

Community

News

<https://doi.org/10.1515/aot-2019-0045>

The laser community honors photonics' visionary Reinhart Poprawe

Throughout his professional life, Prof. Reinhart Poprawe shaped technological progress in photonics and specifically built up young talent for the industry. The renowned laser expert is now retiring in the autumn of 2019. With the symposium 'Digital Photonic Production and Industrie 4.0 and what does that mean for education and research?' on 23 June 2019, in the run-up to the world's leading trade fair LASER World of PHOTONICS in Munich, more than 300 laser experts and companions paid tribute to his work as a professor of Laser Technology, his services in basic and contract research and the networking of industry and science.

In 1996, Prof. Poprawe took over the management of the Fraunhofer Institute for Laser Technology ILT and the Chair for Laser Technology LLT at RWTH Aachen University. It is thanks to his great commitment that the Fraunhofer ILT, with its associated chairs, has for several years been regarded as Europe's most important institution for applied laser research and contract development for industry. 'Prof. Poprawe embodies the Fraunhofer spirit through and through: Our patron saint was active in optical technologies and, like him, has always viewed innovations with a view to concrete application possibilities,' explained Fraunhofer President Prof. Reimund Neugebauer. 'Since the founding of the Fraunhofer ILT in Aachen, Prof. Poprawe has played a key role in shaping the leading position of the German laser industry worldwide. When the positive effect of technology clusters had not yet been recognized, he had already laid the foundation for the Aachen focus on the combination of optical technologies, mechanical engineering and process technology'.

Andreas F. Thoss: <https://orcid.org/0000-0002-3319-5153>

www.degruyter.com/aot

© 2019 THOSS Media and De Gruyter

Networking science and research in a new dimension

High-ranking representatives from science and industry also paid tribute to Prof. Poprawe's consistent and visionary work in photonics: He is one of the initiators of the RWTH Aachen Campus, which is now growing into one of the most important international technology landscapes. Around 30 companies and their laser experts have already established themselves in the photonics cluster on the RWTH campus. With the Digital Photonic Production research campus funded by the Federal Ministry of Education and Research (BMBF), new forms of long-term and systematic cooperation between RWTH Aachen University, the Fraunhofer-Gesellschaft and industry are being established in this environment.

Excellent global innovative strength

The spectrum of Fraunhofer ILT innovations during Prof. Poprawe's tenure ranges from the development of Inno-slab lasers and the first diode-pumped multi kW solid-state lasers for industrial applications to the development and use of high-power ultra-short pulse lasers and the development of processes and systems for laser powder bed fusion and extreme high-speed laser cladding (EHLA). All these innovations, some of which have won multiple awards, were developed by motivated engineers and scientists, to whom Prof. Poprawe offered creative freedom with an outstanding infrastructure and a conducive institute culture. On average, a patent was developed every 3–4 weeks during the decades of his work at the Fraunhofer ILT. Over the course of 20 years, around 30 companies have emerged from this environment, which Prof. Poprawe actively supported with his networks during the critical initial phase.

During his tenure, the number of employees at the Fraunhofer ILT, the associated chairs and the photonics cluster grew from 250 to a total of around 800 laser experts and prospective scientists. In the meantime, an area of around 30 000 m² is available for R&D activities.

Prof. Poprawe's numerous awards include the Arthur L. Schawlow Award of the Laser Institute of America LIA 2014 and the honorary professorship of

Tsinghua University, Beijing in the same year. These stand for his international commitment, which spanned all the continents. The physicist was particularly active in the USA, China and Japan. His work has often been honored, for example, with the Joseph von Fraunhofer Prize in 1987, the Innovation Prize of the State of North Rhine-Westphalia in 2011, and recently with the Fraunhofer coin.

Education as a matter close to the heart – for the benefit of society

Prof. Poprawe took on a role model in teaching the subject matter. He introduced new teaching formats such as ‘Flipped Classrooms’. It was not for nothing that the students awarded him the teaching prize of the Faculty of Mechanical Engineering of RWTH Aachen University four times. In his time as professor, he was also the first assessor of over 200 doctorates. ‘The passing on of knowledge as well as the professional and personal growth of young scientists were and are a matter close to my heart.

In addition to the essential specialist knowledge, the students must also develop an early awareness of their importance for the photonics industry. In this way, they can be motivated to use their creativity later on for socially relevant topics,’ explains Prof. Poprawe.



Prof. Reinhart Poprawe welcomes the 280 guests of the symposium ‘Digital Photonic Production and Industrie 4.0 and what it means for education and research’. © Fraunhofer ILT, Aachen, Germany/Klaus D. Wolf.

