry (e.g., MALDI), computational methods, mathematical modeling and bioinformatics.

Vlad has extensive and unique educational background, the ability to use wide array of different methods and approaches, has broad scientific interests; he is diligent as well as highly intelligent. These qualities are all very important for securing research funding. During his stay at the University of Illinois, he has obtained 3 grants (one as PI and two as coPI). Thus, I foresee success in his research.

Throughout his career, Vladimir's work has been groundbreaking and his work to date has been of substantial influence on the progress of research in several labs in the U.S. and around the world. Here are some examples.

(i) He pioneered development of a general approach to the quantitative analysis of the electron transport in multienzyme complexes. He successfully applied this approach for characterization of different reactions in Photosystem I and Photosystem II of oxygenic photosynthesis, and photosynthetic reaction centers. He established existence of two different cycles of oxygen evolution in photosynthesis. Recently he was able to apply sophisticated analysis for analytical description of flash-induced periodic oscillations of oxygen evolution in plants, thus solving 30 years long problem.

(ii) Vlad has applied direct electrometric method for measurements of light-induced generation of electric potential by different membrane complexes. This method is unique because it provides the possibility to map the position of groups involved in charge transfer in membrane protein with angstrom resolution (after normalizing the response to electrogenic phase arising from charge separation between primary donor and primary acceptor quinone). By using this technique, Vladimir has provided calibration of different electrogenic reactions in photosynthetic reaction centers and bc_1 complex. He made first direct electrometric kinetic measurements of intraprotein proton transfer in the photosynthetic reaction centers. Among other significant results received by electrometric technique are characterization of the electrogenic events in the bc_1 complexes, and discovery of the electrogenic nature of electron transfer between Y_Z and P680 in Photosystem II of green plants.

(iii) He developed and applied new method for analysis of fast intraprotein electron transfer in cytochrome bc_1 complexes. For the first time he was able to measure directly the fast electron transfer between high and low potential hemes of cytochrome b.

(iv) Many membrane protein complexes involved in energy transduction were crystallized recently and their detailed molecular structure became known. Vlad has taken advantage of such progress by developing “*bottom up*” user-friendly and self-directed mathematical models of multienzyme complexes of respiration and photosynthesis.

(v) Vlad has used scanning probe microscopy for characterization of different

intact biological nano- and mesoscale structures. He applied the near-field scanning optical microscopy (NSOM) for analysis of photosynthetic membranes. NSOM has the ability to measure optical signals originating from the sample with a spatial resolution significantly better than conventional optical microscopy. The main advantage of near-field optical microscopy, besides the improved lateral optical resolution, is the simultaneously acquired topography with resolution better than 10 Å. To my knowledge, this is the first application of NSOM to thylakoids from plants and to chromatophores from photosynthetic bacteria. Currently he is applying atomic force microscopy (AFM) to directly observe *in situ* structure of membrane proteins and their ensembles. AFM can provide topographical information greatly superior to that usually acquired by NSOM. He is also trying to visualize conformational changes of iron-sulfur protein induced by specific inhibitors in two-dimensional crystals of the Cytochrome bc_1 complex.

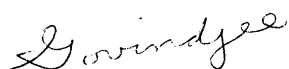
Vlad had significant teaching experience in Russia. He supervised many MS and PhD students and postdocs. His teaching activity was significantly less in USA, mostly due to his 100% research appointment. In spite of his research appointment he has supervised rotation graduate students in the lab. He has been involved in teaching of different aspects of Bioenergetics, Biophysics and Photosynthesis. He has good communication skills, and in spite of some Eastern-European accent, he will be able to participate fully in teaching.

In summary, Dr. Vladimir Shinkarev is a recognized authority in the area of Biophysics and Bioenergetics. More importantly, he is an international authority having made and published several original scientific contributions of high significance and of importance. He has authored two books and over 60 original research papers. I am sure that his energy, accomplishments, background and diligent work will enable him to conduct fruitful and competitive research at your institution.

He is very friendly and gets along easily with other colleagues. He has ongoing collaborations not only with many professors within our University, but also with researchers from different universities in USA (Houston Medical Center, Penn State University, Rice University, University of Denver) and abroad (Finland, Germany, Russia).

I have the highest regard for Professor Shinkarev and I wish to express my strongest possible support for his application for faculty position in your Department. If you have further questions, please send me an E-mail at: gov@uiuc.edu.

Very sincerely yours,



Govindjee
Center for Biophysics and Computational Biology
Professor Emeritus of Biophysics, Biochemistry and Plant Biology