



Workshop Photonic Sensors

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Dozent für Optik und Physik an der Hochschule für Technik und Architektur (HTA) Biel. Aufbau des Optik Labors, Projektarbeiten mit Industriepartnern und in Forschungsprojekten im Gebiet der Optik. 2008 Weiterbildung an der School of Optometry, Cardiff U.K. in der Gruppe von Prof. Dr. W. Drexler im Gebiet der OCT.

Welcome



**Dr.
Christoph Harder
Schindellegi SZ**

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Dr. Christoph Harder received the Electrical Engineering Diploma from the ETH in 1979 and the Master and PhD in Electrical Engineering in 1980 and 1983 from Caltech, Pasadena, USA. He is co-founder of the IBM Zurich Laser Diode Enterprise which pioneered the first 980nm high power pump laser for telecom optical amplifiers.

He has been managing during the last few years the high power laser diode R&D effort in Zurich expanding, working closely with a multitude of customers, the product range into 14xx pumps as well as 808 and 9xx multimode pumps for industrial applications. He has published more than 100 papers and 20 patents and has held a variety of staff and management positions at ETH, Caltech, IBM, Uniphase, JDS Uniphase, Nortel and Bookham.

Introduction



**Dr.
Thomas Hessler**

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Thomas Hessler studied Physics at Constance University and made his PhD in micro-optics at the Paul Scherrer Institute in Zürich and the University of Neuchâtel. He joined Leister in 1998 and is now heading its micro-technology business unit Axetris.

Laser Diode Gas Sensors

Laser diode gas sensors offer contact-less measurements, high selectivity and long-term stability due to their intrinsic signal referencing. To date, the technology has been applied in high-end process control, while recent trends show a move toward the classical gas monitoring market. Basic technical principles and application examples will be discussed.



Dr. Karlheinz Gulden

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After receiving his PhD degree in Physics, Dr. Gulden joined the Paul-Scherrer Institute in Zurich as Staff Scientist. In 1997 he became head of Opto-Electronic Devices at CSEM and founded Avalon Photonics as a spin off from CSEM. He led Avalon in various executive roles from 2000 until it was acquired by Bookham in 2006. Today Dr. Gulden is leading the VCSEL and High Power Laser Business of Oclaro.

High volume manufacturing of VCSELs for Sensors

During the last years, sensor applications using single mode Vertical Cavity Surface Emitting Lasers (VCSELs) have been growing strongly. In this presentation we will review this development and outline the challenges when transitioning an innovative semiconductor laser device from development to high volume manufacturing.



Dr. Christian Velez

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Dr Christian Vélez, – EXALOS AG Founder and Chief Executive Officer. Has a diploma with honors in physics from the Swiss Federal Institute of Technology in Zurich (ETH). During the time when he was finalizing the writing of his PhD thesis at the Institute of Quantum Electronics at the ETH in the laboratory of Prof. Hans Melchior, he managed to cover the global sales and marketing activities for B2B markets of optoelectronic devices at Opto Speed, Ticino. He was a member of the management team of Opto Speed Zurich AG, (InP semiconductors) where he acted as Product Line Manager and Key Account Manager for the SLED product line. He successfully built up and managed the product line team consisting of two to eight persons. He developed new products and expanded them to serve customers in telecommunications, fibre optic sensors, medicine and gyroscope. He increased the product market position through the active involvement in the design activities with strategic customers. As a result, he was able to closed major design wins at key accounts, managing these programs from initial point of contact to engineering prototypes through to production.

High Radiance Broadband Sources



Dr. Markus Ehrat Witterswil SO

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Dr. Markus Ehrat leitet die Zeptosens - A Division of Bayer (Schweiz) AG. Zusammen mit weiteren Wissenschaftlern gründete er 1998 die Zeptosens AG, die er als CEO und Verwaltungsratsmitglied bis zur Übernahme durch die Bayer (Schweiz) AG im Jahre 2005 führte. Markus Ehrat promovierte an der ETH in Zürich als Naturwissenschaftler, absolvierte ein Postdoktorat in USA und war anschliessend in verschiedenen Funktionen in der Ciba-Geigy und Novartis auf dem Gebiet der bioanalytischen Forschung tätig.

