ACADEMY AWARD

Riitta Hari

ACADEMICIAN RIITTA HARI was awarded the Finnish Academy of Science and Letters Academy Award 2020.

Academician Riitta Hari was still a teenager when she became fascinated by the brain after reading a book on the subject. When she entered the medical school, she immediately started to search for neuroscience contacts. She defended her doctoral dissertation in 1980. Soon after that, Academician Olli Lounasmaa, the creator of Finnish low temperature physics, called her and offered the opportunity to run a small brain-research team at the Low Temperature Laboratory of the Helsinki University of Technology in Otaniemi. Hari seized the opportunity, but only after making sure she would have something to fall back on: she first finalized her studies as a specialist of clinical neurophysiology, received a permanent post in a hospital, and acquired her own independent funding. Hari was in charge of the Brain Research Unit of the Low Temperature Laboratory from 1982 to 2016. She is awarded the Finnish Academy of Science and Letters Academy Award for her life's work.

The imaging technique used and developed by Riitta Hari and her colleagues is magnetoencephalography (MEG), which measures weak magnetic fields in the brain with a precision of a few milliseconds. MEG provides information on how and where the brain is activated in different situations.

"The development of MEG required cutting-edge expertise in low temperature physics because the sensitive measuring sensors are cooled close to absolute zero (–273 °C). There was no need to move abroad for longer research visits because we in Finland were leaders in our field worldwide, with a constant flow of foreign researchers heading in our direction", says Riitta Hari.

At first, only a single-channel MEG device was available to measure brain's responses to external stimuli. Naturally a large part of the brain was left invisible.

"The research methods and intellectual content typically develop hand in

Riitta Hari and her colleagues developed imaging technique magnetoencephalography (MEG)

hand. As a neuroscientist, I designed new experimental setups to obtain reliable results despite the limitations of the technology, and we tried to use the available equipment as effectively as possible. The good results convinced our sponsors and inspired the physicists in our research group to develop even better measuring devices. As a physician-neuroscientist among a group of engineers and physicists I was far from my home turf, which was exceptional at that time. Fortunately, our cooperation worked very well, largely because we were within shouting distance of each other."

Over the years, new measuring equipment was developed in Otaniemi, finally to cover the entire head. At the same time, Hari and her team extensively studied the brain's sensory and motor systems, moving gradually towards more natural experimental set-ups. The purpose was to understand how the brain works in the reality in which we live, not just in the artificial conditions of research laboratories.

An imaging technique complementing MEG is the widely used functional magnetic resonance imaging (fMRI), which displays the active brain regions accurately, but is poor in timing. To really understand how the human brain works, it is necessary to combine these two methods to obtain both temporally and spatially accurate information about brain function.

In later years, Hari has been developing two-person neuroscience to examine the brain basis of social interaction.

"Instead of studying a single brain, the brains of two interacting people are studied at the same time. Social interaction is an integral part of human life, but it does not even exist if there is only one person present."

"We already have a fairly accurate picture of how external stimuli activate the brain and what happens during various actions and cognitive functions – such as attending to something, moving or speaking – but we need a lot more information about the multilevel feedback system

through which all previous experience stored in the brain affects the processing of new stimuli. Similarly, we know far too little about the omnipresent and important inhibition mechanisms that allow only a specific movement sequence or a certain behavioural pattern to be realized at any given time", says Hari, referring to some of the questions that brain research still has to address.

As her career as a researcher progressed, Hari became increasingly interested in the connections of the brain to the body, to the outer world, and especially to other people. After all, the brain is not a separate organ in its own vacuum. One intriguing question is the evolutionary connection between human mental functions and motor actions.

"In order to understand the full picture, neuroscientists need input from physiology, physics, biology, psychology, sociology and even the arts and philosophy. All these disciplines bring important perspectives to what we human beings are."

"I am concerned about the wide gap that still exists between the natural sciences and the humanities. Education is part of the problem. Specialization begins already at school which means that the students who start university are already firmly set on a specific career. I would like all students to take part in a "civilization course" for a couple of weeks at the beginning of their university studies – online if that is what it takes these days – in which the best professors and researchers from different fields would describe the achievements of their field with a special focus on unsolved problems. In addition to in-depth specialization, all levels of education should build and foster a multidisciplinary approach, which will increase our understanding of the world, create a sense of proportion and improve mutual understanding."

"The coronavirus has served as an exercise in confronting other crises as well by demonstrating that researchers must be able to change direction in an agile

manner whenever needed. The deeper the researchers' methodological competence and the wider their general knowledge, the better their chances of succeeding in this. During the corona pandemia, we have needed expertise and insights from multiple scientific disciplines besides medicine, and not even the best measures can succeed without an informed civil society that trusts in research-based knowledge."

Hari reminds that scientific knowledge is not just one opinion among others. "It is thanks to science, not to any flimflam, that antibiotics work and airplanes stay in the air."

The Academy Award is the highest honour that the Finnish Academy of Science and Letters can confer on a scholar in recognition of his life's work. The Academy has awarded the Academy Award since 1945.

Photo: Academy of Finland