José Nelson Onuchic

JOSÉ ONUCHIC is a Professor of Physics and Astronomy and Chemistry at Rice University and is the co-Director of the NSF-sponsored Center for Theoretical Biological Physics. He did his undergraduate work at the University of São Paulo, Brazil, and received his PhD from Caltech at 1987 under the supervision of John J. Hopfield. His thesis work was on new aspects of the theory of electron transfer reactions in biology. He then spent six month at the Institute for Theoretical Physics in Santa Barbara and after that went back to Brazil at the University of São Paulo as an Assistant Professor for two and half years. During this period he continued his work on electron transfer theory as well as on the theory of chemical reactions in condensed matter and molecular electronics. He came to the University of California at San Diego in 1990. In 1989 he was awarded the International Centre for Theoretical Physics Prize in honor of Werner Heisenberg in Trieste, Italy, in 1992 he received the Beckman Young Investigator Award, and he is a fellow of the American Physical Society. In 2006 he was elected a member of the National Academy of Sciences, USA, and in 2009 he was elected a fellow of the American Academy of Arts and Sciences and of the Brazilian Academy of Sciences. In 2011 he was awarded the Einstein Professorship by the Chinese Academy of Sciences (CAS).His current research interests centers on theoretical and computational methods for molecular biophysics and chemical reactions in condensed matter. In protein folding, his group introduced the concept of protein folding funnels as a mechanism for the folding of proteins. Convergent kinetic pathways, or folding funnels, guide folding to a unique, stable, native conformation. Energy landscape theory and the funnel concept provide the theoretical framework needed both to pose and to address the questions of protein folding and function mechanisms. Connections between these theoretical advances and experiments are central for the development of this new view for protein folding. A second effort of his group focuses on the theory of chemical reactions in condensed matter with emphasis on biological electron transfer reactions. These reactions are central to the bioenergetic pathways of both animals and plants on Earth, such as the early steps of photosynthesis. Most of the recent work deals with the electronic coupling between the donor and acceptor sites. The concept of tunneling pathways and the methodology for reducing the protein into a combination of relevant tubes of pathways create a new way of designing electron transfer proteins. The connection between this theoretical approach and experiments on electron transfer proteins has substantially improved the understanding of these electron transfer processes. Currently he is broadening his interests to stochastic effects in genetic networks.