2011: International Year of Chemistry

2011 is the International Year of Chemistry, intended to celebrate the achievements of Chemistry and its contributions to mankind. The United Nations officially endorsed this homage in December 2008, and since then several events have been programmed by the International Union of Pure and Applied Chemistry (IUPAC) and by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

This year's unifying theme was "Chemistry – our life, our future". Commemorative activities have been organized by several scientific societies, such as the American Chemical Society, the Royal Society of Chemistry, the Society of Chemical Industry, the Royal Australian Chemical Institute and the Brazilian Society of Chemistry.

Between 1901 and 2011, the Nobel Prize in Chemistry has been awarded 103 times, to 160 researchers. Frederick Sanger is the only scientist who has been awarded the prize twice: in 1958, for his work on the structure of insulin molecule; in 1980, along with Paul Berg and Walter Gilbert, for the determination of base sequences in nucleic acids.

The Brazilian Societies of Pathology, Clinical Pathology/Laboratory Medicine and Cytology, by means of the Brazilian Journal of Pathology and Laboratory Medicine (JBPML), took part in the celebrations of the International Year of Chemistry. The covers of volume 47 present biographies and images of the investigators who were awarded the Nobel Prize in Chemistry between 2002 and 2009, for works that somehow influenced knowledge and activity in the area of medical diagnosis.

Concluding this commemorative series, JBPML presents the three winners of the Nobel Prize in Chemistry 2009: biologist Venkatraman "Venki" Ramakrishnan, crystallographer Ada E. Yonath and the professor of Molecular Biophysics and Biochemistry Thomas Arthur Steitz. The prize was conferred for studies on the structure and function of the ribosome.

Venkatraman Ramakrishnan was born in Chidambaram, Cuddalore, district of Tamil Nadu, India, in 1952. He is a structural biologist at the Medical Research Council (MRC) Laboratory of molecular biology in Cambridge, England.

Dr. Ramakrishnan studied on a National Science Talent Scholarship, receiving his bachelor's degree in

Physics in 1971. After graduation, he moved to the United States, where, in 1976, he got his doctorate degree in Physics from Ohio University. He spent two years studying Biology as a graduate student at the University of California, in San Diego, to make a transition from Theoretical Physics to Biology.

He began a post-doctoral work on the ribosome, with researcher Peter Moore, at Yale University. He continued these studies from 1983 to 1995, as an investigator of the Brookhaven National Laboratory. In 1995, he became professor of Biochemistry at the University of Utah; and in 1999, he took his current position at the MRC Laboratory of Molecular Biology, in Cambridge.

In 1999, Dr. Ramakrishnan's research team published a study presenting the ultra structure of the 30S subunit. In the following year, they determined the complete atomic structure of this ribosomal subunit and its complexes with several antibiotics. The new studies allowed by this knowledge deepened the understanding of the structures and the mechanism which guarantee fidelity of protein biosynthesis. Recently, his laboratory has defined the atomic structure of the whole ribosome. Dr. Ramakrishnan also stood out for his works on histone and chromatin structure.

Ada E. Yonath was born on June 22, 1939, in the district of Geula, Jerusalem. Her parents were Zionist Jews that immigrated to Palestine before the establishment of the State of Israel; her father was a rabbi. She is a crystallographer best known for the pioneering work on ribosome structure. She was the first woman among the nine Israeli Nobel laureates. Currently she is director of the Helen and Milton A. Kimmelman Center for Biomolecular Structure and Assembly of the Weizmann Institute of Science.

She graduated at the Hebrew University of Jerusalem, with a B.Sc. in Chemistry in 1962. She obtained her master's degree in Biochemistry in 1964 and the Ph.D. in 1968, at the Weizmann Institute of Science, with studies on X-ray crystallography. After her doctoral studies, she took positions at the Carnegie Mellon University in 1969 and at the Massachusetts Institute of Technology (MIT) in 1970. There she attended the laboratory of William N. Lipscomb Jr., professor of Harvard University, who won the Nobel Prize in Chemistry in 1976.

Dr. Yonath was a visiting professor at the University of Chicago in 1977 and 1978; from 1979 to 1984 she participated as a leader in a group of researchers of Max Planck Institute for Molecular Genetics, in Berlin, where she investigated the mechanisms of protein synthesis, by ribosome crystallography. She determined the complete high-resolution structure of ribosome subunits and discovered, within the asymmetric ribosome, a universal symmetric region responsible for polypeptide polymerization. Her works demonstrated the ribosome is a ribozyme which places its substrates in a stereochemistry suitable for peptide bond formation and for substrate-mediated catalysis.

In order to enable ribosome crystallography, she introduced a new technique, the cryo-bio-crystallography, which became a routine in Structural Biology and permitted many other projects to be carried out.

Thomas Arthur Steitz was born on August 23, 1940, in Milwaukee, Wisconsin. He is a Sterling professor of Molecular Biophysics and Biochemistry at the Howard Hughes Medical Institute, Yale University, New Haven, Connecticut, USA.

Dr. Steitz studied Chemistry at the Lawrence University. He got his Ph.D. in Biochemistry and Molecular Biology from Harvard University in 1966, where he also worked under the direction of Prof. William N. Lipscomb Jr. His studies there contributed to determining the atomic structures of carboxypeptidase A and aspartate carbamoyltransferase. His post-doctoral research was performed at the MRC at Cambridge University from 1976 to 1970. He was a researcher at the University of Göttingen during 1976 and 1977.

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