



# 2ND DIRECT WRITE LITHOGRAPHY WORKSHOP



Friday 16<sup>th</sup> February 2024 @  **RMIT**  
UNIVERSITY

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**Sponsors**



**Location:**

**Storey Hall RMIT (Building 16)**

[Google Maps Link](#)



**Entrance along Swanston Street**

**Venue Entrance**

8:30 am - 15:00 pm	Registration open	Ground Floor (Lvl 2)
9:00 am - 9:05 am	House Keeping	Lecture Hall (Lvl 1)
9:05 am - 9:10 am	Welcome to Country by Wurundjeri Elder Perri Wandin	Lecture Hall (Lvl 1)
9:10 am - 9:20 am	Welcome by Prof. Chennupati Jagadish	Lecture Hall (Lvl 1)
9:20 am - 10:45 am	Session 1: DWL with electrons Chair: Prof. Lan Fu (ANU)	Lecture Hall (Lvl 1)
10:45 am - 11:20 am	Morning Tea	Auditorium (Lvl 5)
11:20 am - 12:25 pm	Session 2: DWL with photons Chair: Prof. Nicolas Voelcker (MCN)	Lecture Hall (Lvl 1)
12:25 pm - 13:30 pm	Lunch Break	Auditorium (Lvl 5)
13:30 pm - 14:45 pm	Session 3: DWL with ions Chair: Dr. Guanghui Ren (RMIT)	Lecture Hall (Lvl 1)
14:45 pm - 15:25 pm	Afternoon Tea	Auditorium (Lvl 5)
15:25 pm - 16:40 pm	Session 4: DWL with other / resist tech. Chair: Dr. John Morrison (ANFF-C)	Lecture Hall (Lvl 1)
16:40 pm - 16:50 pm	Closing by Dr. John Morrison (ANFF-C)	Lecture Hall (Lvl 1)

# ACKNOWLEDGEMENT OF COUNTRY

RMIT University acknowledges the Wurundjeri people of the Kulin Nations as the traditional owners of the land on which the University stands. RMIT University respectfully recognises Elders both past and present.



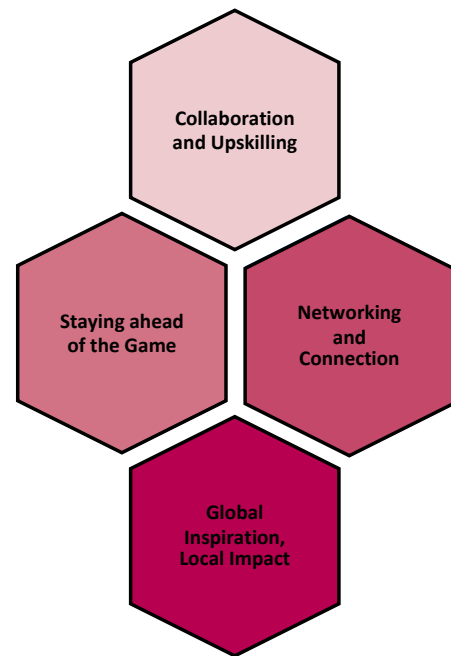
Artwork by Wurundjeri artist Mandy Nicholson

# Vision and Mission Statement

## Pioneering Micro- and Nanofabrication Excellence in Australia

In the realm of cutting-edge micro- and nanofabrication, the Direct Write Lithography (DWL) Workshop emerges as a beacon of innovation, aiming to shape the future of technology through collaboration, education, and networking.

Our vision is to establish a dynamic platform in Australia that mirrors the success of renowned events like *Electron, Ion and Photon Beam technology and Nanofabrication 3Beams or EIPBN* in the US and the *International Micro and Nano Engineering Conference MNE* in Europe, fostering a culture of excellence in micro- and nanofabrication.



### Mission Statement:

At the core of the DWL Workshop lies the commitment to promote collaboration among engineers, researchers, technicians, tool vendors, and service experts. We aspire to increase fabrication knowledge, enabling participants to exceed by embracing cutting-edge micro and nanofabrication techniques. Our mission is to provide a space for individuals to hear from leading engineers and scientific researchers, learn about the newest tool technology from our vendors, and connect with like-minded professionals.

### Collaboration and Upskilling:

The DWL Workshop is not just an event; it's a collaborative ecosystem where minds converge to share experiences and ideas. Through meticulously curated sessions, participants will have the opportunity to augment their fabrication knowledge, gaining insights into the latest advancements in direct write lithography.

## **Staying Ahead of the Game:**

In a rapidly evolving technological landscape, keeping up to date is imperative. The DWL Workshop acts as a conduit for knowledge transfer, bringing together pioneers in the field to share their expertise. By providing a platform for the exchange of ideas and experiences, attendees will gain a competitive edge, staying abreast of the latest developments in micro and nanofabrication.

