Interview: Ricardo Martínez Murillo – Director, Cajal Institute, Spain



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Ricardo Martinez Murillo, director of the Cajal Institute - a neuroscience research center assigned to the Spanish Research Council (CSIC) and the oldest neurobiology research center in Spain – discusses recent breakthroughs in the field of neuroscience and highlights how better facilities and resources are paramount to making Spain a European reference in scientific research.

Could you start by introducing your extensive career in the research of neuroscience along with your current priorities for the Cajal Institute?

I was born in Madrid, on Oct. 13th 1953, and obtained my MD. and doctoral degrees at the Complutense University in Madrid (UCM) in 1977 and 1980, respectively. I started my scientific career at the Department of Experimental Endocrinology, Hospital “Puerta de Hierro” in Madrid, and performed a PhD work at the Cajal Institute on a subject related to neurotransmitter characterization of the rat cerebellum. Later, 1985-1989, I was awarded a grant of the Royal Society for a postdoctoral stay at Oxford University, England. Under the direction of Dr. Claudio Coello, at the Department of Human Anatomy, I was working elucidating the structure and expression of the dopaminergic innervation of the nucleus basalis of Meynert. Later, during the period 1990-1994, I made different stays in the Hammersmith Hospital (now part of Imperial College London) stablishing a productive scientific cooperation with Prof. Julia Polak, head of the Histochemistry Department, focusing on the regulation of neuronal communication by small-molecule neurotransmitters. After occupying the Director chair of the Cajal Institute during the

period 1996-2004, I started my independent career by deciding to pursue a molecular characterization of inflammatory processes in experimental stroke and Alzheimer´s disease. Actually, my research interest focuses on understanding the mechanisms of protection and repair of the neurovascular unit in health and disease of the Central Nervous System, particularly stroke and Alzheimer´s disease. “We research into developing of effective molecules capable of delaying or stopping the neurodegeneration underlying these processes”. Appointed again as director of the Cajal Institute in September 2017, the first, and still the most important priority to me is to move the Cajal Institute to the University of Madrid campuses trying to find out the adequate space and environment to conduct the vast amount of research we house here, and in the future, with the addition of new research groups devoted to neuroscience. In Spain, there are many good researchers working in the field of neurosciences, and I can see a potent move on ahead in the next five years.

A move of the Institute to a bigger and right location will give rise to better results in shorter time. The Institute is very competitive despite the latest years of economic challenges, but to maintain productivity we urgently need better facilities, equipment, and safety to develop a science competitive. Unfortunately, many of the researchers from the Institute have moved abroad to places like Portugal, United Kingdom, USA, etc. due to the lack of up to date equipment at the Institute, but I am sure we will see them return soon at the time that modern infrastructure is installed.

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What is your assessment of the research conducted in Spain since the crisis?

Unfortunately, our situation has not improved what would it have been necessary since the severe economic crisis, and the research we conduct in Spain is still lagging behind compared to Europe, especially in terms of income per project and infrastructure. However, in the latter years, the Cajal Institute has undergone a transformation to a better situation. We recently welcome a new research multidisciplinary group aimed to neural rehabilitation. This research group combines knowledge from the areas of Neuroscience, Physical Therapy, Biomechanics, Control, Robotics, Modeling, Machine Learning, and others, showing a high level of productivity and touch with the industry. This is a qualitative improvement in our scientific panel, giving rise to a positive outlook for the Institute in terms of its innovation capabilities. The incorporation of the Neuro Rehabilitation group boosted the creation of a new department devoted to Translational Neurobiology. A number of research groups previously established in the Institute are now working together in this new Department, including my research group.

What have been the key developments in research coming from the Cajal Institute in the field of neuroscience?

The Institute is making waves of research discoveries in many different therapeutic areas concerning diseases related to nervous system, such as Alzheimer and Parkinson diseases, multiple sclerosis, as well as neuropathology related to inflammation, stroke, pain, neuro-rehabilitation, oncology, etc.. This showcases the multidisciplinary specialization of our center, a strength identified in the SWOT analysis of our Institute.

