Leopoldina
Nationale Akademie
der Wissenschaften

Curriculum Vitae Professor Dr Winfried Denk

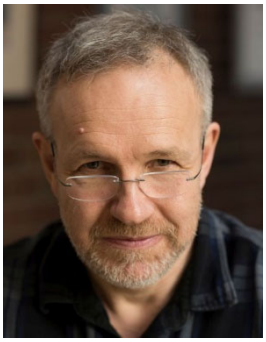

Image: Julia Kuhl

Name: **Winfried Denk**
Date of birth: **12 November 1957**

Research Priorities: Microscope development, multi-quantum microscope, two-photon fluorescence microscope, three-dimensional serial block-face scanning electron microscope, BROPA method, circuit diagrams of the brain, neurological diseases

Winfried Denk is a physicist. His research priority is the new and further development of microscopes. He has developed microscopes (multi-quantum microscope) that make nerve cells and their changes visible in the intact brain. The microscopes can be used to achieve better results while using less energy. As part of his work Winfried Denk wishes to decode the circuit diagrams of the brain to improve our understanding of diseases.

Academic and Professional Career

since 2011	Director, Department of Electrons – Photons – Neurons, Max Planck Institute of Neurobiology, Martinsried, Germany
since 2009	Senior Fellow, Howard Hughes Medical Institute, Chevy Chase USA
since 2002	Professor, Department for Physics and Astronomy, University of Heidelberg, Heidelberg, Germany
1999 - 2011	Director, Department of Biomedical Optics, Max Planck Institute for Medical Research, Heidelberg, Germany
1991 - 1999	Bell Laboratories, Murray Hill, USA
1990	PhD in Physics
1989 - 1991	Postdoctoral Fellow, IBM Research Lab, Rüschlikon, Switzerland
1984 - 1989	Cornell University, New York, USA
1984	Degree in Physics

1981 - 1984	Degree, Eidgenössische Technische Hochschule (ETH), Zurich, Switzerland
1978 - 1981	Physics Studies, Ludwig-Maximilians-Universität (LMU Munich), Munich, Germany

Project Coordination, Membership in Collaborative Research Projects

2017 - 2021	Applicant, Priority Programme 2041, "Functional connectomics of the binocular optic flow processing circuit in zebrafish", German Research Foundation (DFG)

Honours and Awarded Memberships

since 2016	Member, Bavarian Academy of Sciences, Germany
since 2016	Honorary Professor, LMU Munich, Munich, Germany
2015	International Prize for Translational Neuroscience, Gertrud Reemtsma Foundation, Cologne, Germany
2015	Brain Prize, Grete Lundbeck European Brain Research Foundation, Copenhagen, Denmark
since 2015	Member, German National Academy of Sciences Leopoldina, Germany
since 2014	Member, European Molecular Biology Organization (EMBO)
since 2013	Foreign Member, National Academy of Sciences, USA
2012	Kavli-Prize in Neuroscience, The Norwegian Academy of Science and Letters, Oslo, Norway
2006	Alden Spencer Award, Columbia University, New York, USA
2003	Gottfried Wilhelm Leibniz Prize, DFG, Germany
2000	Rank Prize in Opto-Electronics, Rank Foundation, London, UK
1998	Young Investigator Award of the Biophysical Society, Rockwell, USA
1986 - 1989	Graduate Research Fellowship, IBM, Armonk, USA

Research Priorities

Winfried Denk is a physicist. His research priority is the new and further development of microscopes. He has developed microscopes (multi-quantum microscope) that make nerve cells and their changes visible in the intact brain. These methods have brought new insights to neuroscience. The microscopes can be used to achieve better results while using less energy. As part of his work Winfried Denk wishes to decode the circuit diagrams of the brain to improve our understanding of diseases.

Winfried Denk co-developed the two-photon fluorescence microscope. Using this multi-quantum microscope, nerve cells can be observed in the living brain and three-dimensional images of new tissue can be produced. The microscope also makes cells visible which are up to one millimetre below the surface. The two-photon fluorescence microscope uses low-energy red or infrared laser light. Two light particles (photons) are shot simultaneously at a dye molecule and cause the dye to glow. Neuroscientists around the world are using two-photon microscopes to research the functioning of nerve cells.

Denk and his team also developed the three-dimensional serial block-face scanning electron microscope (SBFSEM). In this case a whole piece of tissue is placed into the electron microscope. In a fully automated process the microscope scans the surface of the piece of tissue and saves an image. In the next step an ultrathin slice of tissue is cut off and an image of the now exposed plane is also saved. The whole piece of tissue is captured in this way. Finally, a computer program compiles all of the stored images. In the computer, the tissue structure can be seen as a three-dimensional image on which even the smallest nerve processes can be identified.

In further research Winfried Denk would like to create the full circuit diagram (connectome) of a mouse brain. To achieve this he will use the serial block-face scanning electron microscope he developed. In recent work he has developed a method (BROPA method) with his team, in which it is possible to stain a complete mouse brain, not just individual tissue pieces. As part of his research Winfried Denk wishes to decode the functioning of the brain and thereby improve our understanding of diseases of the nervous system.