

## WORKSHOP

### Maskless Direct-Write Technologies for the Advanced Micro & Nano-Fabrication

Organized by Heidelberg Instruments in collaboration with Indian Institute of Technology-Madras

12th Dec 2023 from 09:30am to 01:30pm @ Hall-3, IC & SR, IIT Madras

**About the Workshop:** The workshop aims to bring together experts, researchers, young scientists, and academicians to disseminate knowledge from interdisciplinary backgrounds. The workshop will provide an opportunity to discuss recent developments in Direct Write Lithography research and foster future directions in Nano & Micro device making. The workshop is being organized by Heidelberg Instruments Mikrotechnik GmbH, a pioneer in Direct write maskless lithography Technology developer along with IIT Madras. This program offers a forum where you may share compelling key developments in the field of Lithography for R&D and even for Production scale.

Click on the link for Registration or scan the QR code:-

<https://t.ly/8ySG9>



To know more about

Heidelberg Instruments Scan the QR Code



### Program Agenda

9:30 am to 10:00 am	Registration
10:00 AM – 10:30 AM	Introduction by CNNP
10:30 AM – 11:15 PM	Heidelberg Instruments – Company and Product Overview – focus on Maskless Aligner and Maskless Stepper by <b>Dr. Sven Preuss Heidelberg Instruments</b>
11:15 AM – 11:45 PM	Empowering microfabrication research with the DWL66+ and unveiling the potential of grayscale lithography. by <b>Dominique Collé, Heidelberg Instruments</b>
<b>11:45 am to 12:00 pm Coffee/Tea Break</b>	
12:00 PM – 12:30 PM	Laser lithography 2D and 3D corrections by <b>Dmitri Titko, GenISys</b>
12:30 PM – 13:00 PM	NanoFrazor Lithography for advanced 2D&3D nanodevices by <b>Vasileios Theofylaktopoulos, Heidelberg Instruments</b>
13:00 PM – 13:30 PM	The MPO 100: 3D Lithography and 3D Microprinting via Two-Photon Polymerization by <b>Dr. Daniel-Alexander Braun, Heidelberg Instruments</b>
<b>Lunch and Networking</b>	



# Abstracts



Dr. Sven Preuss

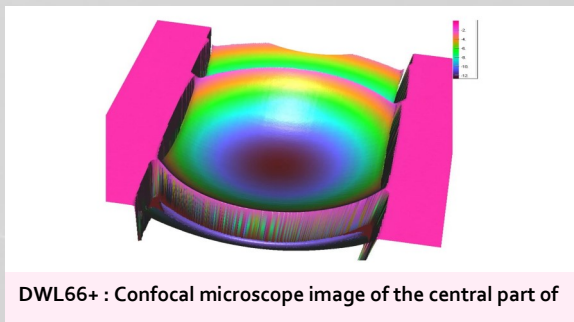
**Session 1:** Heidelberg Instruments is a world leader in the design, development, and manufacture of high-precision laser lithography systems, maskless aligners, and nanofabrication tools. With over 35 years of experience and well over 1,300 systems installed worldwide, Heidelberg Instruments provides lithography solutions specifically tailored to meet the micro- and nanofabrication requirements of our global customers.

**Focus on Maskless Technology (uMLA, MLA 150, VPG 300 DI):** When Heidelberg Instruments introduced the Maskless Aligner in 2015, it changed the perception of maskless lithography, and the way lithography is performed in R&D facilities worldwide. This talk will present the features of our established maskless aligners and our new maskless stepper and explain their advantages over traditional mask-based aligners and steppers.

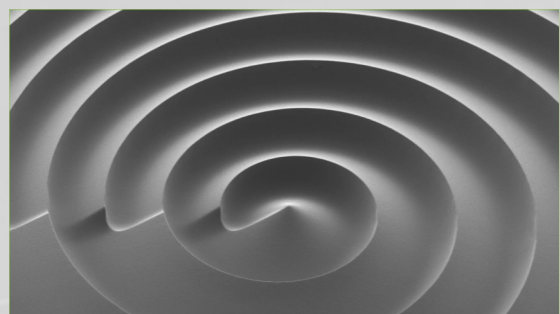
**Session 2:** Functioning as an extremely versatile direct lithography tool, the DWL66+ offers the possibility to achieve high resolution (with a minimum structure size of 300 nm) and reach remarkable throughput. About 350 of these machines have been installed worldwide. They are employed for a wide variety of needs in educational institutions, research laboratories, and manufacturing sites. Their primary purpose lies in fabricating micro-devices for a diverse array of applications, including microelectronics, sensors, MEMs (Micro-Electro-Mechanical Systems), microfluidics and micro-optics. A substantial portion of the applications served by the DWL66+ revolve around 2.5D micro-optical structures. This is largely attributable to its distinctive ability for direct-write grayscale lithography, a competence for which it is a standard setter.



Dominique Collé,



DWL66+ : Confocal microscope image of the central part of



Fresnel Vertex Axicon with angles from 22° to 45° with height of 10µm



Dmitri Titko

**Session 3:** In this presentation will be provided overview of CD linearity and shape fidelity corrections using OPC provided by BEAMER software, as well as model-based greyscale corrections for 3D shapes.



