Statement by MIPT Alumnus (11/2002)
The Biophysics Student admitted to Biology Departments at Harvard University

Statement of Purpose

Applicant's name: Ivan Ivanov

It is noticed that science develops in splashes, each significantly advancing our understanding of the Nature. The 19th century was the time of rapid development of thermodynamics and electrodynamics; in the beginning of the 20th century quantum mechanics and relativity theory were born. In the search for secrets of nature science has reached extremely high and low energies as well as large and small length scales. Still until recently we knew very little about one of the most complex on everyday's length and energy scales systems — life. Now we are at the dawn of efflorescence in molecular biology, which provides an excellent basis for application of modern physics, biochemistry and computational techniques. Revelations of molecular structure become extremely crucial, as they provide insights into the way molecules work.

My interest in the role of biomolecular structure in information processing and signal transduction pathways in the cell has developed during the last two years, while I have been a student of Molecular Biophysics sub-department of MIPT. Processing of biological information plays a crucial role in the existence and development of biological systems and its infringement often leads to different kinds of diseases. The structure and, consequently, the function of the involved biomolecules is an important key to the understanding of these processes. To further study processing of biological information and methods of structure determination I joined the research group of Dr. X, focusing on the structure and function of membrane proteins, lipids and lipid-protein systems.

In September xxxx I started my research in the group of xx, Small City, Russia. I studied the properties of xxx under various conditions. Work there not only deepened my knowledge about crystallisation and lipid systems, but also gave me knowledge and experience of strengths and limitations of structure investigation by neutron scattering. I became familiar with the theoretical background of small angle neutron scattering, experimental setup and data treatment techniques.

In March xxxx I continued my research in the group of Dr. X at the Institute of XX. The ultimate goal of our research is to explain all stages of signal transduction during the chemo- and phototaxis. Currently I am involved in several projects on the structure and functioning of xxx, the specimen of microbial phototaxis system, in the complex with xxx as well as without it. My current task is to obtain crystals which xxx. During this work I acquired a broad range of experimental experience

and theoretical background necessary for crystallisation and structure determination of membrane proteins. One of the most challenging tasks in my project was to find the best conditions for trapping intermediate states of xx in crystals. It was a combination of thorough theoretical analysis of spectral properties of the protein with further experimental examination and finally implementation of theoretical findings. As a result I obtained crystals of xxx which diffract to xx on a synchrotron.

Having succeeded in the current research, employing the knowledge from different fields of physics and biochemistry, I feel well prepared for the further challenging studies and research in the fields of molecular and structural biology, perhaps on very different topics, as well as on the topics I am familiar with. I regard structure investigations to be not only the method of obtaining a particular structure, but one from the collection of methods of life sciences which together advance our understanding of molecular mechanisms of life. Therefore I want to study a range of biophysical, biochemical and computational techniques that are used to reveal function of biomolecules and information processing by biological systems. Spectroscopy, quantum chemistry and computational structural biology techniques, like molecular dynamics and Brownian dynamics are of great interest to me as they are hand in hand with structure determination methods. Therefore multidisciplinary training program in Molecular, Cellular and Chemical Biology perfectly suits my scientific interests. Research in these areas is very active in Dr. X's, Dr. X&#65533;s, Dr. X&#65533;s, and Dr. X&#65533;s groups at XX University.

I want to continue my education at the Department of Molecular and Cellular Biology of XX University. I am convinced that my participation in your Ph.D. program will give me thorough education and excellent research experience, which will advance me to my dream &#65533; discovering new secrets of Nature.

Ivan Ivanov 16th of November, 2002

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