## **Networking and Connection:**

Connecting with fellow engineers, technicians, tool vendors, and service experts is a cornerstone of the DWL Workshop. Our event aims to create a vibrant community where professionals can forge meaningful connections, fostering collaborations that extend beyond the workshop itself.

Networking sessions, social events, and dedicated spaces for discussions will facilitate the establishment of a supportive network within the micro and nanofabrication community.

## **Global Inspiration, Local Impact:**

Inspired by the success of EIPBN and MNE, the DWL Workshop seeks to establish a similar legacy in Australia. By bringing together international and local experts, we aim to create a unique blend of perspectives that will contribute to the growth and advancement of micro and nanofabrication technologies within the region.

## **Conclusion:**

The DWL Workshop envisions a future where Australia stands at the forefront of micro and nanofabrication innovation. By providing a platform for collaboration, upskilling, and networking, we are committed to empowering professionals to navigate the complexities of direct write lithography

**The workshop organising committee.**

# Lanyard and Gold Sponsor



## Gold Sponsors



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Scientific**

**RAITH**  
NANOFABRICATION

**ELIONIX INC.**

## Sponsors

**CRESTED**

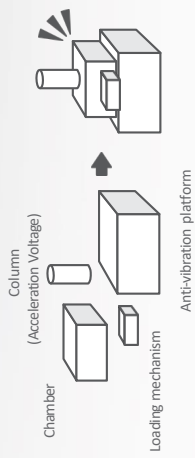


**GenISys**



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# BODEN / BODENS



## ■ MODULAR SYSTEM

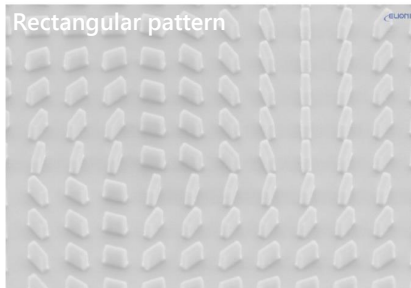
The optimum configuration for each application can be assembled by freely combining acceleration voltage, chamber size, loading mechanism, and anti-vibration platform.

**Session 1:  
DWL with electrons  
Proudly sponsored by:**



**ELIONIX INC.**

**Session Chair:  
Prof. Lan Fu - ANU**



**9:20 am - 9:30 am** Dr. Gerald Lopez - Center Associate Director & Director of Operations and Business Development, University of Pennsylvania  
Singh Center for Nanotechnology, Co-Founder and Board Chair of The Meeting for Advanced Electron Beam Lithography (MAEBL)  
*The Meeting for Advanced Electron Beam Lithography (MAEBL)*

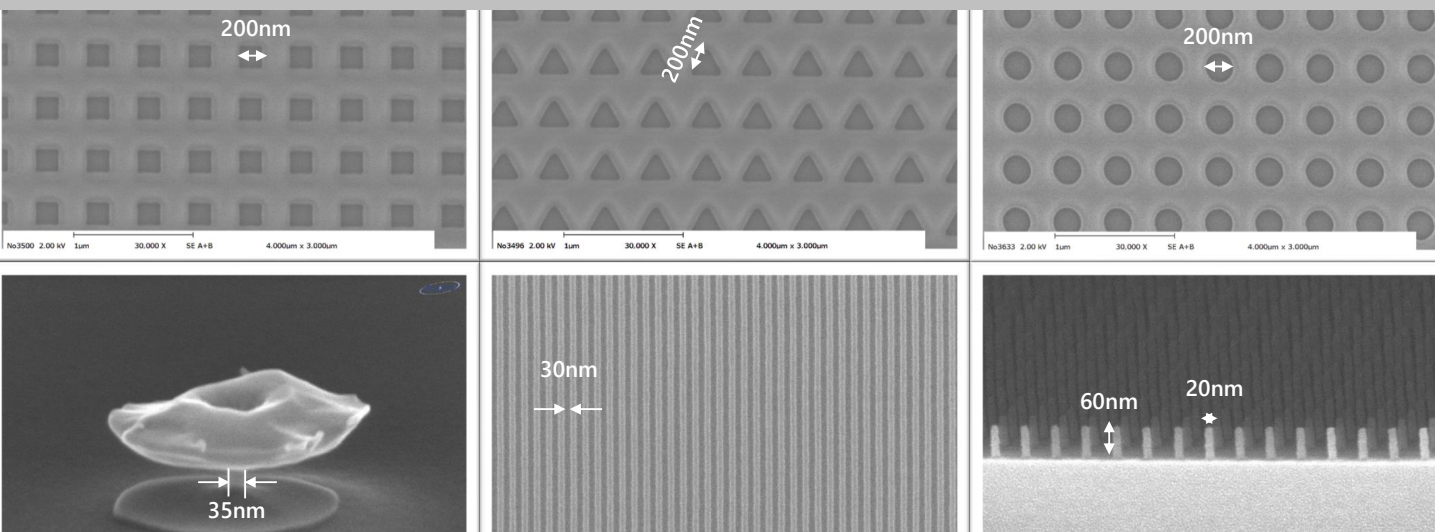
**9:30 am - 9:45 am** Gold Sponsor: Wenchun Chiu - Elionix  
*Electron beam lithography*