Vasileios  
Theofylaktopoulos

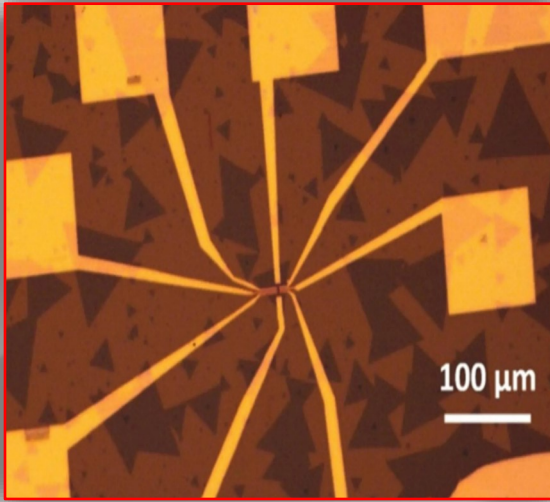
**Session 4:** The NanoFrazor technology provides a fabrication platform for nanostructures of arbitrary shapes on a wide range of substrate materials. It uses thermal scanning probe lithography and direct laser sublimation. Thermal nanolithography is achieved through an ultrasharp heated tip. This is combined with in-situ real-time reading of written structures. The writing depth is actively controlled in a closed-loop system. Along with this a laser writer is integrated and can-do mix & match lithography which is helpful to make smaller to bigger structures. Applications range from nanoelectronics, photonics, spintronics to nano-bio arrays.

**Session 5:** High-precision 3D printing provides a wide range of freedom in design for many applications, like micro-optics, photonics, micro-mechanics and biomedical engineering. The modular 3D printing platform MPO 100 offers high precision on demand for 3D Lithography as well as high print volume for 3D Microprinting and enables production of complex functional microstructures. The talk will give an introduction into the technology and show examples of applications realized with the MPO 100 system.



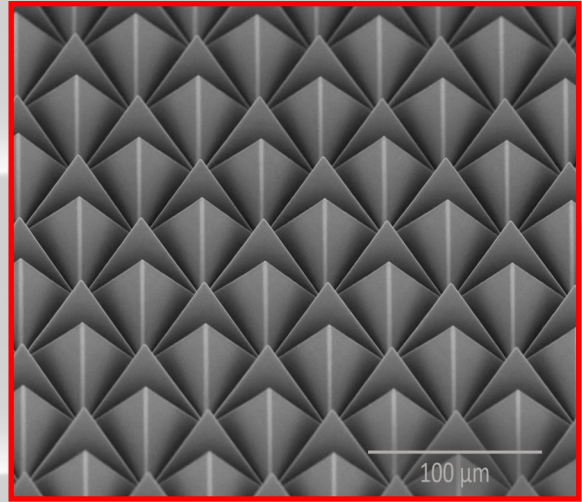
Dr. Daniel-Alexander Braun





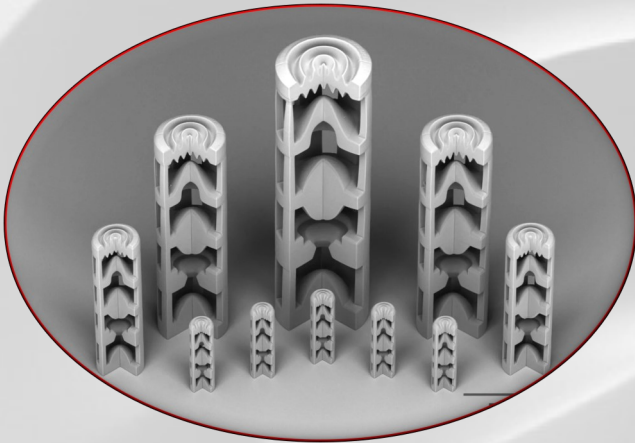
Metal contacts with vanishingly small Schottky barriers fabricated using the NanoFrazor®. On single-layer CVD-grown MoS<sub>2</sub>. (Courtesy of Prof. Elisa

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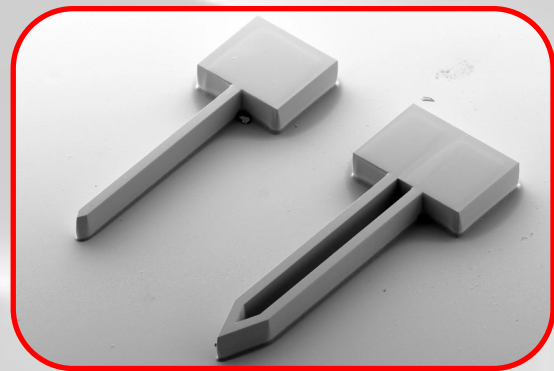
MPO 100: Retro-reflector: Fabrication of high-quality masters used in diverse replication technologies

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Lens stacks for applications in endoscopy (Life Sciences/Biological Engineering). Novel designs can be fabricated in a single process step without the need for alignment and assembly.

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Cantilever

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Contact US

Prof. Soumya Dutta

(heidelberg.workshop2iitm@gmail.com /044-22575474)

Dr. Samik Pal

(Samik.pal@labindia.com/+91 9830383100)

J Jothimanikandan

(Jothimanikandan@labindia.com/+91 9600424485)

Prahlada B L

(Prahlada.Bl@labindia.com/+91 7022023452)