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"Eureka" moment for MCN Senior Tech Fellow

Yonggang Zhu, an MCN Senior Technology Fellow, has been recognised for developing an innovative solution for the fast and reliable analysis of chemical warfare agents outside the laboratory.

Dr Zhu was awarded the prestigious Eureka Prize within the *Science in Support of Defence or National Security* category. The lab-on-a-chip research contributes to the National Research Priority for Safeguarding Australia. The handheld prototype, designed and fabricated using MCN capabilities, allows the rapid in-field detection of toxic material and other chemical agents demonstrating the same level of accuracy sought from commercial labs.

Above: Dr Alex Zelinsky presents MCN Senior Technology Fellow Dr Yonggang Zhu with the Eureka Prize for Science in Support of Defence or National Security

The ultra-fast chemical agent detector can identify hazardous substances from water, soil or a swab within minutes. It has already proved effective against the colourless and odourless biotoxin Sarin known to many from the coordinated attacks on the Tokyo subway system, which killed thirteen people.

The highly sensitive, innovative plastic sensor also has potential uses in the identification of explosives, pesticides, drugs and toxic metals in river water and food.

Plans to integrate the device with other pioneering technologies (such as the miniaturisation of the electronics and power supply) are currently underway to enable real-time analysis of potentially toxic environments.

In this edition....

New Technology Fellows appointed

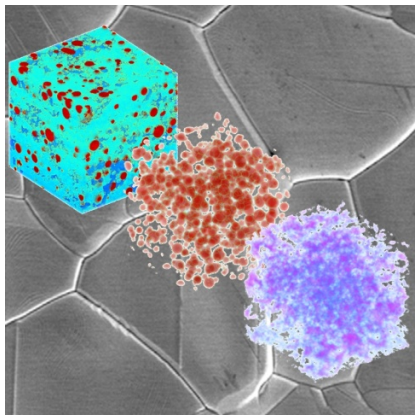
MCN is pleased to announce the appointment of four new MCN Technology Fellows. The recipients will join the existing team of Senior Technology Fellows early next month.

The new team will add a wealth of knowledge to the existing group of technology consultants, providing expertise in areas such as device design, photonics, bio-sensing and solar energy. The MCN Technology Fellows provide free confidential advice on project design and nanofabrication to MCN clients, whilst undergoing their own research activities within MCN. Their research interests include:

Dr Daniel Gomez, The University of Melbourne - Creating artificial photosynthesis using nano-structures that capture and store solar energy within chemical bonds.

Dr Peggy Chan, RMIT University– Fabrication of microbioreactor systems for developing and growing donor-compatible nerves outside of the body.

Dr Qiaoliang Bao, Monash University - Development of a graphene-based broadband optical modulator that incorporates large modulation depth within the full telecommunication spectrum (1260-1675 nm), providing new opportunities in the field of optical computing.



Above: A 3D X-ray tomography image of a Titanium nanocomposite sample, sectioned to show the Ti nanoparticles and voids within the structure. (Image courtesy of Dr Brian Abbey, La Trobe University)

Dr Brian Abbey, La Trobe University - Metallic deformation in polycrystals at the nanoscale: how material microstructure affects its strength.

For more information on the MCN Technology Fellows, visit nanomelbourne.com/technology-fellows.

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A golden project with the Australian Synchrotron

Fabrication of novel self-assembly metallic nanostructures shows great potential for applications in biosensing, optical analysis, computing and solar energy conversion.

Utilising the facilities within the Australian Synchrotron, Thibaut Thai of Monash University has combined bottom-up self-assembly processes with top-down techniques to generate vertical arrays of gold nanorods on patterned substrates.

Gold nanorods (GNRs) are of particular interest to researchers as they display unique yet highly variable optical properties. One such property is their remarkable sensing ability, which is exploited during Surface Enhancement Raman Spectroscopy (SERS). During this process GNRs are closely packed together in a hexaganal-type arrangement forming high density "hot-spots". If a molecule is within this hot-spot, its Raman signal will be greatly amplified.

The Raman signal then acts as a molecular fingerprint and is key in characterising a material's chemical structure, temperature or frequency mode.

