UNIVERSITY OF HELSINKI
VIIKKI BIOCENTER
INSTITUTE OF BIOTECHNOLOGY

17.09.04

To Whom It May Concern,

It is with great pleasure that I write this recommendation letter for Professor Vladimir P. Shinkarev for the position in your Department.

I have known Dr. Shinkarev for over 30 years. We both were studying biophysics at the Moscow State University and later worked together at the Department of Biophysics of the same University. Thus, I am uniquely qualified not only to judge his professional activity, but also his character and abilities.

Dr. Shinkarev has achieved international recognition for his research accomplishments in physical biochemistry (biophysics) and molecular bioenergetics. Since his original work on kinetics of electron transfer in molecular complexes of his early years in the department of Biophysics at Moscow State University, Vladimir Shinkarev's contributions have consistently been at the forefront of research on the mechanism of electron transfer and couple processes in different membrane complexes.

From the beginning, Vladimir's research efforts have always included both experimental and theoretical approaches. His work is marked not only by technical innovations, and insightful experiments, but also by theoretical analysis of electron transfer and coupled processes.

The membrane complexes involved in energy transduction are, as a rule, metalloproteins and carry significant number of reporter groups convenient for characterization by different spectroscopic methods. Vladimir is very productive in development and usage of different spectroscopic tools for studying electron transport and proton uptake/release. For example, recently he developed kinetic multichannel spectrophotometer which allows parallel time-resolved characterization of component of RC and bc_1 complex simultaneously. He has also been at the forefront in applying different types of infrared spectroscopy to bc_1 complex (transition FTIR, ATR-FTIR, step-scan FTIR).

Vladimir's broad knowledge and experience of a variety of enzyme systems included studies of cytochrome bc_1 complex, reaction centers from purple bacteria, Photosystems I and II. Vladimir Shinkarev's research has been of significant importance in our understanding of function of these integral membrane proteins. Through his more recent contributions, he continues to be a major player in current developments in these fields.

Here are two examples of his recent advances in different systems:

In case of cytochrome bc_1 complex he measured, for the first time, the kinetics of intraprotein electron transfer between low and high-potential hemes of cytochrome b in cytochrome bc_1 complex in chromatophores from purple photosynthetic bacteria. Because activation bc_1 complex by it natural substrates are significantly slower that intraprotein electron transfer, this kinetics cannot be studied by traditional approaches. To overcome this problem, he used fast electric field generated by reaction center to shift equilibrium of electron transfer between low-and high potential hemes of cytochrome b.

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The acceptor quinone complex of reaction center (RC) of purple bacteria consists of two quinones with essentially different properties. The primary acceptor quinone (Q_A) functions as one-electron carrier, while the secondary acceptor quinone (Q_B) functions as a two-electron carrier. The coupling of the one-electron Q_A with the two-electron Q_B occurs via sequential flash-induced reduction Q_B by Q_A^- first to Q_B^- and then to Q_BH_2. This mechanism suggests that semiquinone Q_B^- is stabilized at Q_B binding site long enough till second light activation of the RC, which enables transfer of the second electron to Q_B^-. In contrast to the Q_B^-, the neutral forms of quinone (Q, QH_2) can exchange rapidly ($\leq$1 ms) with quinones from the membrane pool. Vladimir suggested that semiquinone is stabilized in the Q_B binding site by topography of the binding site in which quinone can leave binding site only near the center of the membrane, where dielectric constant is low. As a result, semiquinone needs to overcome significant potential barrier (Born energy) to move out of binding site. This new insight into the functional organization of ubiquinone binding site not only explains fine-tuning of one and two electron reactions of ubiquinone and their coupling to proton uptake, but also provides simple explanation why the binding site is not occupied by phospholipids.

In conclusion, I am happy to give Vladimir Shinkarev's application my strongest support in his application for the following reasons: Vladimir is an internationally known scientist in biophysics and molecular bioenergetics. He made significant and multiple contributions to understanding molecular mechanisms of different integral protein complexes involved in energy transduction. He authored over 60 works, including multiple reviews and chapters as well as highly sited book on electron transfer in biological systems. He has proven record of successful federal funding. He has unique multidisciplinary background in biology/biophysics/mathematics. He has proven record of teaching multiple courses. He has prepared cohort of internationally known scientists. He has a pleasant character, and gets on well with his colleagues. He is involved in extensive collaborations with other labs nationally and internationally.

Sincerely,

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