**9:45 am - 10:05 pm** Dr. Guanghui Ren - Integrated Photonics and Applications Centre (InPAC), RMIT University  
*Quality vs. Quantity: How to choose the right fabrication tools?*

**10:05 am - 10:25 pm** Dr. Daniel Peace – School of Mathematics and Physics, University of Queensland  
*Inverse design nanophononics for classical and quantum information processing*

**10:25 am - 10:45 am** Prof. Charlene Lobo - School of Mathematical and Physical Sciences, University of Technology Sydney  
*Direct write nanofabrication of two-dimensional materials and semiconductor thin films using electron beams*

**10:45 am - 11:20 am** Morning Tea





# Think big. Print nano.

Reshaping precision, output and usability in 3D Microfabrication



## Quantum X shape

Fastest and most accurate 3D printer in class for rapid prototyping and wafer-scale batch processing

Your advantages at a glance

- ▶ High-speed 3D Microfabrication with 100 nm feature size control
- ▶ 200 typical mesoscale structures printable overnight
- ▶ Broad range of substrates and wafers up to 8"

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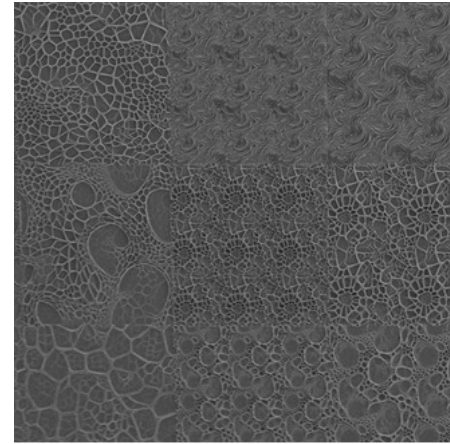
**Warsash Scientific**  
Advanced Instruments for Research & Industry

[nanoscribe.com](http://nanoscribe.com)

**Session 2:**  
**DWL with photons**  
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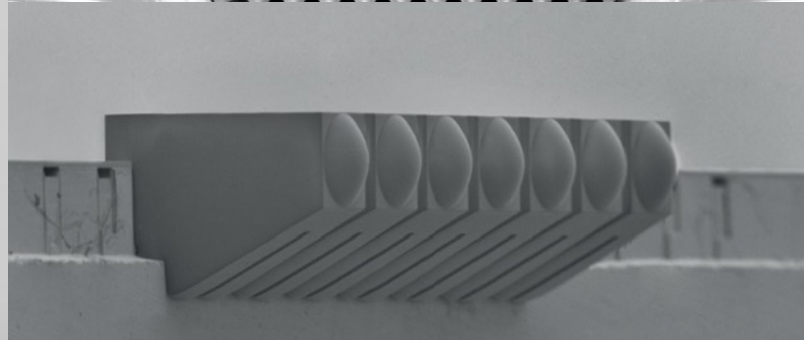
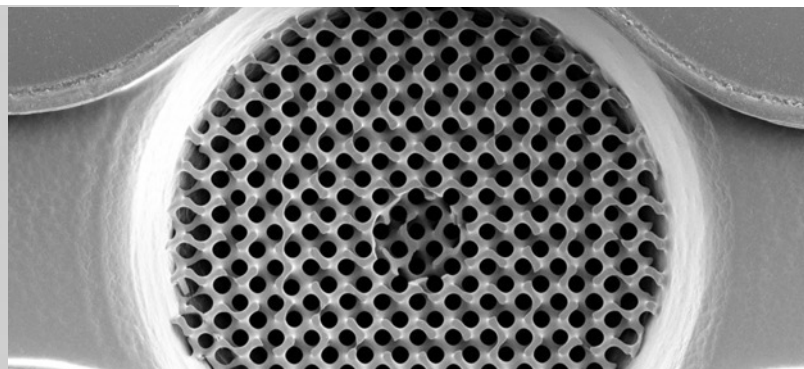


