

2011: International Year of Chemistry

2011 is the International Year of Chemistry, and the *Brazilian Journal of Pathology and Laboratory Medicine* participates in the celebrations by featuring in its 47th issue cover stories relating to the researchers who received the Nobel Prize in Chemistry in the last decade for work that somehow contributed to the better scientific knowledge in the field of diagnostic medicine.

The 2003 Nobel Prize in Chemistry was shared by two scientists, the physician Dr. Peter Agre and the chemist Roderick MacKinnon, for the discovery of aquaporins and ion channels, respectively.

Peter Agre is a descendant of Norwegian and Swedish immigrants, born on January 30, 1949 in Northfield, Minnesota, where he spent his childhood and adolescence. He attended the Ausburg College in Minneapolis, Minnesota, where he earned a BA in Chemistry. In 1970, he joined the Johns Hopkins University School of Medicine, in Baltimore, Maryland, receiving his M.D. in 1974. After four years living in Cleveland Heights, Ohio, he moved to Chapel Hill, North Carolina, gaining a grant at the local university. In 1981, Dr. Agre joined the National Institute of Health (NIH), returning to Johns Hopkins and contributing to Vann Bennett's research group. Subsequently, he has established himself as independent scientist and chemist, and began a new project on the Rh blood factor.

Between 1988 and 1989, Dr. Agre attended the laboratory of Steve McKnight, a researcher in DNA

transcription factors, and had the opportunity to learn new technologies related to the study of DNA and transcription factors.

By studying the proteins of the Rh factor, he discovered that one of them acted as a water channel (aquaporin, which are proteins that form the channels through which water molecules move across cell membranes), and published the results of his research in 1992 in *Science* magazine.

In 1993, he became professor at the Department of Biological Chemistry and, in the following years, concentrated his work on aquaporins, in collaboration with several groups, studying the structure and role of these proteins.

In 2005, he left Johns Hopkins to become vice chancellor for science and technology at Duke University Medical Center in Durham, North Carolina, returning, however, in 2008 as director of the Malaria Research Institute. For the science, he left his seminal contribution to the understanding of how water moves across cell membranes, a matter scientists had been discussing for a century.

Dr. Agre was one of 48 Nobel Prize winners who signed a letter endorsing Senator John Kerry for U.S. president and a critic of Bush administration policies, especially those related to the environment, including the refusal to sign the Kyoto Protocol.

Roderick MacKinnon is an American chemist and physician, born February 19, 1956 in Burlington,

Massachusetts. He is currently Professor of Molecular Neurobiology and Biophysics at Rockefeller University and received the Nobel Prize in Chemistry in 2003 for his work related to the structure and operation of ion channels. His research was conducted primarily at Cornell High Energy Synchrotron Source (CHESS) at Cornell University and the National Synchrotron Light Source (NSLS) of Brookhaven National Laboratory.

Dr. MacKinnon graduated in Biochemistry in 1978 at Brandeis University, where he studied the transport of calcium across cell membranes. In the following year, he joined the Tufts University School of Medicine, where he received a bachelor's degree in 1982. He completed his residency at Beth Israel Hospital of Harvard Medical School, in Boston. In 1986, he returned to the laboratory Christopher Miller, at Brandeis University, to conduct his postdoctoral studies.

In 1989, he became assistant professor at Harvard University, where he studied the interaction of the potassium channel with a specific toxin derived from scorpion venom, developing and using methods of protein purification and crystallography. In 1996, he moved to Rockefeller University as professor and head of the Laboratory of Neurobiology and Molecular Biophysics, where he started do work on the structure of the potassium channel. These channels, responsible for the passage of potassium through cell membranes, are of great importance in the nervous system and heart.

Before the knowledge acquired from MacKinnon's studies, the detailed molecular architecture of ionic channels and the exact means by which they convey

ions remained speculative for several decades. In 1998, Dr. MacKinnon and colleagues described the three-dimensional molecular structure of the potassium channel from a bacterium using crystallography. By understanding this structure and other experimental studies, it was possible to explain the mechanism of action of selective potassium channel.

References

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