In past research, controlling the self-assembly process has been a challenge due to the non-uniform nature of the nanorods.

Using a method developed at MCN, researchers were able to control the orientation of the assembly and select a precise location to express the desired features. The mask aligner, reactive ion etching process, electron-beam evaporator and scanning electron microscope were all critical components during the fabrication process.

The accuracy of the micro-patterns was confirmed using the small-angle X-ray scattering (SAXS) beamline at the Australian Synchrotron.

This work highlights the unique research opportunities that can be tackled between the Australian Synchrotron and MCN, as a world-class hub for research.

Details of this work were published in the international journal *Angewandte Chemie (2012, Issue 35, 8732–8735)*

Up close with micro-spectroscopy

MCN has just taken delivery of a microspectroscopy system. The system is not unlike that which has helped historians decipher the 2000-year-old text found on Herculaneum papyri – a series of ancient scrolls unearthed from the ash layer of Mount Vesuvius.

Multichannel spectroscopy allows researchers to sharply focus a multispectral image at every wavelength, providing an aberration - free resolution of less than 0.1nm. In the case of the Herculaneum scrolls, analysing the light-reflectivity of black ink allowed researchers to distinguish text from black ash - sodden paper.

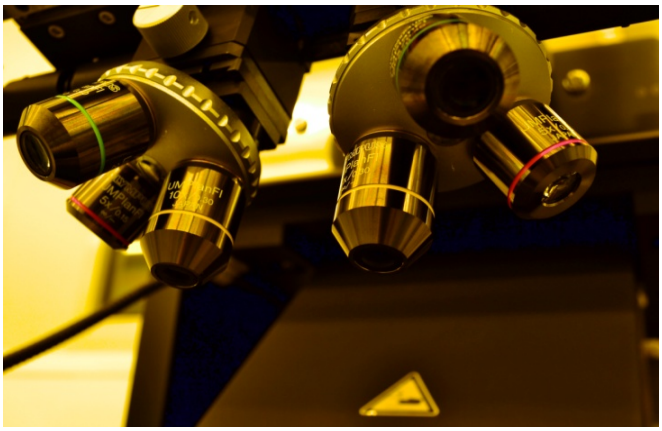
The same principle will enable MCN users to quickly identify specimen features across UV to near-infrared spectra. A still camera and adjoining conventional microscope also allows flexibility between imaging modes.

With a little help from the new system, the unknown chemical composition of samples, mysterious intracellular signatures or concealed character of polymers might just become things of the past.

Want to learn more about Microspectroscopy? Attend our free training session @ 1pm on Friday, 5th October. Visit nanomelbourne.com/training for info.

New funding for industry R&D

A NEW Technology Voucher Program has been developed by the Victorian Government to give Victorian businesses the opportunity to increase their competitiveness by using small technologies in their products, processes and services. The program assists Victoria's innovative companies with the cost of access, consultation and R&D services provided by state-of-the-art facilities such as MCN. The Technology Voucher Program replaces and expands on the highly successful Small Technologies Industry Uptake Program (STIUP), which, through MCN, has supported companies such as Grey Innovation, Aqua Diagnostic, Biodetectors Ltd, and Liquitab. For more information on the Technology Voucher Program, visit **http://goo.gl/7qRMM** or email **mcn-enquiries@monash.edu.**



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Industrial strength capability docks at MCN

MCN has received a new Leadwell v-20i vertical subtractive milling machine. From boring out alloy exhaust manifolds to customising plastic prototype gear wheels, this machine can tackle a variety of projects.

The CNC is designed for heavy duty cutting, milling, drilling, rigid tapping and surface finishing operations with high accuracy. The tool boasts a powerful, high speed spindle that can operate at speeds of up to 8000 rpm and a massive cast iron base and wide column design for extra rigidity. Samples will be able to be mounted on the high capacity table (200kg) using either tie down clamps or tool vices and still have a large machining travel range (X=510mm, Y=350mm and Z=410mm).