**Warsash  
Scientific**

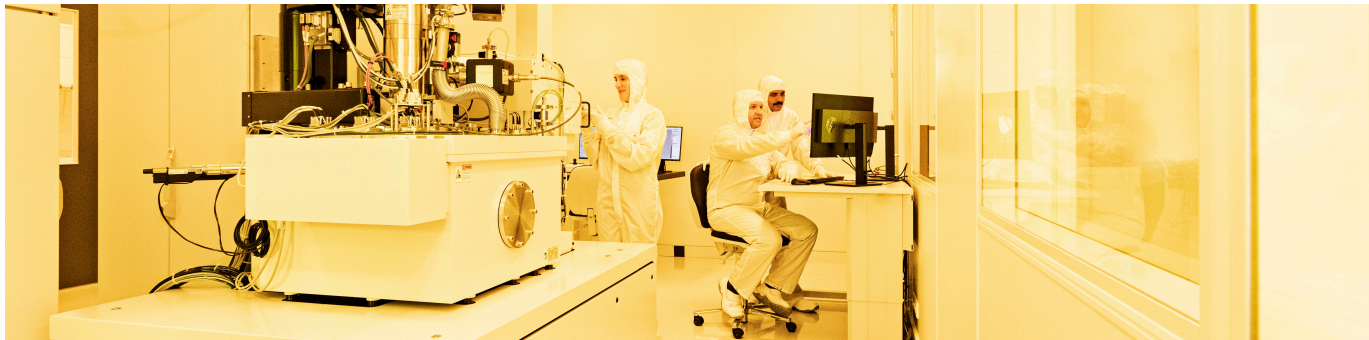


**Session Chair:**  
**Prof. Nicolas Voelcker - MCN**

11:20 am - 11:35 am	Gold Sponsor: Dr. Daniel Day - Warsash <i>Streamlined 2PP: from in-chip bioprinting to on-chip photonics</i>
11:35 am - 11:55 am	Ying Zhi Cheong - Functional Materials and Microsystems Group, ARC TMOS, RMIT University <i>Mask-less and precision 3D printing</i>
11:55 am - 12:15 pm	Dr. Daniel Fan - University of Melbourne <i>3D printed diffractive optical elements for rapid prototyping</i>
12:15 pm - 12:25 pm	Dr. Grant van Riessen - La Trobe University / MCN <i>Prospects for Direct Write X-ray Nanolithography</i>
12:25 pm : 13:30 pm	Lunch Break



## Systems for nanofabrication



### About Raith

Raith is a leading precision technology solution provider for micro- and nanofabrication, electron beam lithography, focused ion beam fabrication, maskless laser lithography, nanoengineering, process control, and reverse engineering applications.

The company offers solutions for researchers and engineers in both academic and industry settings.

Founded in 1980 and headquartered in Dortmund, Germany, Raith employs around 300 people. The company works closely with customers in the most important global markets through subsidiaries in the Netherlands, the USA, and Asia and through an extensive partner and service network.

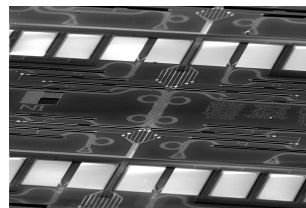
In February 2013 Raith joined forces with Vistec Gaussian Beam Lithography, another leading lithography equipment manufacturer with more than 45 years of experience. With this ideal extension to the product portfolio, customers are now able to select from a comprehensive range of nanofabrication systems.

In July 2021 Raith acquired 4PICO Litho, expanding its nanofabrication portfolio to take in maskless laser lithography.

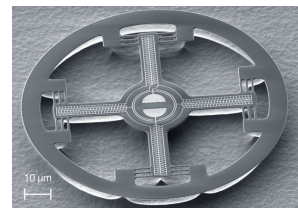
Raith customers benefit from innovative, intelligently configured high-tech systems at an excellent price-performance ratio. With the world's largest service and support infrastructure in the area of nano fabrication, the world's greatest customer community, and highly trained personnel, customers can be sure of making a solid investment with the company.

### Application Areas

With its range of solutions, Raith operates in all areas where nanostructures are deployed as indispensable components of products and technologies. Such systems could be in quantum physics, materials science, nanobiotechnology, nanoelectronics, or nanomedicine. Some of the largest areas of application are in semiconductor technology and in information and data storage technology.



