

Photonics in Industrial Production

BUAS Burgdorf BE, 28th November 2018



Dr. Christoph S. Harder

President Swissphotonics NTN, 8832 Wollerau SZ
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Dr. Christoph S. Harder received the ETH Diploma in 1979 and the Master and PhD in EE in 1980 and 1983 from Caltech, Pasadena, USA. He is cofounder of the IBM Zurich Laser Diode Enterprise which pioneered the first 980nm high power pump laser for telecom optical amplifiers and laser diodes for industrial and consumer applications with ultrahigh reliability. He is the recipient of a Fulbright scholarship and the OSA Fellow recognition. Christoph is now heading a consulting company and is cofounder of Swissphotonics and has been its president for the last few years. 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 and has volunteered on society boards and committees.

Moderation



Peter Brunner

Head of Technology Transfer, Bern University of Applied Sciences BUAS, 2501 Biel / Bienne BE
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Peter Brunner graduated from the ETH Zurich with a MSc in Mechanical Engineering. In his 20-year career in the medical device industry he held project management and leadership roles in product development. He worked for the national innovation agency CTI and acts as expert and jury member for entrepreneurship programs and advisory boards. As the Head of Research he now leads the department's applied R&D with 10 institutes.

Welcome address



Prof. Dr. Valerio Romano

Fiber technologies, ALPS, BUAS, 3400 Burgdorf BE
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Prof. Valerio Romano received his PhD degree in 1991 from the University of Bern. His research topics are special optical fibers and laser-materials interaction. He is Professor for Applied Photonics at the Institute for Applied Laser Photonics and Surface Technologies ALPS of BUAS and Lecturer as well as research group leader at the IAP of Bern University. With Swissphotonics NTN, he is coordinator of the National Fiber Lab SNFL and vice president.

Photonics: the discipline that is making manufacturing smart

Smart manufacturing requires "collaborative manufacturing systems that respond in real time to meet changing demands and conditions in the factory ..." (NIST). For data science this asks for the intelligent connection of machines. For process scientists, much of the *smartness* has to reside in the machine itself. The talk will show how photonics is giving an incredible boost to process development and reliability at the machine level.



Dr. Gilbert Schiltges

Head Development Cutting, Bystronic Laser AG, 3362 Niederoenz BE

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- Master and PhD in engineering at ETH Zurich
- Development Engineer, Head of System Integration and Head of Technology Infusion Systems at Roche
- Head of Technology and Process Innovation Wafering at Meyer Burger AG
- Since February 2017 with Bystronic.

Lasers for cutting: old challenges – modern solutions

Overview over the main technology components to improve performance, both quality and speed, in laser cutting – current status and brief outlook.



Prof. Roland Hungerbühler

Head Mechanical Engineering, BUAS, 3400 Burgdorf BE

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Prof. Roland Hungerbühler, dipl. Masch. Ing., Experiences: 10 year in software development, 5 Year in international Projects focused on Computer Integrated Manufacturing, Since the mid-90s, professor in mechanical engineering at the BUAS Bern, Head of department (2012).

Der Laser in der Maschinentechnik

Product development uses a variety of design principles, to ensure that design follows manufacturing requirements. Compared to conventional production, laser-based manufacturing lacks broad experience. Our mechanical engineers learn to deal with these new requirements. Together with the institute ALPS, we operate plants for manufacturing by means of Selective Laser Melting SLM, Direct Metal Deposition DMD or laser-based micromanufacturing.



Thorsten Kramer

Additive Manufacturing AM, ALPS, BUAS, 3400 Burgdorf BE

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Thorsten Kramer studied Physics at the RWTH Aachen. He worked at the Fraunhofer Institute for Laser Technology ILT in the fields of Rapid Manufacturing, Micro Joining and Micro Structuring. In 2004 he joined Robert Bosch GmbH in the division *Automotive Electronics*. He moved to Switzerland in 2007 and became part of the Innovation Steering Committee for manufacturing processes at ETA SA. From 2012 to 2014 he was CTO at Swiss Micro Laser GmbH in Stallikon and since 2014 he is with BUAS. In 2018 he started a Tenure Track to set up a research group in AM.