In 2016, I was part of a team of scientists that created the ASS234 molecule in the fight against Alzheimer's, a fundamental advance in the field of neurology. Our research is improving in this field because we have also developed another similar molecule, mba121, with better efficiency in the treatment of animal models of the disease. My work has been in collaboration with a research group in the "Instituto de Química Orgánica General" (IQOG), CSIC (Spanish National Research Council). This research is ongoing.

What are the main challenges and opportunities that present themselves regarding research in Spain?

It is a positive sign that our institution (CSIC) is improving, which coincides with the growing economy and increases in the economic support that the CSIC has received in recent years. In addition, the multiple research groups established in the Cajal Institute procure their own incomes supporting themselves. However, we are yet to improve on these figures of economic support and the number of research groups we have, which have stayed at similar numbers over the past few years. We hope to see an increase in these numbers and the opportunities to gain more in terms of income and scientific publications. In terms of scientific publications, we are still competitive at a European level, collaborating with many different scientific centers, not only nationally but internationally in Europe and the US.

Spain offers quite strong capabilities in translational research. How would you assess the country's competitiveness in this field?

The country is very competitive in the field of neurosciences, but we need urgently more incoming funds, better facilities, equipment, and researchers to develop a science competitive. Many of our research groups are working in the area of diseases related with age: Alzheimer's, stroke, etc., especially because of the fact that aged population will exponentially grow in a near future. We research to provide a cure or a way to slow down the progression of these diseases. In summary, we are working to improve the quality of life of our citizens.

How do you ensure the legacy of the founder of the Institute remains alive to this day?

Santiago Ramón y Cajal (1852-1934) is considered the father of modern neuroscience for his outstanding studies of the microanatomy, his observations regarding degeneration and regeneration, and his theories about the function, development and plasticity of virtually the whole central nervous system. Cajal was awarded the Nobel Prize in 1906 and, spite of the passed time, his work continues to captivate and stimulate modern neuroscientists. Some of his original possessions are housed at the Cajal Institute (CSIC), Madrid, Spain. The Cajal Institute preserves the items that Cajal bequeathed to its Institute, which together are referred to as “Cajal Legacy”: ““… my collection of microscopic slides, cupboards to keep them in and some scientific devices of my property, such as the microtome and two microscopes, a Zeiss model and another Leitz model, and finally, a Zeiss microphotographic device”. The Cajal Legacy also holds other items that Cajal’s family has entrusted to the CSIC in homage to his memory. The legacy of Santiago Ramon y Cajal is very valuable and is still a matter of research and remains alive to this day. Currently, there is a traveling exhibition of Santiago’s works in the United States, with several of his scientific drawings also exhibited in Bethesda, (NIH) and even in Japan.

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At present there is no museum for the Cajal Legacy, and most of the Cajal Legacy now remains in a secured area with temperature, light and humidity controlled. These priceless treasures require a dedicated world-class museum, not just for Cajal’s legacy but also for his disciples. Such a museum would inspire the next generation of thinkers who will also have complex and seemingly intractable problems to solve. Meanwhile, a small permanent exhibition showing a careful selection of historical pieces of the Cajal Legacy is now open in the Institute’s library, where the workplace of Cajal is recreated with original possessions bequeathed by Cajal.

What is your take as an expert on the future of neuroscience in Spain?

The field of neuroscience in Spain has a very good future, as we have very good research groups devoted to this area, researchers who are very productive and competitive in their laboratories, so the future of the Cajal Institute is guaranteed. To further discover more in this field, we need strong support from the industry. Traditionally, the industry has supported a kind of research at develop a short term effective product to treat patients. However, basic research needs a broader perspective. I agree that this perspective is more expensive, but there is still room for the industry to support our basic research which will provide in the medium term knowledge that will be needed to find new scientific breakthroughs in the future.

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