Photonic CNOT quantum gate, Menno Poot, Yale University



Broadband-tunable double disk electro-optomechanical system with integrated gold electrodes, Christiaan Bekker, University of Queensland

#### VELION



#### EBPG Plus



### Solutions for



Electron Beam Lithography



FIB-SEM Nanofabrication



Large Area SEM Imaging



Nanolithography Upgrades



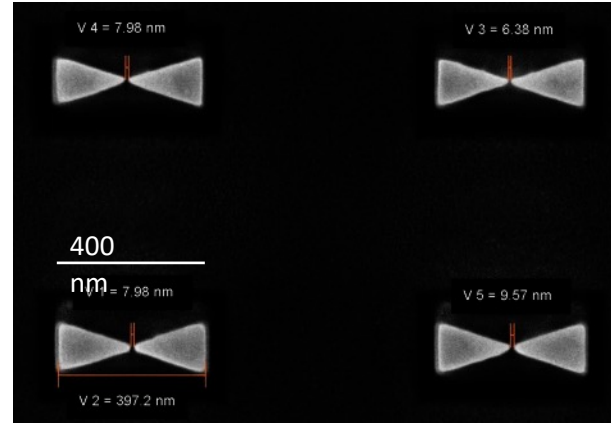
Maskless Laser Lithography

**Session 3:  
DWL with ions  
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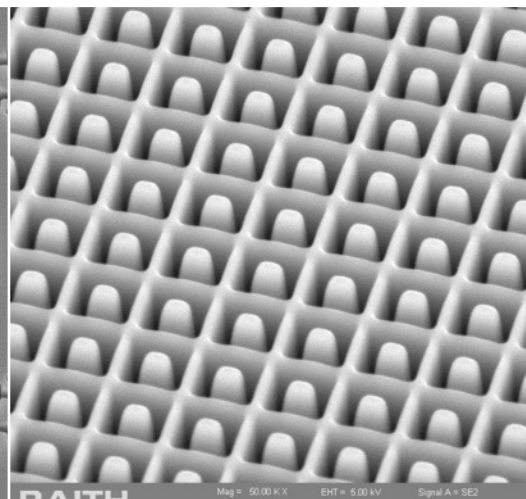
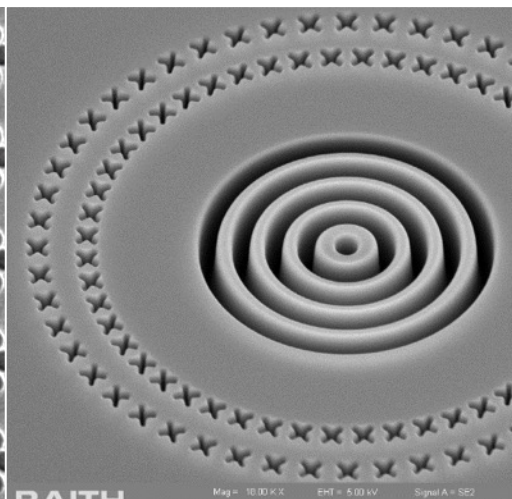
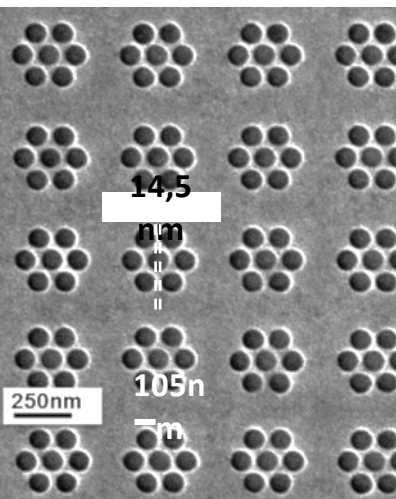


**RAITH**  
NANOFABRICATION

**Session Chair:  
Dr. Guanghui Ren - RMIT**



- 13:30 pm – 13:45 pm** Gold Sponsor: Dr. Andrew Yu - Raith  
*FIB with GaBiLi Source for 3D Lithium Ion Microscopy and Nano-lithography Application*
- 13:45 pm – 14:05 pm** Dr. Anders Barlow - Materials Characterisation and Fabrication Platform (MCFP), University of Melbourne  
*Light-ion beams in nanoscale lithography – advantages and challenges*
- 14:05 pm – 14:25 pm** Dr. Jean-Phillippe Tetienne - School of Science, RMIT University  
*Controlled creation of crystalline defects with focused ion beams for quantum technologies*
- 14:25 pm – 14:45 pm** Dr. Eugeniu Balaur - La Trobe University  
*Advanced Focused Ion Beam techniques: case studies*
- 14:45 pm : 15:25 pm** Afternoon tea