Dr. Hossein Najafi

R&D Project Manager, ALPS, BUAS, 3400 Burgdorf BE

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Hossein Najafi studied Physics of condensed materials at Ecole Polytechnique Fédérale de Lausanne EPFL. He joined the institute ALPS of BUAS in 2013. While at BUAS, he has worked in the field of laser-based AM of metallic parts for power industry and production of fiberglasses for fiber lasers.

In situ metal alloying by DMD

In situ metal alloying by DMD Powder-based AM techniques like SLM or LDMD utilize available powders, that are not optimized or adapted to the individual character of the process. Industrial relevant or desired alloys often are not existing as adequate powder, whereas most base metals can be purchased as powder. One approach, to alloy two base powders directly during the LMD-process is presented for Nickel and Aluminum powder to form AlNi and AlNi3.



Fouad Cheaitani

Senior Consultant Welding Engineering and Laser Technology, Schweizerischer Verein für Schweisstechnik SVSXASS; European Welding Engineer EWE, International Welding Engineer IWE; Expert in laser cladding, Stellba AG, 5605 Dottikon AG
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Global Senior consultant with more than 12 years of professional experience (between Sulzer, Metco, Oerlikon and now SVS) in technical leadership to develop, design, and prototype next generation manufacturing processes applying welding and cladding processes. Involved in several patents in Laser cladding as principle inventor or participant. Identifies the best manufacturing process options for many different clients and global organization.

Lasers in high performance coating technology: a success story

Industrial lasers are used for cladding, welding and AM. They are an emerging, promising, next-generation technology. The great flexibility in component geometry and component size is attracting a lot of attention in many industrial sectors.

To know how to incorporate industrial lasers into your manufacturing processes is a way of how to stay competitive in the high-tech market, for Swiss industries innovation is the only way to survive in this global market.



Werner Krüsi

Head of Section Photonics, Swissmem; US Managing Director of FISBA US, Tucson, Arizona, USA
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- Since 2016 Managing Director FISBA US, Tucson AZ
- 1993 – 2015 CEO FISBA AG, St.Gallen
- 1979 – 1990 LEICA / WILD HEERBRUGG
Project-Mgr./ Product-Mgr. / Sales-Mgr.

- Since 2013 President SWISSMEM Photonics Industry Division
- Since 2018 Member of the Board of RhySearch, Research Institute
- Since 2015 Member of the Board of FISBA AG

- 1977 BSc. in Geodetic Engineering and Surveying University of Applied Sciences, Muttenz - Basel

The White Paper Photonics Switzerland – Background, Intentions – Action Items

Photonics, as the enabling technology of the 21.Century, needs a strong, well harmonized action taking, also in Switzerland – in Research Programs, in Educational Offerings and for the related Lobbying. This lays in the interest of both, Science Community as well as Industry.

The *White Paper Photonics Switzerland* is the roadmap for many decisions to be taken in favor of Photonics in Switzerland. The most crucial directions are recommended in 5 concisely defined Areas of Action (Handlungsempfehlungen).



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Digitalisation Impulse Program

This Swissphotonics workshop is designed for interested parties to form consortia in order to submit substantial projects to the Innosuisse Impulsprogram 2019 / 2020:

www.innosuisse.ch/digitalisierung

Elaboration of project proposal ideas in 4 parallel sections



Prof. Dr. Andreas Ettemeyer

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Prof. Andreas Ettemeyer studied Mechanical Engineering in Munich and Aachen and graduated on holographic interferometry in Stuttgart. During nearly 20 years in industry, he concentrated on optical measuring techniques such as holography and speckle interferometry. In 1989 he founded and managed a company for production of laser measuring systems until he moved back to academia in 2005. Today he is professor for Technical Optics and prorektor of NTB.

