Interview with Jacek Jaworski

The Dream of a Fluorescent Brain

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True biologists like Jacek Jaworski and his wife Agnieszka always keep close to the green

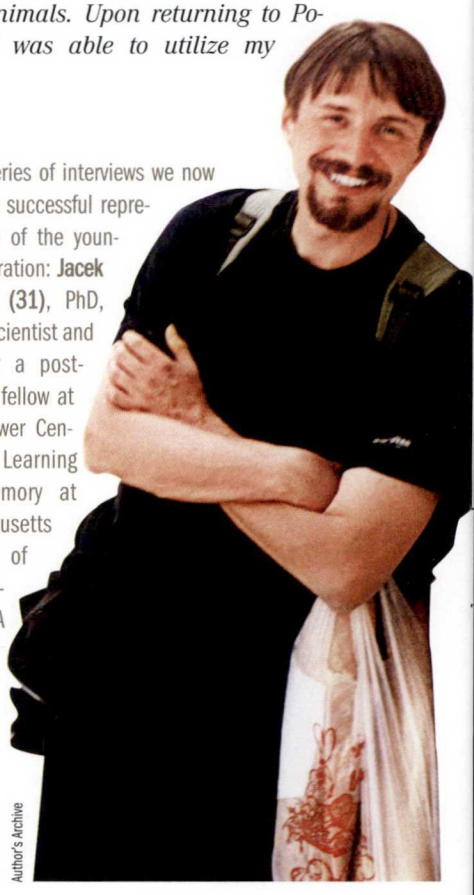
Academia: Your dream must have came true: you have become a scientist...

Dr Jacek Jaworski: As a child, I wanted to become a fireman or a policeman instead. Or maybe an archeologist. Later on I very seriously considered studying medicine. However, I always had some doubts about whether I would be a good physician. Just before I made my final decision, a book about advances in biotechnology made me think, for the first time, about how it might be fascinating to do science. I think I started to seriously consider a career in research close to the end of my master's degree project, once I realized that I really enjoyed planning and doing experiments and that the satisfaction associated with scientific discoveries helped me survive the failures and frustrations. Equally important was support from people I met at the Warsaw University Department of Genetics, and then later at PAN Nencki Institute of Experimental Biology. They, together with my parents, all gave me huge vote of confidence by convincing me that I might be a potentially good researcher.

Your career seems to reflect evolution itself: starting from the simplest creatures, you ended up examining the most complex organ – the brain.

That's true – I started my scientific career at the Department of Genetics, which was a far cry from being a neuroscientist. At that time, as an undergraduate student, I worked on producing human hormones in yeast for biotechnological purposes. It was the extensive training in molecular biology techniques I obtained there that gave me a chance to become a graduate student at the Nencki Institute. Under Prof. Leszek Kaczmarek's supervision I had a chance to study the involvement of transcription factors (proteins that specifically control part of the transfer of information from genes to proteins) in the processes of learning and memory formation, as well as how pathologies of the the nervous system develop. Collaboration between my supervisor and Dr. Jacques Mallet, head of the Laboratory of Molecular Genetics of Neurotransmission and Neurodegeneration in Paris helped in further improvement of my skills in the genetic modification of neurons. During 6 months of training in his laboratory I learned how to use different viral vectors (that deliver genes of interest to the cell) to modify neurons, not only in the Petri dish but also inside the brains of living animals. Upon returning to Poland I was able to utilize my

In our series of interviews we now talk to a successful representative of the younger generation: **Jacek Jaworski (31)**, PhD, a neuroscientist and currently a post-doctoral fellow at the Picower Center for Learning and Memory at Massachusetts Institute of Technology, USA



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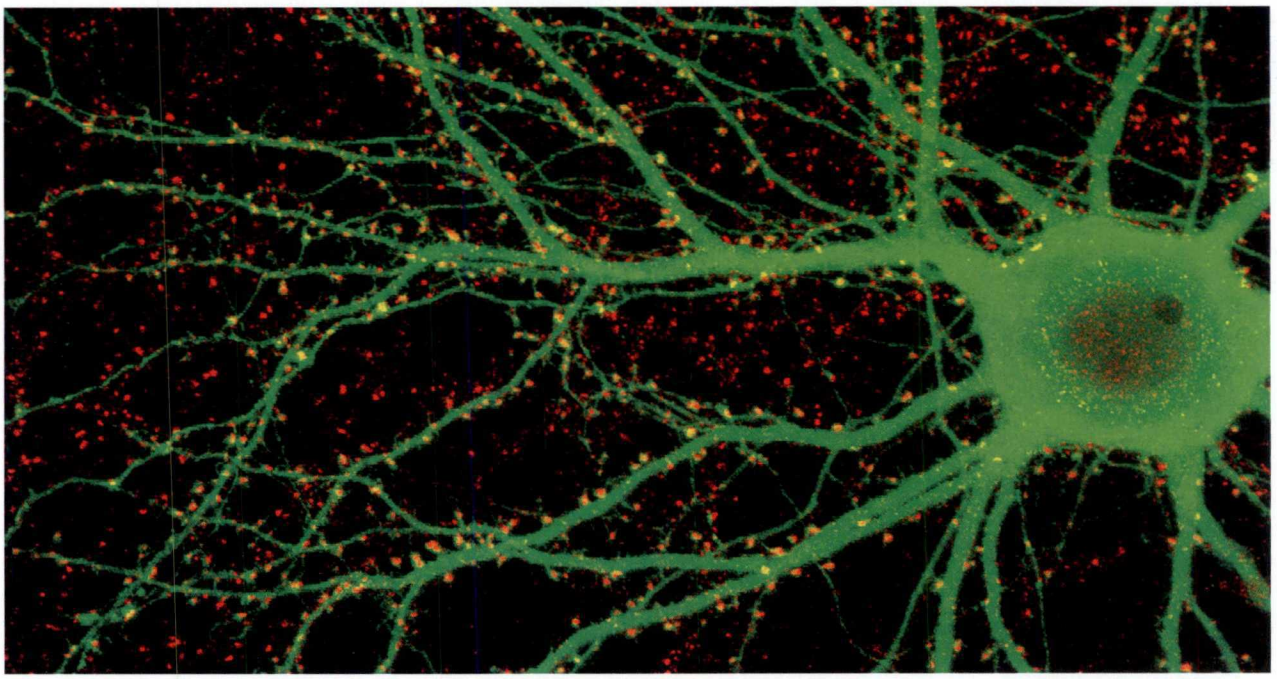

