Overview

The Institute for Ophthalmic Research is headed by Prof. Dr. med. Eberhart Zrenner and cooperates closely with the University Eye Hospital (head: Prof. Dr. med. Karl Ulrich Bartz-Schmidt) under the common roof of the Centre for Ophthalmology. The Institute, founded in 2007, aims at uncovering the causes for degenerative, inflammatory, neoplastic, and vascular diseases of the eye and the visual pathways at molecular, cellular and systemic level.

Prof. Dr. med. Karl Ulrich Bartz-Schmidt, Director of the Eye Hospital
Prof. Dr. med. Eberhart Zrenner, Director of the Institute for Ophthalmic Research

The University Eye Hospital provides health care in all areas of ophthalmology at highest quality level with more than 60,000 consultations of patients and more than 13,000 surgeries annually. In close cooperation with the Institute, it develops novel therapeutic approaches for diseases of the eye.

The Institute houses several teams of scientists who work together to develop and evaluate concepts for therapy and treatment and optimise clinical and research diagnostics. Thus, the Institute provides an efficient infrastructure which supports research and education and mediates contacts to other research institutions and to industry.

Our goal is to uncover the biological mechanisms of myopia development and to develop strategies to inhibit its progression. Development of new optical techniques to measure eye growth and optical properties of eyes in animal models for myopia and in humans.

Methods: Measurement of refractive state and accommodation with high temporal resolution, binocularly and including pupillography and gaze tracking: infrared photoretinoscopy; optical measurements in eyes: new phacometry and fast automated peripheral photorefration; measurement of ocular dimensions: low coherence interferometry and A-scan ultrasonography; measurement of gene expression in different fundal layers: real-time RT-PCR; screening for candidate genes for myopia with mouse and chicken microarrays; description of activity and gene expression in individual cells: quantitative immunohistochemistry and laser microdissection with RT-PCR; testing of visual function in transgenic and wildtype mice: automated optomotor experiments and pupillography; recording from retinal ganglion cells in vitro: MEA; measurements of contrast adaptation due to defocus: psychophysical measurement of supra-threshold contrast sensitivity.

Recent major results of our research: Demonstration that the retina can detect amount and sign of defocus and use this information to control the axial growth rate of the eye. Identification of the glucagon amacrine cells as a major carrier of this information and demonstration that glucagon can act as an axial eye growth inhibitor in the chicken. Analysis of the central role of the transcription factor Egr1 as an initial trigger in the signalling cascade for visual eye growth control in chickens and mice. Description of mechanisms of atropine and other muscarinic antagonists during the inhibition of myopia in animal models. Role of insulin during myopia development. Demonstration of the importance of peripheral refractive errors for the development of myopia in humans.

Brand C, Schaeffel F, Feldkaemper MP. A microarray analysis of retinal transcripts that are controlled by image contrast in mice. Mol Vis, 2007; 13: 920-32
Diether S, Schaeffel F, Lambrou GN, Fritsch C, Trendelenburg AU. Effects of intravitreally and intraperitoneally injected atropine on two types of experimental myopia in chicken. Exp Eye Res. 2007; 84(2): 266-74
Schippert R, Schaeffel F. Peripheral defocus does not necessarily affect central refractive development. Vision Res. 2006; 46(22): 3935-40
We investigate the functional organization of cortical columns for visual functions, by developing novel psychophysical methods and combining them with fMRI, we investigate visual performance and pathways in normal and dysfunctional vision. Current topics include the testing of visual dysfunctions associated with dyslexia, the effects of ageing on visual performances and pathways in normal and dysfunctional vision. We also offer screening procedures and colour vision at high altitudes. We also offer procedures for the diagnosis of visual field defects, and the testing of visual dysfunctions associated with dyslexia. Our processes, adaptive mechanisms (colour constancy), and colour vision at high altitudes. We also offer procedures for the diagnosis of visual field defects, and the testing of visual dysfunctions associated with dyslexia.

When an object moves: High level processes and visual perception. We use different animal models for the study of the retina.


Our research focuses on the understanding of electrophysiological and biological effects that occur during electrostimulation, and on the development of retinal prostheses by transfection of retinal neurons in an organotypic culture of mature zebrafish retina. Mol Vis, 2006; 22(12): 100-7.


Ocular Neurodegeneration

Our mission is to uncover the pathogenesis of blinding human neurodegenerative diseases with an emphasis on retinal degeneration. To this end, we explore the genetic basis of disease using a combination of molecular, cellular, and animal models. Our work has led to the identification of novel disease genes and the development of new therapeutic approaches.

Molecular Genetics of Sensory Systems

The Molecular Genetics Laboratory has a well-documented history of research in the field of hereditary retinal disorders and has contributed significantly to the identification of disease genes and the development of new therapeutic strategies.

