



center for neurodynamics

November 10, 2005

Yves Brun, Systems Biology/Microbiology Faculty Search
Department of Biology, Indiana University
Jordan Hall 142, 1001 E 3rd St
Bloomington IN 47405-7005

REF: Support letter for: Dr. Gabor Balazsi

Dear Dr. Brun,

This is a letter in support of the application of Dr. Gabor Balázsi for an academic position your Department.

Dr. Balázsi completed his Ph. D. degree in physics at the University of Missouri in December 2001. After his degree was awarded, he obtained a postdoctoral position in the group of Dr. Zoltan N. Oltvai, M.D., Department of Pathology, Northwestern University Medical School. In this role during the subsequent two years, he performed research on the frontier in the overlapping areas of biology, specifically genetic regulatory dynamical mechanisms, and statistical nonlinear physics. He then moved to a second postdoctoral appointment in the laboratories of Prof. J. J. Collins, Center for Biodynamics, Boston University.

Dr. Balázsi's most recent research before moving to Boston concerns conditionally essential genes in *E. coli*. A second study is described in the publication, "Experimental determination of system-level analysis of essential genes in *E. coli*" that recently appeared in *J. Bacteriology*. As this publication shows, the program at Northwestern University, and Balázsi's role in that program, are on the cutting edge of genetic research, employing advanced methods of software development for informatics studies of processes in gene expression. It should be noted that the other coauthors of these publications - Barábási, Oltvai and Osterman - are the frontier makers in this field. In addition to these and other first rate publications, Dr. Balazsi's work at Northwestern culminated in an article in the *PNAS*.

Dr. Balázsi worked previously with me on spatio-temporal dynamical processes in various systems, notably Ca^{++} intercellular oscillations, an area which has recently captured high interest among those working on glia and intercellular communication in the brain. The current high level of interest in his work is indicated by invited seminars and talks, for example at the University of Chicago Department of Computational Neuroscience as well as the second postdoctoral appointment at Boston University..

Dr. Balazsi's research for his Ph. D. degree in my laboratory was the best I have ever had the pleasure to sponsor and mentor. Dr. Balázsi is, in my opinion, among the top 2 or 3 % of researchers currently in the early stages of their careers in biological physics. During the course of his research he early demonstrated a surprising maturity and sophistication. We have numerous visitors in this laboratory. Dr. Balázsi almost from the beginning of his research

engaged each in vigorous questioning and discussions. He demonstrated the same enthusiastic intellectual curiosity at the numerous meetings he attended during his career as a graduate student here. (Unlike many other labs, we require our students to give talks at national or international meetings, for example, the March meeting of the American Physical Society and the dynamical systems meeting at Society for Industrial and Applied Mathematics.)

After his degree was awarded, Dr. Balázsi accepted a postdoctoral position with one of the few leading groups working on the *dynamical* processes of gene regulatory mechanisms. The key word here is “dynamics”, or the temporal evolution governing gene regulation and the ultimate expression of a target protein. His Ph. D. research consisted of simulations and theory of inter- and intra-cellular interactions using spatio-temporal Ca^{++} wave visualization. He made use of the physics of nonlinear dynamics and stochastic processes in this research and will use similar approaches in his new studies of the dynamical processes in genetic expression including dynamical noise (or random processes).

I have known Dr. Balázsi for approximately 8 years, and I was his Ph. D. advisor. I met him first as a graduate student participant in a conference in Hungary. I was so impressed with his knowledge and determination that I invited him to St. Louis to enter as a graduate student (Ph. D.) in our Department. Dr. Balázsi and I have collaborated on a number of projects, and we have several publications in common as shown on his vita. He has presented several lectures at various conferences on our joint research work, one an invited lecture for which he won a recognition award.

Dr. Balázsi has taken the lead in defining the dimensions of his research topic. He formed a close collaboration with Dr. Ann Cornell-Bell, an experimental cell biologist, from whom he obtained experimental data on Ca^{++} wave propagation in networks of cultured glial cells (from both human and rat brains). He then proceeded to make theoretical and numerical analyses based on stochastic and nonlinear intercellular processes. In the course of this work he discovered (from Dr. Cornell-Bell’s data) that glial cells inhibit the Ca^{++} oscillations of their neighbors, that is, neighboring cells oscillate approximately 180 degrees out of phase, and this phase angle shifts as the distance from a particular cell increases. This was a significant discovery (unknown to the community) and was completely his own. He then proceeded to model this with a network of FitzHugh-Nagumo oscillators coupled as inhibitors. (He studied the network with excitatory coupling as well.) I wish to emphasize that I was only peripherally involved in his discovery and his simulations. Moreover, having completed this work, he then wrote it up for publication again largely by himself. I proof read his ms and made only a few minor suggestions for revisions. It might be added here that Dr. Balazsi’s use of English in both style and clarity is excellent.

In my opinion, Dr. Balázsi has a very great potential for further significant contributions to his field. He had taken the lead in applying for a very prestigious (Humboldt-National Research Council) fellowship and in identifying Institutes where he could successfully continue his career, while developing appropriate research proposals for local collaborative work. (This prestigious fellowship was subsequently awarded to Dr. Balázsi, but he declined it in order to work with the Northwestern-Notre Dame groups on dynamical genetics.) I am convinced that Dr. Balázsi has a substantial potential for scientific leadership in an academic setting or within the setting of a significant research center. He is young yet, but he studies the literature assiduously and shows great initiative and originality in his ideas for research. Considering scientific potential both in the longer and shorter time spans I would rate Dr. Balázsi well above other recent candidates for research and/or academic positions. Judging from his lectures and other presentations, I would suppose that he is an effective and talented teacher.

Dr. Balázsi has a pleasant and cooperative personality. In the Center here he has shown a talent for collaborating with others of our group as well as occasionally with visitors from outside the Center and for learning from them. Though he was a graduate student in Physics at the time, he displayed an outstanding ability to discuss with and learn from faculty and students of other disciplines, in particular biology and medicine. Consequently, he knows personally a number of well known scientists who have visited here or whom he has met at conferences. During their visits and lectures he was always eager for discussions, always voicing a number of stimulating questions.

To conclude, I wish to thank you for the opportunity to comment on Dr. Balázsi. I hope these remarks will be useful to you in the course of your deliberations. If you require further information, please do not hesitate to contact me at any of the coordinates below.

Sincerely,



Frank Moss

Curators' Professor and Director

+01-314-516-6150 (voice)

+01-314-516-6152 (fax)

mossf@umsl.edu

<http://neurodyn.umsl.edu>