

MEETING REPORT



"Proteins and Beyond" October 12–16, 2015, Leiden University, Leiden, The Netherlands

„Budućnost proteina“ 12–16. oktobar 2015, Univerzitet u Lajdenu, Lajden, Holandija

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Leiden University, located in the city of Leiden, is the oldest university in the Netherlands, founded in 1575 by William, Prince of Orange. The Dutch Royal Family and Leiden University still have a close relationship - Queens Juliana and Beatrix and King Willem-Alexander are all former students¹.

Leiden University includes seven faculties, over 50 departments and it is known to have an outstanding international reputation. In 2013, for example, Leiden was the highest ranked university in the Netherlands in the Times Higher Education World University Rankings, rated as the 28th best university worldwide and 61st for international reputation. Also, Shanghai Jiao Tong University's 2011 Academic Ranking of World Universities ranked Leiden University as the 29th best university worldwide. Leiden University is consistently ranked as the best university in Continental Europe for Arts and Humanities by the Times Higher Education World University Rankings. The University is associated with numerous Dutch and foreign leaders, prime ministers, a president, and even 16 recipients of the Nobel Prize (including renowned physicists Albert Einstein and Enrico Fermi). During the Dutch Golden Age (within the 17th century), scholars from around Europe were attracted to the Dutch Republic by its atmosphere of intellectual tolerance and Leiden's international reputation, thus Leiden was home to such persons as René Descartes, Rembrandt, Hugo Grotius, Baruch Spinoza and Baron d'Holbach. Now the university is a member of the Coimbra Group, the Europaeum and the League of European Research Universities¹.

Albert Einstein used to be a professor at Leiden University. Einstein regularly taught Leiden students for a few weeks per year. His first lecture at Leiden was about "Ether and Relativity Theory". It was a breaking news for scholarly circles in August 2005 that the original manuscript of a paper Albert Einstein published in 1925 had been found

in the archives of Leiden University's Lorentz Institute for Theoretical Physics.

The Lorentz Institute, one of more than 40 national and international research institutes at the Leiden University was established in 1921, thus being the oldest institute for theoretical physics in The Netherlands. It is a part of the Leiden Institute of Physics together with the experimental physics groups in the Kamerlingh Onnes Laboratory and the Huygens Laboratory. The Institute Lorentz participates in two research schools, the Casimir Research School (jointly with Delft University of Technology) and the Dutch Research School of Theoretical Physics.

Ever since its foundation, the Lorentz Institute has been known for attracting scientific attention by organizing numerous events. This year, together with the Leiden Institute for Chemistry, it organized, among many others, the Workshop "Proteins and Beyond", that was held from 12 October 2015 through 16 October 2015. It brought together remarkable figures with different backgrounds and diverse methods and aspects of researching at the vast field of proteins. The most significant questions regarding the future of proteins in health and disease, the possible and desirable methodological and technical breakthroughs, including biophysical techniques for studying proteins at the molecular level, were recognized and discussed.

During the workshop numerous questions were discussed, eg molecular mechanisms of cancer development and aging, protein folding, the role of chaperons and cell membranes during folding etc. In order to better understand all of the abovementioned issues technical developments are necessary. The important observation was that in vivo protein research is becoming very powerful in visualization of proteins and therefore in studying their function in the cellular context. Still in vitro studies at the atomic level remain

essential for deeper structural understanding at the atomic level and hypothesis formulation for cellular studies.

On October 16, 2015 the three renowned speakers suggested their vision on urgent questions concerning the broad field of protein research and the technical advances expected for the coming decade.

The Chair of this public section of the workshop was Professor Claudio Luchinat (Florence University). With due respect to other scientists, especially remarkable was the appearance and the lecture of highly esteemed Professor Christopher Dobson² (Cambridge University):

The proliferation of amyloid disorders – A challenge for modern protein science!