Community

Conference Notes

Review: Laser World of Photonics

Munich, Germany, 10–12 April, 2019

The LASER World of Photonics in Munich, Germany, set new records with about 34 000 visitors and 1325 exhibitors when it closed its doors on the 27th of June. The co-located congress enthused the 6000+ audience with plenaries by Nobel Prize winner Gérard Mourou, gravitational physicist Carsten Danzmann, quantum physicist Anton Zeilinger and other renowned scientists.

The feelings in the trade show halls were positive but came within an economic slow down. Laser giants IPG and Coherent saw their stock plunging more than 25% in May after they published significant downturns in their revenues. Local champion Trumpf has not shown any numbers yet, but CEO Leibinger-Kammüller expected a downturn last year already: ‘There are increasing signs that this long phase of recovery could soon be over’. And

the German mechanical engineering industry just published a warning of production decline.

Those who wanted to see a detailed picture of the laser economy went to hear laser market analyst Arnold Mayer and his Laser Marketplace workshop in Munich. He showed that the market for laser material processing systems grew by an incredible 50% from 2016 to 2018. Any outlook for 2019 is difficult to make: ‘Maybe we are lucky and get out with zero growth’, he said during his workshop. But looking back over the last 20 years, he sees no reason why long-term growth between 7 and 9% should not continue. If global economic growth picks up, he expects better figures as early as 2020.

Beside the global picture, the Chinese market might be most interesting at the moment. And this market for industrial laser processing equipment is about to shrink, as Qitao Lue, CTO of Han’s Laser, pointed out. He also sees China growing as a laser system export nation. According to his numbers, the relation of imported (\$920 million) versus exported (\$739 million) industrial laser systems



The 24th LASER – World of Photonics opened its doors on June 24 in Munich, Germany. (Copyright 2019: Messe München GmbH).



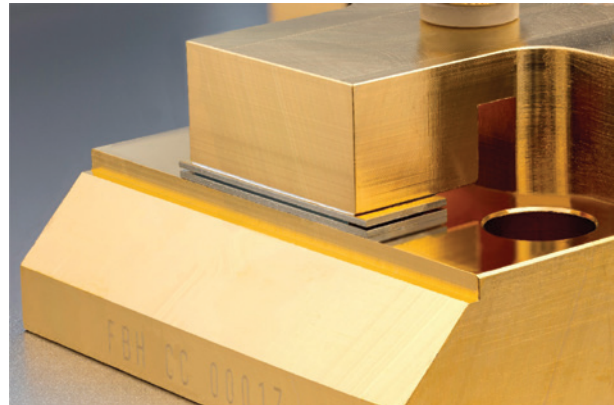
E-mobility was one of the main trends at the LASER fair. (Copyright 2019: Messe München GmbH).

was almost equaled in 2018. And the trend of growing exports to Asian countries such as Vietnam, Taiwan or Korea seems to persist.

Better, bigger and blue laser systems

As the name of the trade show suggests, it is a good place to showcase new laser systems. Those who think that laser development is not so hot anymore had a chance to learn many new things. The hottest topics in recent months has certainly been the development of ultrafast (i.e. ultra short pulsed) lasers with high average power. While all the major laser manufacturers offer systems with about 50 W, it was a small company from Jena, Germany, that presented a record breaking 2 kW ultrafast laser: This device from Active Fiber Systems delivers 20 mJ pulses at 100 kHz in 200 fs pulses. It uses a fiber-based technology developed by the team around Jens Limpert from the Friedrich Schiller University Jena. It is the same technology that will be available soon in application labs in Jena and Aachen from the Fraunhofer Cluster of Excellence Advanced Photon Sources.

And there is another field where progress is far from being completed: diode lasers. Paul Crump just recently wrote about laser diode research in LFW. In Munich he and some colleagues from the Ferdinand-Braun-Institut (FBH), Berlin, Germany, presented a new record at the CLEO Europe conference. They made the brightest and most efficient kW bar ever reported with an efficiency >65% at 1 kW, and also the narrowest lateral far field of



Paul Crump and his co-workers from FBH presented a new record diode laser bar for kW output power and 65% efficiency (Copyright: FBH/schurian.com).

8.8°. The research was done in close cooperation with the Trumpf laser.

A third trend I spotted (there were many more) is green and blue lasers. For example, Trumpf presented a 1 kW green laser. Foremost, this is planned for copper processing as it is frequently required in e-mobility applications. The green light at 515 nm is much better absorbed in the copper and thus the processing is much cleaner than with infrared lasers.

Alternatively, one could use blue diode lasers as presented by Christoph Ullmann, Laserline, at the main press conference of the trade show. With funding from the German government, Laserline participated in the BlauLas project (together with Osram Opto Semiconductors and

Dilas) where blue laser diode modules were developed with kW power. The advantages for copper processing are comparable to the green lasers, just the diode lasers come with higher efficiency and lower beam quality.