Neurodegeneration research:

Recently, we have been working on the autosomal dominant inherited Leber's Hereditary Optic Neuropathy (LHON). We have worked intensively on the maternally and mitochondrial causes of hereditary optic neuropathies. In the past, we have been involved in the first description of novel subtypes. Another main research project focuses on the characterization of retinal gene promoters. We have also engaged in transcript analyses and the characterization of homologous animal models on a functional, phenotypic, and morphological level.

Methodological innovation and refinement:

Recent advances in therapeutic strategies have led to collaborations with many leading groups on the development and refinement of new application procedures. In addition, we are regularly involved in the development and refinement of innovative diagnostic strategies in human subjects and animal models. The focus of our work is the identification of novel candidate genes and the elucidation of their role in human disease.

Neurodegeneration research:

We investigate the causes and consequences of neurodegenerative diseases with an emphasis on the role of genetic factors. Our research is aimed at identifying disease genes and understanding the mechanisms underlying neurodegeneration.

Methodological innovation and refinement:

Recent advances in therapeutic strategies have led to collaborations with many leading groups on the development and refinement of new application procedures. In addition, we are regularly involved in the development and refinement of innovative diagnostic strategies in human subjects and animal models. The focus of our work is the identification of novel candidate genes and the elucidation of their role in human disease.
Numerous clinical studies concerning the functional and morphological interrelation of circumscribed visual pathway lesions, in order to facilitate statements in regard to indication and prognosis of therapeutical methods. Clinical studies concerning the functional and morphological interrelation of circumscribed visual pathway lesions, in order to facilitate statements in regard to indication and prognosis of therapeutical methods. Clinical studies concerning the functional and morphological interrelation of circumscribed visual pathway lesions, in order to facilitate statements in regard to indication and prognosis of therapeutical methods. Clinical studies concerning the functional and morphological interrelation of circumscribed visual pathway lesions, in order to facilitate statements in regard to indication and prognosis of therapeutical methods. Clinical studies concerning the functional and morphological interrelation of circumscribed visual pathway lesions, in order to facilitate statements in regard to indication and prognosis of therapeutical methods.

Neuro-Ophthalmology & Perimetry
Research Group Visual Pathway:
www.uak.medizin.uni-tuebingen.de/
ezrenner@uni-tuebingen.de
72076 Tuebingen
Schleichstr. 12–16

Eberhart Zrenner
Prof. Dr. med.
Director
Clinic for Hereditary Retinal Degeneration
University of California, San Diego (in co-operation with the Hamilton Glaucoma Center, University of California, San Diego)
Molecular Genetics laboratory of the Institute of Molecular Genetics, the Federal Medical Research Institute of the Russian Federation, and the Russian National Research University
M. V. Lomonosov Moscow State University. The group is supported by the German Research Foundation and the Russian Foundation for Basic Research.

*Correspondence: Eberhart Zrenner, MD, PhD, Director, Clinical for Hereditary Retinal Degeneration, University of California, San Diego, 9500 Gilman Dr., La Jolla, CA 92037, USA. Tel.: +1-858-822-0443; Fax: +1-858-822-0575; E-mail: ezrenner@ucla.edu

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Wilhelm H, Wilhelm B. Pupil response components: afferent and clinical research and applies special knowledge in clinical routine. The afferent visual system is examined by the swinging flashlight test, even with an automated pupillographic pupil campimetry has been developed. This is used in basic research to provide a better understanding of the visual system. The Pupil Research Group does basic and clinical research and applies special knowledge in the field of diversity and consists of an established team of professors and doctors in the field of ophthalmology.

The Neuro-ophthalmology clinic serves as a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group. The Neuro-ophthalmology clinic is a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group. The Neuro-ophthalmology clinic is a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group. The Neuro-ophthalmology clinic is a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group. The Neuro-ophthalmology clinic is a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group. The Neuro-ophthalmology clinic is a country-wide reference centre for pupillary disorders by applying the diagnostic features provided by the pupil group.

In the course of an increased national and international competitiveness and the quality of the research, the scientific Research are mandatory. In order to ensure the high standard and outside the University Hospital.

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The Research Institute offers numerous training activities for students from medicine as well as from biology and other related natural sciences. The training ranges from teaching in Ophthalmology to specialist workshops on applied methods (e.g. the famous FUN course, an interactive course for application of advanced neuro-ophthalmological techniques; Basic Science Course in Vision, Research Colloquium, Lab Rotation Program, Glaucoma workshop; Interactive courses on kinetic perimetry, function testing in neuro-ophthalmology, Electroretinography Course) as well as soft skills, such as project and laboratory management.

Training at the Centre for Ophthalmic Research has in the past received top evaluations in the Tuevalon rankings. Prof. Dr. med. U. Schiefer has been awarded the medal for excellence in teaching from the State of Baden-Württemberg. The Institute also participates in lectures and courses at the Graduate School for Neural and Behavioural Neurosciences, Max-Planck-Research School, and the faculty of biology. Several theses Doctoral Students have been marked with a summa cum laude from the faculty of biology and medicine.

Contact