

# Ivana Weygand-Đurašević (1952 – 2014)

## Curriculum Vitae

**P**ROF. IVANA WEYGAND-ĐURAŠEVIĆ was born in Osijek, Croatia, on June 15<sup>th</sup> 1952. She received a graduate degree in Chemistry from Faculty of Science, University of Zagreb in 1975. She started postgraduate studies at the same university, and received MSc degree in Molecular Biology in 1978 (supervisor: Ž. Kućan). In 1981 she earned PhD degree in Chemistry from the Faculty of Science, University of Zagreb.

Prof. Ivana Weygand-Đurašević began her scientific career under supervision of Prof. Željko Kućan. Her early research interests were the structure and conformation of transfer RNA for tyrosine (tRNA<sup>Tyr</sup>) from yeast and the interaction of tRNA<sup>Tyr</sup> with the components of the cellular machinery for protein biosynthesis. Transfer RNA, the chemistry and interactions of nucleic acids remain in focus of her scientific interest throughout her career. Prof. Weygand-Đurašević started to work as Research and Teaching Assistant in 1975 at Department of Chemistry, Faculty of Science, University of Zagreb, and later on as Research Associate (1981–1984). During her postgraduate studies she visited the group of Prof. B. F. C. Clark, University of Aarhus, Denmark (1979–1980). She went for postdoctoral study to Yale University, New Haven, USA, where she worked with Prof. Dieter Söll from 1984 to 1987. She returned to Yale as a visiting fellow in 1990 to 1993. During her stay at Yale University she cloned aminoacyl-tRNA synthetase genes and studied the influence of the mutational changes in proteins on tRNA recognition, with special emphasis on misacylation properties. The collaboration with Prof. Söll continued after she returned to Zagreb through joint international research projects funded by NIH-FIRCA. She was a short-term Visiting Fellow at Institut de Biologie Moléculaire et Cellulaire du CNRS (with Prof. J. P. Ebel and Dr. F. Fasiolo), Strasbourg, France in 1988, where she made an important contribution toward understanding the role of noncatalytic domains in aminoacyl-tRNA synthetases. In 1995 she returned again to Yale as Associate Visiting Professor.

The accuracy of protein biosynthesis, involving the aminoacyl-tRNA synthetases in particular, became the main interest of Prof. I. Weygand-Đurašević after establishing her

own research group at the Faculty of Science, University of Zagreb, in 1993. She attracted several excellent young researchers (undergraduates and postdocs) and together with them pursued the research on structure, function and evolution of aminoacyl-tRNA synthetases specific for serine (SerRS) from all three domains of life. Prof. Weygand-Đurašević and co-workers identified the similarities and differences underlying the efficiency and specificity of seryl-tRNA formation in different organisms and in different subcellular compartments. By combination of genetic and biochemical approaches, Weygand-Đurašević and co-workers showed that all SerRS enzymes they investigated (from bacteria to higher eukaryotes) share the general mode of substrate recognition (ATP, serine and tRNA). Significant contribution of Prof. Weygand-Đurašević to the field of protein biosynthesis was the investigation of eukaryotic SerRSs and translational quality control. She discovered that optimization of amino acid binding to the active site of seryl-tRNA synthetase is assisted by tRNA, and that the presence of cognate tRNA diminishes misrecognition of structurally similar threonine by the SerRS enzyme. Thus, her work has shown that the macromolecular complexes of eukaryotic seryl-tRNA synthetases are more efficient and more specific catalysts than the enzymes alone. Macromolecular complexes of SerRSs emerged as an important topic of her research. She and coworkers identified peroxin Pex21p as the interacting partner of yeast SerRS, while SerRS from archaeon *Methanothermobacter thermautotrophicus* was shown to interact with other aminoacyl-tRNA synthetases and ribosomal proteins (see below). Furthermore, important contribution of Prof. I. Weygand-Đurašević and co-workers to the understanding of translational quality control is demonstration of pretransfer editing reactions of yeast SerRS in the enzyme's active site, challenging the long-standing paradigm that proofreading editing reactions occur in separate, additional editing domain.