Trends in e-mobility and beyond

Well e-mobility was certainly the biggest trend on the show. I counted at least three electrical vehicles presented in the halls to highlight the multitude of things one can do with lasers in the manufacturing of electrical cars and their components. Nevertheless, I found two more trends to be remarkable and less obvious.

The first trend to mention for industrial laser applications is process control. Take battery welding: Every seam has to be tight. To be safe you better track and record every single weld seam. And to be efficient in that, you may consider inline process control to see every minute change immediately. Interestingly, it looks as if process control is now a feature that separates the premium laser processing systems from low cost systems. It is there where the money is made.

A second, and even less obvious trend, was explained to me by Dirk Hauschild from LIMO: 'After laser optimized engineering became common practice it is now time to consider laser optimized materials', he told me. A simple example is already well known: Laser annealing of amorphous silicon is a process where the laser changes a

material and enables it to show very useful properties. Of course, the secret here is the right beam shape made by advanced microoptics.

Another example is metal powders for additive manufacturing: If you know how they behave in the build-up process you can select the right material according to your laser process. Some processes are well known but it takes the joint efforts of laser physicists, material scientists, and mechanical engineers to use the full potential in this direction. There might be plenty of reward for such an effort: What if a laser could help to make much more efficient battery materials?

And so much more...

Four days and five halls plus a congress with seven separate conferences made it a tough challenge to follow all activities. While one of the most influential persons in the German laser community, Reinhart Poprawe, was given a farewell colloquium on the eve of the LASER fair, a new generation with new ideas was welcomed in the following days: For example, a makeathon and a startup challenge drew a lot of attention from the younger and youngest visitors. Those with new ideas had a chance to meet with VCs in a European Photonics Venture Forum.

Trade show organizer Messe München and the German high-tech industry association SPECTARIS presented a study on how photonics can help in protecting



Another big topic in Munich was quantum technology. Nobel prize winner Ted Hänsch (left) saw a lot of components and systems for QT at the booth of Toptica Photonics (Copyright Toptica Photonics).

our climate: Photonic technologies help to reduce carbon emissions and to establish alternative energy generation methods. In exemplary calculations they found that photonics will help to save 3 billion tons of CO₂ emissions in 2030.

Climate change was very obvious in Munich: For most of the recent years it was hot, but this year the outside temperature hit a new record of 39°C. That did not stop

people from enjoying another important part of the trade fair program: The booth parties! Tuesday night a new party giant took over leadership in this challenge: Hübner Photonics convinced with a well-filled dance floor and lots of beer. Tough competition for the longtime party champion Toptica Photonics!

The next Laser World of Photonics is coming on 21–24 June, 2021, in Munich, Germany.

Community

EOS News

EOS at the World of Photonics Congress

EOS organized the Optical Technologies conferences as part of the World of Photonics Congress in Munich, Germany, 24–26 June, 2019. These conferences included the Manufacturing, Tolerancing, and Testing of Optical Systems (MOS), and Optofluidics (OF).

The World of Photonics Congress was once again a meeting place for the international science elite with lectures by Nobel Prize winner Gérard Mourou, gravitational physicist Carsten Danzmann, quantum physicist Anton Zeilinger and other renowned scientists. To bridge the gap between research and industry, the attendees of the conferences had free access to the LASER World of Photonics, the world's leading trade fair for photonics, with 1325 exhibiting companies. Approximately 34 000 visited the exhibition.

The industrial poster session was once again a success for the MOS conference and attracted 13 posters from companies wanting to promote their know-how to the attendees. The posters were visible all throughout the

conference in the conference room. This session will again be organized within the upcoming EOS Topical Meeting on Integrated Optics, as well as the EOS Annual Meeting (EOSAM) in Porto, Portugal in 2020.

The World of Photonics Congress provided an impressive 3661 talks and poster presentations. The participants were able to obtain information and discuss all the scientific trend topics of photonics at the seven conferences and at the application-oriented application panels, ranging from basic to applied research.

The best student papers were awarded for the EOS conferences, sponsored by Springer/JEOS:RP. The award included a diploma, free submission to the JEOS:RP open access journal, as well as a book price of the winner's choosing. The best paper at the conference on Manufacturing, Tolerancing, and Testing of Optical Systems (MOS) was presented by Melanie Ulitschka, Leibniz Institute of Surface Engineering (IOM, Germany) on 'Reactive Ion Beam Etching – Based Finishing of Optical Aluminium Surfaces'. For the Optofluidics conference, the award went to Pooria Hadikhani, EPFL (Switzerland), for 'Learning



Poster session at the EOS conference in Munich (Copyright 2019: EOS).

the Fluid/Flow Properties Using Microfluidics'. Congratulations to the winners!

Upcoming EOS Topical Meetings

Diffractive Optics

Jena, Germany, 16–19 September, 2019

The Topical Meeting has been organized by the EOS since 1995, and was launched by the present conference chairs, Jari Turunen and Frank Wyrowski.

