



Press Release, June 26, 2019

dr. christiane menzfeld

phone: +49 89 8578-2824

pr@biochem.mpg.de

www.biochem.mpg.de/news

[@MPI_Biochem](https://twitter.com/MPI_Biochem)

Wolfgang Baumeister wins Stifterverbandspreis 2019

The biophysicist has revolutionized molecular structural biology with the help of cryo-electron tomography.

In contrast to our knowledge of our planet, there are still many unexplored regions in the cellular nanocosmos. The fragile architecture of large protein complexes composed of numerous subunits is particularly difficult to decipher. This is because attempting to isolate and purify the proteins also rips them out of their functional context. Wolfgang Baumeister has been pursuing a completely new approach for more than three decades. The director at the Max Planck Institute of Biochemistry has developed a method that opens up entirely new possibilities and numerous fields of application for structural research: cryo-electron tomography. He is now being recognized with the Wissenschaftspreis des Stifterverbands 2019 (Science Award of the Donors' Association) for his pioneering work. The prize, which is endowed with € 50,000.00, was awarded by the Max-Planck-Gesellschaft (MPG) and the Stifterverband at the annual MPG meeting that took place in Hamburg on 25 June.

Wolfgang Baumeister is to be recognized for his outstanding achievements in the field of cryo-electron tomography. What is particularly notable here is his examination of molecular and supramolecular structures within the context of intact cells at high spatial resolutions. The jury explained that it was awarding the prize because of the method's great economic relevance, which is evident in important areas of high technology, such as electronics, materials technology and pharmaceuticals. The cryo method allows larger spatial structures from cells to electronic components to be tomographically captured at very high resolutions and analyzed.

Pioneering work in the field of cryo-electron tomography

"We are developing methods to make the molecular architecture of cells visible," said Wolfgang Baumeister summarizing his research focus. The cryo-electron tomography method that he has developed in conjunction with his team opens up completely new opportunities for structural research: Entire cells or cell organelles are 'shock-frozen' in liquid nitrogen in the blink of an eye. The fragile cell architecture remains unchanged while it is embedded in the glassy ice. Two-





dimensional images of the samples to be examined are taken from different angles. A three-dimensional image is then built from these images. This method has already made it possible to understand the architecture of many proteins in their cellular environments.

Structural research using electron microscopes

“It is only possible to understand the various functions that the molecular machines are responsible for by examining their structures,” explained Baumeister. Using cryo-electron tomography, he and his team have been able to decipher the structure of the 26S proteasomes, which are highly complex molecular shredders for proteins that are made up of 66 individual proteins. He and his team have also been able to reveal the superior organization of the ribosomes in cells, the so-called polysomes. The researchers have now turned their attention to other cellular structures and are investigating the blueprints of pores in nuclear membranes, contact points between nerve cells (synapses) and protein complexes in membranes and cell walls. It is possible to use cryo-electron tomography to image these macromolecular structures in the intact cellular environment. Pathological changes, such as toxic protein aggregates that are mainly associated with such neurodegenerative diseases as Alzheimer's and Parkinson's, may also be investigated in this way. This method that has been developed in basic research is potentially able to open up new prospects for therapies by providing insights into cell architectures.

About Wolfgang Baumeister

Wolfgang Baumeister, who was born in 1946, studied biology, chemistry and physics at the Universities of Münster and Bonn. He received his doctorate from the University of Düsseldorf in 1973. He has been Director at the Max Planck Institute of Biochemistry, where he has headed the Department of Molecular Structural Biology, since 1988. He is also an Honorary Professor at the Faculties of Chemistry and Physics at the Technical University of Munich. He has published more than 500 articles in internationally renowned journals, including Nature and Science. Wolfgang Baumeister has been honored with numerous awards, including the Ernst Jung Medal for Medicine in Gold, the Louis-Jeantet Prize, the Harvey Prize from the Technion in Israel and the Karl Heinz Beckurts Prize.

Further information on research by Wolfgang Baumeister

Movie: Cryo-electron tomography revolutionized structural biology (German): <https://youtu.be/rOgZeraVjrw>

About the Max Planck Institute of Biochemistry

The Max Planck Institute of Biochemistry (MPIB) belongs to the Max Planck Society, an independent, non-profit research organization dedicated to top level basic research. As one of the largest Institutes of the Max Planck Society, 850 employees from 45 nations work here in the field of life sciences. In currently eight departments and about 25 research groups, the scientists contribute to the newest findings in the areas of





biochemistry, cell biology, structural biology, biophysics and molecular science. The MPIB in Munich-Martinsried is part of the local life-science-campus where two Max Planck Institutes, a Helmholtz Center, the Gene-Center, several bio-medical faculties of two Munich universities and several biotech-companies are located in close proximity. <http://www.biochem.mpg.de>

About the Stifterverband

Around 3,000 companies, business associations, foundations and private individuals have come together within the Stifterverband to jointly promote education, science and innovation. The Stifterverband employs funding programmes, analyses and recommendations for action to maintain the infrastructure of innovation: efficient high education institutions, strong research facilities and a fruitful exchange between industry, science and civil society.



Caption:

Wolfgang Baumeister

Photo: Axel Griesch © MPI of Biochemistry



**Contact:**

Prof. Dr. Wolfgang Baumeister
Department of Molecular Structural Biology
Max Planck Institute of Biochemistry
Am Klopferspitz 18
82152 Martinsried
Germany
E-Mail: baumeist@biochem.mpg.de
www.biochem.mpg.de/baumeister

Dr. Christiane Menzfeld
Public Relations
Max Planck Institute of Biochemistry
Am Klopferspitz 18
82152 Martinsried
Germany
Tel. +49 89 8578-2824
E-Mail: pr@biochem.mpg.de
www.biochem.mpg.de