A: Advanced Manufacturing of Photonic Components and Systems

This subject is divided into 3 thematic clusters:

1. Innovative optimized manufacturing processes (UP manufacturing, selective Laser etching, laser polishing, inline inspection, nano imprint technologies, etc.)
2. Multi Discipline Miniaturized Packaging Technologies (overall concept for miniaturized optical systems handling, innovative fixation technologies, standardized correction elements, precision assembly of optical systems)
3. Cleaning in Photonics Production (optimizing and understanding cleaning processes, flexible automatic inspection systems)

These topics have been discussed with photonics industry partners. We will shortly present the concepts of these precompetitive cluster projects and invite interested parties to participate.



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B: Digital Photonics for *Fire-and-Forget* Laser Processing



Dr. Rolando Ferrini

Head of the MicroNano Optics & Photonics Section, CSEM SA, 4132 Muttenz BL
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Rolando Ferrini joined CSEM Muttenz in 2011 as Project Manager and, since 2012, he is Head of the MicroNano Optics & Photonics (formerly, Integrated Light Management) Section at CSEM Muttenz. In 1999, he obtained his PhD degree in Physics at the Università degli Studi di Pavia, Italy, with a thesis on the optical properties of III-V semiconductor materials for electronics and optoelectronics. From 2000 to 2004, he worked as Research Associate at the EPFL, where he studied the optical properties of semiconductor-based photonic crystal devices. From 2004 to 2011, as Senior Research Associate at EPFL, he was in charge of the activities on organic devices for optics, photonics and lighting in the framework of a collaboration with ILFORD Imaging GmbH. In particular, he coordinated the activities of a mixed industrial-academic group working on the validation and the technology transfer of the ILFORD roll-to-roll printing techniques for optical and lighting applications. Rolando Ferrini is Coordinator of the Swiss National Laboratory for Solid State Lighting SSSL of Swissphotonics NTN.

C: Photonics 4.0: Digitalization for Photonics & Photonics for Digitalization

Digitalization can be applied to manufacturing processes in photonics to make them smart and flexible, thus reducing the production cycles from design to prototype to production. Innovative precision miniaturized photonics systems and components can lead to digitalized photonics, thus enabling digitalization in several application fields, from health to artificial and virtual reality, etc.



Prof. Dr. Patrik Hoffmann

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Adjunct Professor at Laboratory for Photonics Materials and Characterization LPMAT, EPFL. Laboratory Head of LAMP, Swiss Federal Laboratories for Materials Science and Technology EMPA in Thun, Switzerland. Chemistry studies at University of Karlsruhe, PhD thesis at EPFL in 1992. Industrial experience at IBM San Jose, USA, and manager of the dental section in a German company. Since 1997 research and teaching Laser Micro-Processing at EPFL. Since April 2009 heading LAMP at Empa, continuing teaching at EPFL. Author of 111 peer reviewed journal papers and inventor of 6 patents. With Swissphotonics NTN, he is coordinator of the Swiss National Application laboratory for Photonic tools and Manufacturing SNAP.

D: Additive Manufacturing

I was thinking within the field of AM the Digitalisation will play an important role in smarter processing by self learning machines and real-time detection combined with closed loop process control.



Prof. Dr. Beat Neuenschwander

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Prof. Beat Neuenschwander studied physics at the University of Bern and realized his PhD in 1996 at the IAP. Since 2000 he is at the BUAS where he built up the laboratory for laser micro machining and laser surface engineering. He lectures physics and applied laser technology at the ALPS of BUAS, is expert for MicroNano Technologies of Innosuisse and head of the optics section of the Swiss Society for Optics and Microscopy SSOM.

Plenary Discussion *Digitalisation Impulse Program*



Our next stop:

SPIE Photonics West
Swissphotonics Apéro
Wednesday 6th February 2019
5:00 pm – 6:30 pm

South Hall | Booth 1765 of FISBA AG
The Moscone Center
San Francisco, California



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