In 2019, the Topical Meeting will be held in the 'City of Light' Jena, Germany.

As a European center of research in optics and photonics, the close integration of Jena's two universities with research institutions and local industry, Jena is the cradle of the optical industry in Europe and stands for innovation and progress, and as such, serves as a perfect location for this Topical Meeting. The success story of Jena began with Carl Zeiss, Ernst Abbe, and later Otto Schott.

We look forward to welcoming you to Jena, the City of Light.

Integrated Optics (IntOp)

Joensuu, Finland, 26–28 November, 2019

The EOS is organizing the first topical meeting on integrated optics and photonics in Joensuu (Finland) at the end of the year.

The annual growth rate generated by photonics industry in Finland is one of the largest in Europe (over 20%). An even more dynamic photonics playground is expected in the very near future thanks to the PREIN Flagship on photonics, supported by the Academy of Finland, which aims for groundbreaking research and innovations and to transfer the techniques to industry. This Topical Meeting provides the perfect setting for companies to show to a panel of experts and customers their latest products and expertise.

The Topical Meeting builds a bridge between academia and industry. Submissions are welcomed for both oral and poster presentations. In addition to the scientific and industrial program, several social and networking events are included, among others the welcome reception and conference dinner.

We look forward to welcoming you to Joensuu, Finland.

Community

Conference Calendar

2019

August

SPIE Optics + Photonics

San Diego, CA, USA

11–15 August 2019

<http://spie.org/x124283.xml>**EPIC World Photonics Technology Summit 2019**

Berlin, Germany

29–30 August 2019

www.epic-assoc.com/world-photonics-technology-summit-2019/

September

SPIE Remote Sensing/Security + Defense

Strasbourg, France

9–12 September 2019

<http://spie.org/x124461.xml>**Frontiers in Optics: the 103rd OSA Annual Meeting and Exhibit/
Laser Science Conference**

Washington, DC, USA

16–19 September 2019

www.frontiersinoptics.com/home/**SPIE Photomask Technology + EUV Technology**

Monterey, CA, USA

15–19 September 2019

<http://spie.org/x126645.xml>**2019 European Conference on Optical Communications (ECOC)**

Dublin, Ireland

22–26 September 2019

Abstract submission date: 19 April, 2019

www.ecoc2019.org/**OSA Laser Congress**

Laser Applications Conference

Advanced Solid State Lasers Conference

Vienna, Austria

29 September–3 October 2019

[www.osa.org/Meetings/Global_Calendar/Events/Advanced_Solid_State_Lasers_Conference_\(1\)](http://www.osa.org/Meetings/Global_Calendar/Events/Advanced_Solid_State_Lasers_Conference_(1))**2019 IEEE Photonics Conference (IPC)**

San Antonio, TX, USA

29 September–3 October 2019

<http://ieee-ipc.org/>

October

V2019 – Vakuu & Plasma

Dresden, Germany

8–10 October 2019

www.efds.org/event/v2019-vakuu-plasma/**SPIE Optifab**

Rochester, NY, USA

14–17 October 2019

<https://spie.org/conferences-and-exhibitions/optifab>

November

2019 24th Microoptics Conference (MOC)

Toyama, Japan

17–20 November 2019

www.moc2019.com/**medica**

Düsseldorf, Germany

18–21 November 2019

www.medica.de**formnext**

Frankfurt/Main, Germany

19–22 November 2019

<https://formnext.mesago.com/events/de.html>

2020

SPIE Photonics West

San Francisco, CA, USA

1–6 February 2020

<http://spie.org/PW>**Optical Fiber Communications Conference and Exhibition (OFC)**

San Diego, CA, USA

8–12 March 2020

www.ofcconference.or**SPIE Photonics Europe**

Strasbourg, France

29 March–2 April 2020

<http://spie.org/x126677.xml>**OSA Biophotonics Congress: Biomedical Optics**

Fort Lauderdale, FL, USA

20–23 April 2020

www.osa.org/Meetings/OSA_Meetings/OSA_Biophotonics_Congress_Biomedical_Optics

AKL'20

Aachen, Germany
6–8 May 2020
www.lasercongress.org

LASYS

Stuttgart, Germany
16–18 June 2020
<https://www.messe-stuttgart.de/lasys/>

Stuttgarter Lasertage SLT 2020

Stuttgart, Germany
16–17 June 2020
www.slt.uni-stuttgart.de

**Frontiers in Optics: the 104th OSA Annual Meeting and Exhibit/
Laser Science Conference**

Washington, DC, USA
14–17 September 2020
www.osa.org/en-us/meetings/global_calendar/events/frontiers_in_optics_the_104th_osa_annual_meeting_a/

VISION

Stuttgart, Germany
10–12 November 2020
www.messe-stuttgart.de/vision/