

“We are heading for new directions in brain research”

Neuroscientist László Acsády, winner of an ERC Advanced Grant, the most prestigious grant of the European Research Council fostering discovery research, has set the objective to explore the so far virtually unknown links between the frontal lobe of the cerebral cortex – responsible for cognitive functions, movement coordination, speaking and in pathological cases also for epilepsy and Parkinson’s disease – and the thalamus. With the professor of the Institute of Experimental Medicine of the Hungarian Academy of Sciences (MTA KOKI) we discussed the directions of research in the forthcoming five years.

We could rightly say that you are “specialised” in the thalamus, as you have been the head of the Thalamus research team of MTA KOKI since 2003. One of your major discoveries is also related to this area: in addition to the excitatory synapses known so far, a new inhibitory synapse has been identified in the thalamus, which causes “twilighting” an unconscious state of behavioural arrest. Does your awarded ERC project has anything to do with it?

The answer is partly yes, as this project also focuses on the thalamus, but this time we set a far more ambitious goal for ourselves. So far neuroscientists traditionally have considered the thalamus as the central relay of sensory signals to the cerebral cortex, which, however, is not directly connected to higher areas of the cerebral cortex. I would like to break away from that concept. Thalamus is known to be directly connected to the frontal cortex, the frontal lobe, responsible for functions superior to perception, such as cognitive functions. However, for the time being the relevance of this connection in the functioning of the frontal lobe is not known. The aim of my project is to identify the structural and functional specificities between the two areas of the brain mentioned before that enable this higher level activity of the cerebral cortex.

As a general practice, the ERC Advanced Grant is awarded to a project after a multiannual application process of several rounds. In spite of this fact, it took you only one application to be awarded the grant, which is rare in the practice of the ERC. What do you think convinced the board awarding the grants?

Honestly, it took me by surprise. This was the first time I had submitted an application, so I thought it would take me another two or three years to achieve support. The favourable decision might be reasoned by the global paradigm shift in brain research and my project is also relates to that direction. It must be noted that sensation and higher level activities of the nervous system, such as movement and thinking, require different types of cerebral activities. Sensation takes place in a much shorter time, a splinter of a second, whereas thinking, scaling, decision making or speaking are the result of persistent cerebral activities requiring a longer time. In these cases the activities need “to be retained” in your brain for some time. By exploring the specificities of the synapses between the thalamus and the frontal lobe, we will get closer to knowing more about the nature of these persistent activities. We assume that it is these persistent activities that make several severe diseases linked to the frontal lobe – such as the Parkinson’s disease, epilepsy, schizophrenia, chronic pain - incurable, because these make pathological processes linger on. Thus this direction of neuroscience may open up new perspectives in medicine, as well.



László Acsády

Relying on domestic and foreign funds, you have conducted research in Hungary for nearly one and a half decade. How much support does the ERC Grant provide and how will you use it?

The Grant amounts to approximately HUF 500 million for five years that is an annual amount of HUF 100 million. This is a considerable amount of money, but let me underline that I could not have gone this far without the support I have received over the past few years from domestic funds, such as the National Research, Development and Innovation Fund or the NAP programme (NAP, the National Brain Research Programme was launched by the government in 2014 with the so far most substantial budget of HUF 12 billion – editor’s note). I will use the ERC Grant to pay the ten people in my research team, and it also allows me to use technical devices and procedures that triggered a real technological revolution in neuroscience. Such technological devices and procedures include optogenetics (molecules activated by light), or new imaging technologies. We will, for example, use a special electro-microscope that – to put it figuratively – “slices” the brain tissue, scans the slices and finally constitutes the complete, 3D image of the tissue with nanometre accuracy. Like a cheese slicer, which can produce the complete 3D model of the whole cheese. This imaging technology can be used not only to study the cerebral tissue of mice, but of human beings, as well.

Internationally, Hungary is considered as a country in the forefront of neuroscience. How fundamental do you think your research will be and

who will you work together with?

I was “grown up” from the school of the famed János Szentágothai, and I am also eager to involve young researchers in my project. One of my students, Nóra Háding is now on a post-doctoral fellowship in New York, we expect her to return, while two other students of mine, Péter Barthó and Ferenc Mátyás already run their own laboratories, but I will rely on their expertise too. And of course, my closest collaborator: my wife, Hajnalka Bokor, also a biologist. We have been working together for 13 years and she has made a remarkable contribution to elaborating the fundamental ideas in my research. In addition, I have a working relationship with several international teams, I owe a great deal to British, American, French and Korean cooperations. Last year, at one of the most prestigious conferences, the Gordon Research Conference, I delivered a paper exactly on this project, which was so successful that I was chosen to chair the next conference to be held in two years' time, again in the USA. This is a great recognition in professional terms. But right now the most important thing is that the ERC Grant will help us find new directions in research focusing on the structure of the thalamus and the frontal lobe, we can get closer to the functioning of the human personality as a whole, and may as well help find the cure for pathological cerebral activities which so far have been incurable. And we can do all this in our mother institution in Hungary.

You can find more information on research projects lead by László Acsády and funded from the NRD1 Fund by clicking [on this link](#).

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