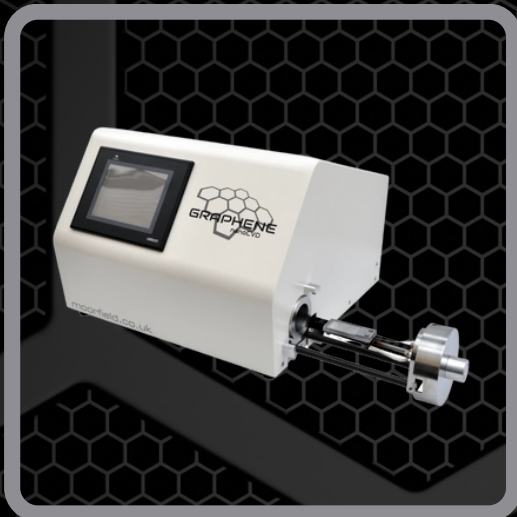




**NANOVACUUM**  
ENABLING NANOFABRICATION

## Nanomaterials Fabrication & Lithography Solutions

### Fabrication



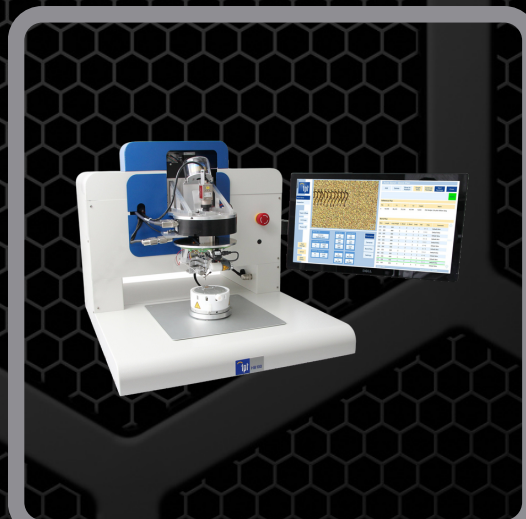
### Lithography



### Characterisation



### Packaging



1800 560 820  
sales@nanovactech.com  
www.nanovactech.com



# About Us

Nano Vacuum's team has over 50 years of experience within the nanofabrication industry. We have highly qualified staff members including PhD qualified Mechanical and Electrical Engineers with expertise in Bio-Nano and Surface Science Engineering.

Our aim is to provide the best service and advice to our Australian and New Zealand customers, equipping you with cutting-edge tools for your research. Our extensive customer base includes academia, government, defence, aerospace, semiconductor and private industry, covering industries and R&D sectors within Quantum, Space/Aerospace, Defence, Semiconductor, Photovoltaics, Microfluidics, Photonics, Wearable Electronics, Opto-electronics, Sensors, MEMS, OLED/LEDs, SiC and GaN Power Devices, Medical/Dental Implants, Condensed Matter Physics and Material Science.

Our range of deposition, etching, plasma modification, clean/inert environments, packaging and lithography and surface characterisation tools offer nanofabrication resources to ensure you stay at the forefront of the highly competitive research space.

Nano Vacuum can also design, project manage and deliver complete clean rooms including UHP gas panels and orbital welded piping, clean room walls, HEPA filters, toxic gas cabinets, wet/dry scrubbers and more.

All this will be with a service level and price point that will exceed your expectations.

We look forward to working with you on your next project.

Team Nano Vacuum

## Lithography Systems at Nano Vacuum

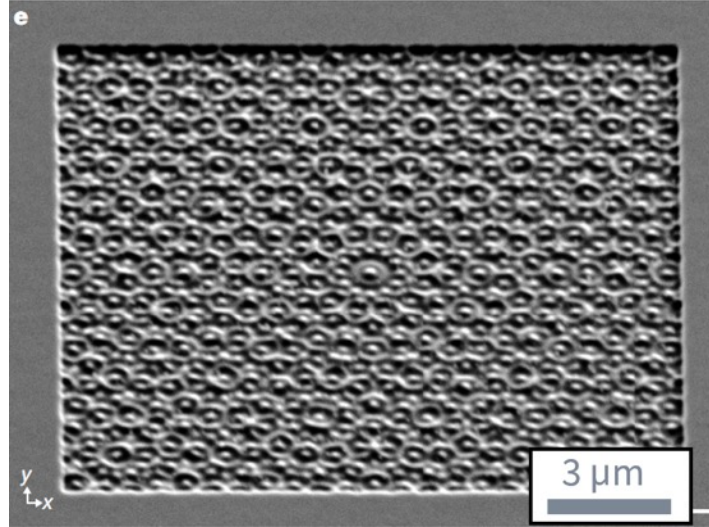
- $\mu$ MLA The Table-Top Maskless Aligner
- MLA150 Direct Write Maskless Aligner
- MLA300 Maskless Aligner for Volume Production
- DWL66+ Direct Write Laser Lithography Tool
- ULTRA The Semiconductor Laser Mask Writer
- NanoFrazor Scholar Thermal Scanning Probe Lithography
- NanoFrazor Explore Thermal Scanning Probe Lithography
- MPO 100 - Multi-User Tool for 3D Lithography and 3D Microprinting
- VPG 300 DI