After a very interesting review of great plagues ever since the era of Plato, Professor Dobson addressed the triumph of modern medicine embodied in the discovery of penicillin, and then directed our curious attention to the disease number¹ of the 20th century, especially after 1980, namely Alzheimer's disease, emphasizing it as just one out of dozens and dozens of the so-called protein-misfolding diseases.

The simple fact that amyloid disorders proliferate imposes a great challenge on the scientists of almost any branch of research, putting the complexity and importance of proteins and their misfolding and aggregation under the special spotlight.

As having been in collusion with the proteins for millions of years, Professor Dobson explained the significance of proteins, where from they are given instructions for folding, the conceptual basis of protein folding, protein folding in a cellular context, protein misfolding as the origin of many diseases, the molecular nature of amyloid state, generic toxicity of amyloid aggregates, unified view of amyloid diseases, proteins in living organisms, the mechanisms of amyloid diseases, amyloid formation in cellular context, and many, many more quintessential aspects of this highly complex phenomena emanating from the "magic retort" of Professor Dobson.

Are we that close to resolving the mechanism(s) of amyloid disorders and, consequently, finding a proper prevention and/or remedy, remains to be seen, but the efforts to get into the heart of proteins misfolding of Professor Dobson, as well as of other scientists give us hope that it will be soon!

This highly favorable and promising atmosphere took us perfectly to the second part of this exceptional day, right into the Academy Building and the speech delivered by dear Professor Dr. Gerard W. Canters³, the one to whom the Workshop "Proteins and Beyond" was dedicated. Professor

Dr. Gerard W. Canters is widely known for his research focused on the molecular characterization of redox enzymes and proteins (mainly copper proteins) by NMR and EPR, X-ray crystallography, electrochemistry, single-molecule spectroscopy and protein engineering. It is also known that cloning of the gene for the protein azurin performed by Professor Dr. Canters in 1987 was widely accepted as new bearings in the study of structure/function relationships of blue copper proteins³. The extensive research of Professor Dr. Canters involves studying biological redox processes by single molecule techniques and on designing in vitro and in vivo biosensors, added to decades of scientific research and investigation and devotion to better humankind.

There have been, of course, numerous awards, as was the Royal Dutch Shell award, and each of it on this special occasion was lit up with many faces of eminent professors from all around the globe in ceremonial academic black gowns and square academic caps and the faces of all of us flocked together to greet Professor Dr. Canters with highest honors and willingly to mark together with him a new chapter of his rich scientific career.

The particular day indeed swarming with academic events and emotions was also highlighted with the other eminent participants, Prof. Thijs Aartsma, Prof. Marcellus Ubbink, at the same time highly successful organizers of the workshop, Dr. Martina Huber, to name just the three of them, but also with the PhD students, two of them heading to finishing their dissertation projects focused on protein misfolding and neurodegenerative diseases, namely Marija Mučibabić, alumna of the Department for Molecular Biology and Physiology, Belgrade University, Belgrade, Serbia and Nemanja Markešević, alumnus of the Faculty of Physics, Belgrade University, Belgrade, Serbia.

Much research has been done indeed, but scientists still have to persistently go on finding more promising techniques and analytical tools for proteins studying, combining biophysical methods, modelling cellular processes, linking in-vitro and in-cell characteristics of proteins, their misfolding tendencies under certain conditions that result in aging, and disease development. That should get scientists closer to the mechanism(s) of amyloid disorders occurrence and help in keeping proteins in their normal and functional conformation and possibly prevent or find efficient medications against those debilitating diseases that prevail over the globe in this stressful time!

R E F E R E N C E S

1. Leiden University. Available from: https://en.wikipedia.org/wiki/Leiden_University.
2. Professor Christopher Dobson. Available from: www.ch.cam.ac.uk/person/cmd44.

3. Professor Gerard W. Canters, PhD. Available from: <http://www.physics.leidenuniv.nl/gwc-home>.