Her research on serylation system expanded to atypical archaeal seryl-tRNA synthetases, the highly divergent representatives of SerRS family, found only in the limited number of methanogenic archaea. Biochemical,

functional and structural characterization of these unusual enzymes resulted in the major breakthrough when the crystal structure of atypical SerRS from archaeon *Methanosarcina barkeri* was solved in 2006, revealing several unforeseen peculiarities of this group of enzymes. Initial biochemical and functional characterization of atypical SerRS from methanogenic archaea was conducted in collaboration with Yale University and Prof. D. Söll and the structural characterization was the result of collaboration with Prof. Nenad Ban from ETH Zürich (Switzerland) where the structure of *M. barkeri* was solved. The work on atypical SerRSs continued toward identification and characterization of their macromolecular complexes through cooperation with Prof. Michael Ibba from The Ohio State University (Columbus, OH, USA) and Prof. N. Ban. It was shown that atypical SerRS associates with arginyl-tRNA synthetase leading to improved catalytic activity of SerRS and several ribosomal proteins of large ribosomal subunit. The interaction with the ribosome is in line with the "tRNA channeling hypothesis" which proposes that tRNA is directionally shuttled between components of protein biosynthesis machinery, without freely diffusing into solution, leading to more efficient mRNA translation. Another important finding related to atypical SerRSs was discovery of a new class of SerRS-like proteins in numerous bacteria, deprived of tRNA-binding domain and tRNA aminoacylation activity. These enzymes attach the amino acids to dedicated carrier proteins, instead to tRNA, and participate in yet unknown biological process unrelated to protein biosynthesis.

Prof. Ivana Weygand-Đurašević was distinguished and internationally recognized scientist. She was the principal investigator or project co-leader of a dozen research projects funded by Croatian funding bodies, as well as international funding agencies, such as NIH-FIRCA, ICGEB, SCOPES, UKF, FP7-REGPOT, just to name few of them. She collaborated and maintained contacts with many eminent international scientists, some of them already mentioned. She served as Liaison Officer of ICGEB (International Centre for Genetic Engineering and Biotechnology, Trieste), Croatian Affiliated Centre, from 1998 to 2005.

Ivana Weygand-Đurašević was also actively involved in other aspects of scientific work. She was a member of Editorial Board for *Croatica Chemica Acta* (2000–2014). She was selected for Editorial Board of the highly distinguished journal *The Journal of Biological Chemistry*. She also served as a member of the Committee on Ethics in Science and Higher Education (2006–2010), the Scientific Field Committee for Natural Sciences - Chemistry (2009–2014) and was Vice Dean for Science at Faculty of Science, University of Zagreb (2005–2010).

Important aspect of Prof. Ivana Weygand-Đurašević professional life was her engagement in teaching and education. She became Assistant Professor of Biochemistry at Faculty of Science, University of Zagreb in 1988, Associate Professor in 1995, Full Professor in 2000, and tenured Full Professor in 2005. She served as Head of

Division of Biochemistry, Department of Chemistry, Faculty of Science, University of Zagreb (1999–2013), Head of Biochemistry studies at Doctoral School of Chemistry at Faculty of Science (1999–2014) and Head of Doctoral School of Chemistry (2005–2006). She was the president of IAESTE Croatia (International Association for the Exchange of Students for Technical Experience) from 1997 to 1999. She loved to teach and had a great impact on many generations of chemistry and molecular biology students of undergraduate, graduate and postgraduate study programs. As lecturer, Prof. Ivana Weygand-Đurašević was highly respected by the students. Her lectures were comprehensive, systematic, and always updated with the most recent findings from the scientific literature. She was an engaged and fair teacher. Taking into account her scientific excellence and sincere care for the students, it is not surprising that many students of chemistry and molecular biology strived to join her lab to work on their projects for the diploma thesis or to gain some practical lab experience. Many of them became prominent scientist or leading experts in Croatia or abroad. She supervised 12 PhD students and numerous students working on their MSc and BSc theses. She is also a co-author of the textbook for high school level chemistry teaching and together with Prof. Ž. Kućan and Prof. Jernej contributed to translation of Stryer's Biochemistry (6<sup>th</sup> Edition) to Croatian language. Indeed, her teaching and education contributions are rich and numerous, and it is difficult to fully describe them. She will be remembered as dedicated teacher, respected and admired mentor.

For her academic and scientific achievements, Prof. Ivana Weygand-Đurašević received many awards and recognitions. In 2002 she became associate member of Croatian Academy of Sciences and Arts and in 2012 she became full member of the Academy. She was awarded National Annual Science Award of the Republic of Croatia for year 2005.

Prof. Ivana Weygand Đurašević deceased on April 7<sup>th</sup>, 2014 in Zagreb. She courageously struggled with burdensome disease until the last days of her life. She will be remembered as esteemed scientist of broad knowledge, outstanding expert in the field of biochemistry and molecular biology, and dear, appreciated colleague. She left deep impact on Croatian biochemical community through knowledge transfer, by implementation of modern biochemical and molecular biology techniques, especially those related to genetic and protein engineering, and by training many generation of students of chemistry and molecular biology. Her co-workers respected her knowledge and authority and admired her scientific achievements. As a person, she was quiet, modest and polite. She was reliable, very dedicated to her work, with strong sense of responsibility. Still, in informal situations Ivana was warm and kind. She is truly missed as a scientist, as a colleague and as a person.

Marko Močibob