**Session 4:  
DWL with thermal / resist tech  
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**NANOVACUUM**  
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**Session Chair:  
Dr. John Morrison - ANFF-C**



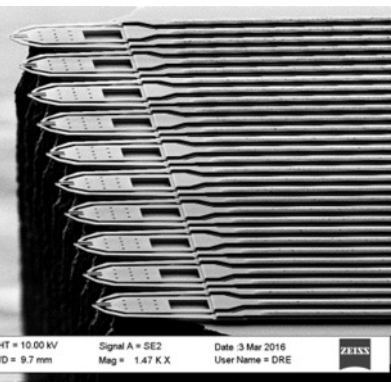
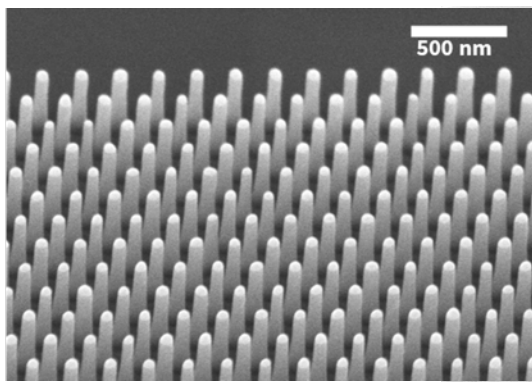
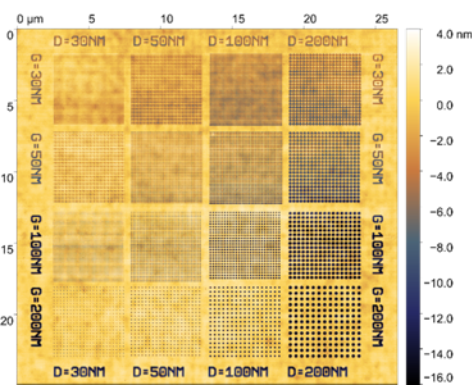
**15:25 pm - 15:40 pm Gold Sponsor: Dr. Emine Cagin - CTO Heidelberg Nano**  
*Enabling Novel Devices With the NanoFrazor*

**15:40 pm - 16:00 pm Dr. Hemayet Uddin - MCN**  
*NanoFrazor enabled nanofabrication at the MCN*

**16:00 pm - 16:20 pm Dr. Crispin Szydzik - Research Fellow - Integrated Photonics and Applications (InPAC)**  
*Direct write lithography for lab-on-a-chip applications*

**16:20 pm - 16:40 pm Dr. Elliot Cheng - University of Queensland**  
*Fantastic resists and their properties*

**16:40 pm - 16:50 pm Closing by Dr. John Morrison (ANFF-C)**



EHT = 10.00 kV Signal A = SE2 Date = 3 Mar 2016  
WD = 9.7 mm Mag = 1.47 K X User Name = DRE



