Centre for Neural and Adaptive Systems

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Subject: Letter of Recommendation for Dr. Evgeni Nikolaev

Dear Committee Members,

I have known Dr. Evgeni Nikolaev for about 20 years since the time he was an undergraduate student of the Moscow Engineering Physics Institute. As an outstanding student, Dr. Nikolaev pursued his master degrees studies at the Institute for Mathematical Problems in Biology (IMPB), a leading research institute of the Former USSR Academy of Sciences and then Russian Academy of Sciences. After successful graduation, Dr. Nikolaev was awarded a research position at IMPB. In a short period of time he became very proficient in Dynamical Systems, Bifurcation Theory, numerical methods, etc. At that time Nikolaev's outstanding abilities were formed and became even more manifest. Evgeni Nikolaev has a keen ability for theoretic work, a fundamental scientific background, and strong computer skills.

Dr. Nikolaev was very fortunate to collaborate with outstanding Russian mathematicians and biologists as Professors L.P. Shilnikov, E.E.Shnol, and E.E. Sel'kov. Professor E.E.Shnol, the Dr. Nikolaev's Ph.D. thesis adviser, has been in my view one of rare individuals who significantly contributed in pure, applied and computational mathematics. These three individuals deeply influenced and shaped Dr. Nikolaev's research style and directions.

Dr. Nikolaev completed his Ph.D. thesis in the theory of bifurcations of periodic solutions of differential equations with finite symmetry. He holds his Ph.D. degree in Physics and Mathematics with specialization in Differential Equations and Mathematical Physics from the Lobachevsky Nizhegorod State University, Nizhnii Novgorod, Russia. The Nizhegorod mathematical school is world renowned for its achievements in the theory of stability, the bifurcation theory and chaos. Dr. Nikolaev's results on bifurcations in systems with symmetry are well known, and some of them are included in modern textbooks on dynamical systems.

I believe that Dr. Nikolaev has a deep knowledge and unique expertise in Pure and Applied Mathematics, Mathematical Modeling, Mathematical Biology, and Numerical Methods. All this demonstrates a serious strain in Dr. Nikolaev's work, his constant seeking opportunities for collaboration with scholars in different scientific fields. In particular, we fruitfully worked on a joint problem to analyze nonlinear dynamics in a system of electrically coupled neurons. Dr. Nikolaev brought his unique expertise in the bifurcation theory and asymptotic analysis to the problem we studied. He suggested a new approach to find all periodic regimes in the system, analyze their stability and bifurcations. I enjoined working with him and in the co-authorship with

Dr. Cymbalyuk we prepared an interesting paper (Cymbalyuk G.S., Nikolaev E.V. and Borisyuk R.M. 'In-phase and anti-phase self-oscillations in a model of two electrically coupled pacemakers'. Biological Cybernetics, 1994, 71:153-160). It was shown for the first time that electrically coupled neurons could oscillate in anti-phase. At present Dr. Nikolaev's scientific interests are focused on modelling cellular organisms and this field promises to revolutionize modern life just as rapid advances in computer technology did during the last century.

Dr. Nikolaev's other activities and interests include computational and programming projects. One of such projects relates to the development of LocBif, a unique graphical and computational environment to analyze bifurcations in dynamical systems and iterated maps. Dr. Nikolaev developed a parameter continuation technique, a key part of the LocBif computational bifurcation engine. LocBif has made such a great impact on the modern scientific and industrial communities that the paper where LocBif was introduced has already been cited more than one hundred times (Khibnik A., Kuznetsov Yu., Levitin V., Nikolaev E. 'Continuation techniques and interactive software for bifurcation analysis of ODE and iterated maps'. Physica D, 1993, 62:360-371).

While at IMPB Dr. Nikolaev had a serious teaching load ranging from regular classes in mathematics to co-advising graduate students. As the Head of the IMPB Educational Department I invited him to teach classes at the School of Natural Sciences for gifted high school students. He had taught advanced mathematics for three years. Many of his students were admitted to the leading educational institutions of Russia. His former students always admired him as a great teacher. Some of them, such as Galina Lunina and Konstantin Denisyuk have become brilliant scientists.

Dr. Nikolaev and I co-advised Dr. Gennady Cymbalyuk who at that time was a graduate student in computational neuroscience. Dr. Nikolaev was not only an excellent mentor for Gennady but also a good friend who could always help with good advice in many situations. He exposed Gennady to the modern theory of dynamical systems and numerical methods, formulated a research project that ended up with a publication which I already discussed.

Dr. Nikolaev is a sincere, responsible person of high moral character who is diligent in his work and forthright in relationships with his associates. He is also a person who sets great store in family values. He has a lovely family who share his positive characteristics. His wife is a highly qualified medical assistant, and his young son is bright and talented.

The scientific career of Dr. Nikolaev looks very successful. He was awarded a Soros Scholarship in Mathematics and then a grant in Mathematical Modelling by the International Science Foundation (Washington DC). Dr. Nikolaev is an author and co-author of several seminal results in both pure and applied mathematics, published in leading international journals. There is no doubt that the scientific work of Dr. Nikolaev is outstanding. He has an enormously diverse professional experience in both research and teaching and I enthusiastically support the Dr. Nikolaev's application.

Sincerely yours,
Prof. Roman Borisyuk