

Biocomplexity Faculty Search Committee,
c/o Professor Rob de Ruyter van Steveninck,
Biocomplexity Institute
Indiana University
Swain Hall West 117
Bloomington, IN 47405-7105, USA

Physik Department E22
Lehrstuhl für Biophysik
James-Franck-Straße
D-85748 Garching

Prof. Dr. E. Sackmann

Telefon-Nr.: +49 (89) 289-12471
Telefax-Nr.: +49 (89) 289-12469
e-mail: sackmann@ph.tum.de
http://cell.E22.physik.tu-muenchen.de/www/Welcome_E.html

27.12.2003

Letter of recommendation for Dr. habil. Alexei Boulbitch in connection with his application for the tenure-track faculty position in Theoretical Biophysics at the Biocomplexity Institute

Herewith I would like to support with great emphasis and enthusiasm the application of Dr. A. Boulbitch for the tenure-track faculty position in Theoretical Biophysics at the Biocomplexity Institute of the Indiana University.

Dr. Boulbitch came to my Laboratory 7 years ago as a Humboldt fellow with the aim of starting a new scientific career in the field of physics of biological materials after he had performed outstanding and internationally well recognized work in the field of phase transitions in crystals with defects, fracture and plasticity. He rapidly became a leading expert in the field of micromechanics of biological membranes and cells. Dr. Boulbitch belongs to the group of Russian scientists with outstanding capacities in the field of mathematical physics fortunately paired with the strong desire and outstanding abilities to work on problems of applied theoretical physics.

In Russia Dr. Boulbitch had performed outstanding theoretical studies of the control of plasticity of metals by the dynamics of dislocation and fracture of solids during phase transition and for this reason obtained the Humboldt Fellowship despite of strong competition. I was particularly impressed by the fact that this outstanding work was done independently and far away from the classical centers of theoretical physics in Moscow.

During his stay in Munich, Dr. Boulbitch started first to work on a general theory of bending energy control of shape changes of composite cell plasma membranes. Since he also accounted for the membrane coupled actin cortex and cytoskeleton, his theory is much more general than previous theories and can be applied to the more complex problems of cell envelope shape changes, such as blebbing, for instance during cell death (apoptosis). Together with experimentalists of our laboratory he provided experimental evidence for his theory.

A recent outstanding result of Dr. Boulbitch is the development of an approach to describe the motion of the adhesion rim of a biomembrane whose interaction to a substrate is dominated by specific forces. This approach has

already been compared with experiments going in my laboratory and enabled us to understand a number of recent experimental results on spontaneous binding and enforced unbinding of biomembranes.

Other outstanding achievements during this time in Munich are (i) the development of a model of elastic properties of the peptidoglycan networks of bacteria, (ii) a theory of deformation of a bacterial cell enabling the measurement of its turgor pressure by atomic force microscopy and (iii) a recent prediction of osmotic forces dominating microrheological measurements of actin.

Dr. Boulbitch supported his research through the prestigious fellowship from Alexander von Humboldt Foundation and through the 5-year grant from the German Research Society (Deutsche Forschungsgemeinschaft). Since only about 30% applicants are supported and he was successful with all his applications, Dr. Boulbitch thus demonstrated that he is well prepared to finance his research groups through public and private financing agencies.

Dr. Boulbitch participated to the teaching at our University. He has given courses in the mechanics of biological membranes, the physics of gels, the kinetics of enzyme reactions, bioadhesion and numerous seminars for the nearly 50 students working at my laboratory. The lectures were very well recognized by our students demonstrating that Alexei is also a very gifted and stimulating academic teacher. These teaching activities were also highly recognized by our Faculty and led to his Habilitation in Theoretical Physics on 18.07.01.

Alexei Boulbitch demonstrated his outstanding capacities as scientific group leader by his highly successful activities as supervisor of PhD students in theoretical biophysics. In addition he helps me a lot participating in the supervision of my experimental PhD students on the level of planning of necessary experiments and their interpretation. He demonstrated outstanding abilities to work together with experimentalists.

Dr. A. Boulbitch is a mostly highly gifted, motivated and versatile scientist and academic teacher who does cutting edge research in the physics of living materials. His mental capacities are outstanding and his abilities to motivate students to high quality scientific work led to numerous internationally recognized publications. We would certainly like to offer him a professorship in Theoretical Physics at our University, if we would have a position available in the near future. I think that one of the strengths of Alexei is that he can easily switch between different research fields and that he is prepared to do this.

Last but not least I would like to emphasize that Alexei is also a most cooperative loyal and stimulating colleague.



Prof. Dr. Erich Sackmann