Fluorescent derivatives of neural cell proteins can be potentialy used to tag synapses for *in vivo* imaging

skills learned in Paris to demonstrate, using viral vectors, that the transcription factor called ICER is involved in the programmed cell death of neurons. Furthermore, additional experiments showed that the activation of ICER is observed in situations that mimic nervous system pathologies. However, my work with Prof. Kaczmarek not only taught me how to do good research both, in Poland and abroad; I also learned how to successfully compete for research funds and scholarships.

So doing your PhD in Poland prepared you well to further develop your career abroad?

Yes. For the last 2 years I have been working as postdoctoral trainee in Prof. Morgan Sheng's laboratory at MIT in Cambridge, USA. My research interests have shifted toward attempting to image synapses (connection and communication sites between neurons) in the living brain. The ultimate goal of my postdoctoral project is to create genetically modified (transgenic) mice that would allow us to visualize, in real time, the processes of synapse formation and elimination in the brains of living animals. This goal might possibly be achieved by creating transgenic animals expressing fluorescent proteins specifically directed to synaptic sites and by applying in vivo two-photon microscopy. MIT is a great scientific environment for carrying out such a project, which demands the joint application of very advanced biological and technical tools.

But is it the only such environment? Globalization and unification are two of the basic processes that define the modern world, and science is especially international. Does it actually matter to you which country your lab is in?

As far as I can compare the style of work here and the opportunities for scientists to those in Poland or even more generally in Europe, I would say that there are several differences that still make the US a much more attractive place for research. The general work attitude and work organization, better research financing, the competitive environment, lower prices for reagents and their fast delivery, and young researchers' much shorter path to independence are just a few examples. However, with institutions like MIT and Harvard University, the Boston-Cambridge area is an exceptional and unique scientific environment even within the US, which can offer truly outstanding opportunities to do the most challenging and technologically advanced research. This is due to the presence of thousands of talented scientists from all over the

world with their know-how, the investment of enormous amounts of money for research, the accessibility of high-tech equipment and unique reagents, the involvement of the biotech industry, and finally, very tight-knit links between basic and clinical research. Together, these elements allow researchers to approach particular scientific questions from a broader perspective, with a variety of methods and on a much more massive scale than I have experienced in Europe. The development of this distinctive environment has been fostered for years in a very systematic and planned way, by establishing scientific centers that are dedicated to studying particular problems in a multidisciplinary fashion. The Picower Center for Learning and Memory directed by Nobel Prize winner Prof. Tonegawa is one of the latest examples of this directed approach to creating research environments.

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"I already realized, while doing my PhD, that a scientific career is a demanding one that consumes a considerable amount of time. However, my wife Agnieszka and I were always able to find time to meet friends, go to the theatre and explore interesting places in our city. Furthermore, during the summer and wintertime we usually had a chance to enjoy our favorite outdoor activities, like traveling, hiking, bicycle trekking and skiing. Unfortunately, work at a high profile institution like MIT does not leave too much time for activities other than work"

Many Polish and European professors complain that North America is a "black hole" that attracts young researchers but doesn't let them back home. Do you think you could continue your research in Poland?

Since I still have two years of my postdoctoral training to go, my future is quite unclear right now. However, I hope that it will be possible to continue my research in Poland with the tools I am developing here. My future "dream" project will be to cross my "fluorescent synapse" reporter mice with transgenic mice models of brain disease, to study synaptic plasticity at the early stages of deterioration.

It is really very difficult to predict to what extent (if at all) I will be able to continue this type of research in my home country. There are several issues that will determine this. The success or failure of my postdoctoral training is one concern, for example. Working in a leading lab on topics that are aimed at opening up new directions in the field gives one the opportunity for great success, but also entails a higher risk of total fiasco. The condition of Polish science, the financing for research, the job availability for returning young scientists, and the level of independence after returning are also factors that will affect my scientific activity in Poland.

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