# DWL Workshop Organising Committee



**Daniel Peace**  
(UQ)



**Elliot Cheng**  
(UQ)



**Gayatri Vaidya**  
(ANU)



**Jacky He**  
(Archer)



**Jason Hwang**  
(Usyd)



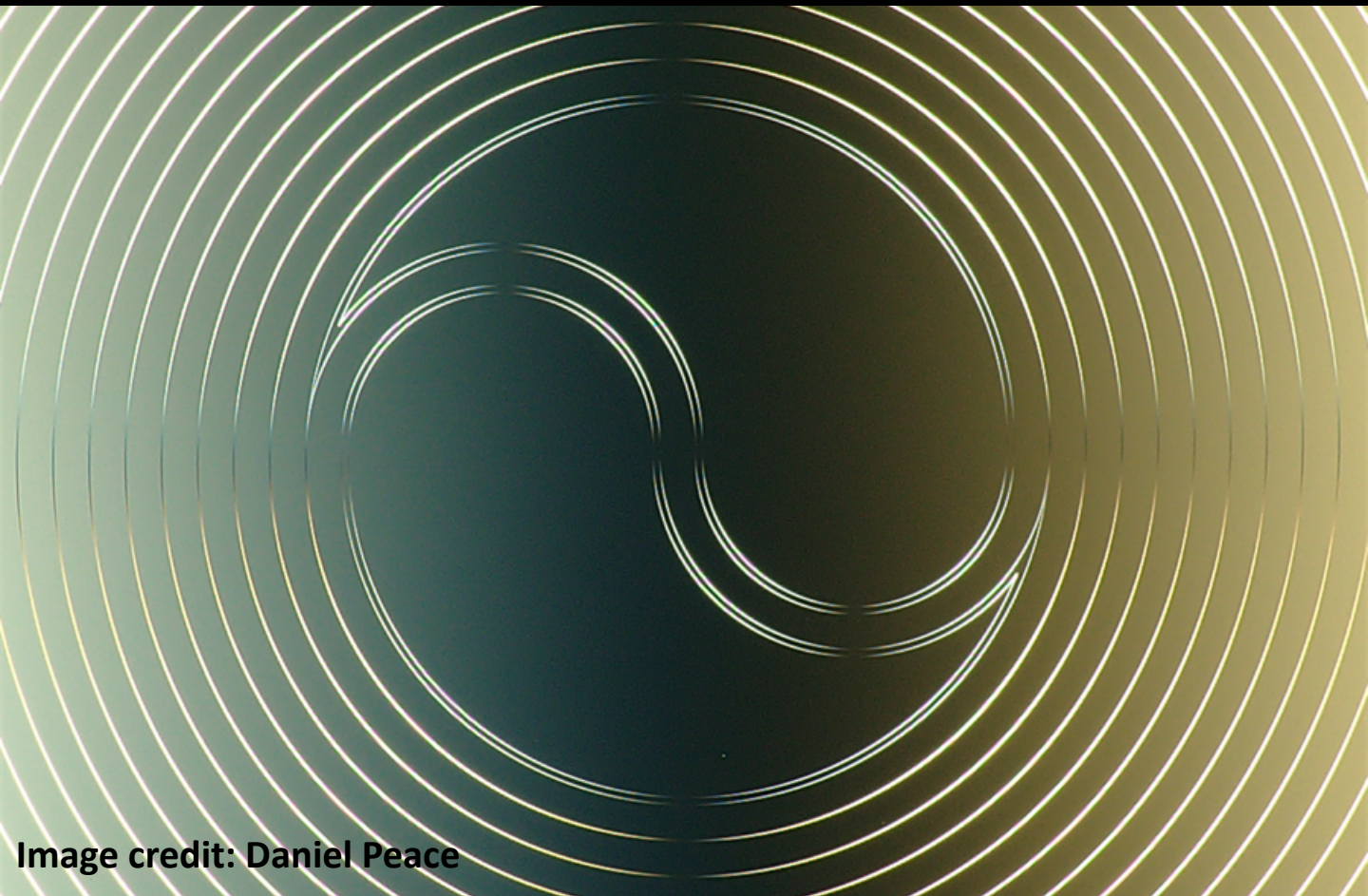
**Michael Stuibler**  
(MCN)



**Tatiana Pinedo Rivera**  
(MCN)



**Vijay Sivan**  
(RMIT)





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NATIONAL  
FABRICATION  
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**NCRIS**  
National Research  
Infrastructure for Australia  
An Australian Government Initiative



## **DIRECT WRITE LITHOGRAPHY WORKSHOP (DWL)**

**16 FEBRUARY, 2024  
RMIT**

**ANFF  
CONNECTED**

## **ARE YOU A MICRO- AND NANOFABRICATION ENGINEER, TECHNICIAN OR RESEARCHER LOOKING TO STAY AHEAD IN THE GAME?**

Elevate your expertise by participating in a 1-day Direct Write Lithography Workshop.

### **WHAT TO EXPECT:**

**Insightful sessions:** Hear from leading engineers and researchers how they incorporate cutting-edge micro- and nanofabrication techniques.

**Tools and techniques:** Learn about the latest hardware and software developments from leading tool vendors.

**Networking opportunities:** Connect with fellow engineers, technicians, tool vendors and service experts to exchange ideas and share experiences.

<b>Time</b>	<b>Session</b>
8:00-8:45	Welcome to Country
9:00-9:05	Welcome
9:05-10:30	<b>Session 1: DWL with electrons</b>
10:30-10:55	<i>Morning tea</i>
10:55-12:20	<b>Session 2: DWL with ions</b>
12:20-13:25	<i>Lunch break</i>
13:25-14:50	<b>Session 3: DWL with photons</b>
14:50-15:25	<i>Afternoon tea</i>
15:25-16:50	<b>Session 4: DWL with other/resist technology</b>
16:50-17:10	Closing

**REGISTER HERE >>**

### **+ FOR MORE INFORMATION, CONTACT:**

**Dr Michael Stuibler**, Melbourne Centre for Nanofabrication  
E: [michael.stuibler@nanomelbourne.com](mailto:michael.stuibler@nanomelbourne.com)

**ANFF.ORG.AU**