Capture the Mode-of-Action of Pharmaceuticals in Living Cells

Monitoring the effects of cell stimulation on signaling pathway activation requires a sensitive proteomics platform. Reverse protein arrays (RPA) are particularly suitable to monitor cellular signaling events. To ensure high levels of sensitivity even with the small sample volumes of only 400 pL per spot, we are applying chips based on planar waveguide technology. Typical applications and aspects of bringing a new technology into a commercially viable system will be addressed.



Dr. Nicolas Blanc

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Nicolas Blanc is Vice-President Photonics at the "Centre Suisse d'Electronique et Microtechnique SA" (CSEM). He is responsible for the Photonics Division which is focused on the development of optoelectronics components and systems for a wide range of applications in the automotive, consumer, industrial control, medical and security markets. Nicolas Blanc has the full responsibility of CSEM's Center in Zurich with about 30 employees. He holds a PhD in physics and an executive MBA.

Photonic Sensors at CSEM

Examples of high performance image sensors providing close to single-photon detection and very high dynamic range as well as smart imagers will be presented. Smart imagers include both 3D imagers that provide depth information in real-time and 2D vision sensors that enable processing images on chip at very low power. General trends in image sensors will also be discussed.



Dr. Yargo Bonetti

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Physics diploma (1996) from University of Zurich, PhD (2000) from ETH Zurich. Five years with Alpes Lasers SA: production, testing, qualification and installation of QCL systems, after sales services; two years at University of Neuchatel: research in optoelectronics. Currently at Institute of Quantum Electronics (ETH Zurich), group of Jerome Faist: research and development on QCLs (CTI and SNF projects). <http://yargo.andropov.org/>

Quantum Cascade Lasers

Since their first realization 15 years ago, Quantum Cascade Lasers (QCLs) have matured from a research topic to an established type of pulsed and CW radiation source in the mid and far infrared, available from several suppliers, as single wavelength or tunable systems. We discuss performances of current commercial systems, and future trends in development and applications.



Dr. Alexei Sirbu
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PhD-1979, Dr. Hab.-1993, Senior Member IEEE – 2002, joined EPFL in 1996 coming from Bell Labs-Lucent where he worked on the development of high power 980 nm pump lasers. At EPFL he worked on different projects targeting the development of Wafer Fused VCSELs. One of these projects resulted in the demonstration of first European long-wavelength VCSEL in 1998. In 2001 he co-founded BeamExpress and from 2002 to 2006 he acted as VP VCSEL development. Dr. Sirbu did important personal contributions to the development of tunable VCSELs, electrically pumped longwavelength VCSELs emitting in 1310 nm and 1550-2000 nm bands and double-fused, full 2-inch VCSEL wafer fabrication process. Starting with 2007 Alexei Sirbu is working at EPFL on the development of new generations of long-wavelength VCSELs and VCSELs applications. He published more than 100 papers and 10 patents.

Longwave VCSEL Sensors

New generations of gas and fiber-grating sensors (FBGs) are based on laser optical spectroscopy approaches. Tunable laser diode spectroscopy is capable of detecting absorption lines in the ppm range. One important spectral band is 1500-2000 nm, which includes absorption lines of most important gasses like CO₂, ammonia, etc. One emerging gas sensing technique is based on photo-acoustic spectroscopy. It allows reaching the detection limit in the sub-ppb range.

These applications require laser sources with quite specific performance at an acceptable cost. One solution for these sources is Vertical cavity lasers emitting in the 1500 nm-2000 band. Recent developments in the field are presented in the talk.



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The principles of Frequency / Fourier Domain Optical Coherence Tomography

(FD-OCT) are highlighted in a brief introduction. Performance and limitations of these systems are discussed, the recent "state of the art", and applications, will be presented. The special requirements of OCT Systems on laser sources had a high impact on developments in laser technology within the last few years; some of those important developments will be presented.