The new centre is configured with a 20 tool automatic changer and is controlled via a Fanuc O*i*-m computer numerical controller (CNC). The cutting tool work area is completely encapsulated by a guarding system which houses a chip conveyor (auger type) for swarf removal and a continuous coolant pump system. This tool has been configured to operate with BT40 arbours and collet sets allowing quick tool setup and changeover.

For further information on the system please contact Paul Spizzirri (paul.spizzirri@monash.edu)

Above: The new CNC subtractive milling machine arrives via forklift at the MCN loading dock during September, 2012.

Make your publication count

The MCN access and pricing policy requires that all academic publications arising from the of use MCN facilities are required to acknowledge MCN. Please include acknowledgements in the following form and report any new publications to the MCN facility manager.

Papers: Please use the following in the acknowledgement section of all papers.

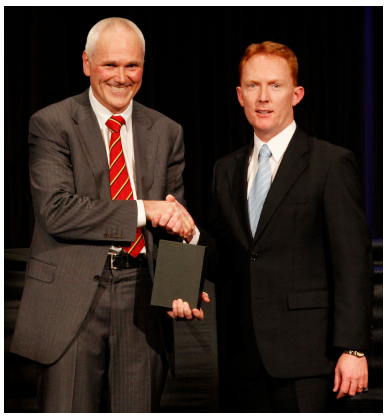
"This work was performed in part at the Melbourne Centre for Nanofabrication"

Presentations: MCN logos and powerpoint templates can be accessed online at nanomelbourne.com/access.

MD named SACS leader

Dr Dwayne Kirk, MCN Managing Director, was honoured at the SACS Consulting Leadership awards as a finalist in the Not for Profit Executive Category.

Dr Kirk was recognised for his leadership influence at MCN for increasing levels of client usage and industry engagement and dramatically improving staff job satisfaction and customer service.



Above: Andrew Marty, M.D of SACS Consulting presents Dr Dwayne Kirk with the SACS Consulting Leadership Award.

Asher promises deep clean

A new PVA TePla Ion Wave 10 Plasma Asher system is currently being installed, with completion expected in early November. The Ion Wave 10 is a PC controlled, recipe driven microwave (2.5GHz, 600W) plasma system primarily used for photo-resist removal and wafer cleaning. The microwave technology offers several advantages over conventional RF systems, including minimal exposure to static discharge (ESD), no ion damage due to impact sputtering, and readily achieving ashing temperature due to microwave absorption by silicon. The system is operational in batch mode (up to 25 × 6-inch wafers) as well as single wafer mode (small samples/pieces up to 8-inch wafer). Substrate materials include silicon, glass, ceramics and polymers. The system consists of three process gases, O2, Ar and CF4, providing the flexibility for SU8 ashing.

The plasma asher will support existing capabilities and have a range of applications including wafer cleaning, removal and etching of photoresist layers and surface activation.

For further information on the system please contact Sasikaran Kandasamy (sasikaran.kandasamy@monash.edu)

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Beamers trade secrets

In order to facilitate the development of techniques between users, an E-beam Lithography Users Group met at MCN on the 17th of August, 2012. Approximately 15 users attended the workshop, comprising trained and new users interested in learning more about the machine's capabilities.

Since the E-beam's arrival, the routine operation of the tool has shifted into the hands of a rapidly growing, independent user base, which holds a substantial amount of know-how regarding the tool and associated lithography processes. Four established users each gave a presentation about specific topics related to data preparation, pattern transfer, overlay of subsequent exposures and pattern fidelity. The meeting marks the first in a series of biannual meetings.

Above: IM Dr Matteo Altissimo shares his expert knowledge with other E-beamers in the Class 100 area.

MCN users score high on impact

The MCN Staff and user community regularly feature their research in academic and industry based journals. Highlights, including the *50th Anniversary Edition of Applied Physics Letters Editors Pick,* include:

• Cheol-Ho Yun, Leslie Y. Yeo, James R. Friend, and Bernard Yan "Multi-degree-of-freedom ultrasonic micromotor for guidewire and catheter navigation: The NeuroGlide actuator", APL (2012).

Other high-impact journal publications include:

• Chen Y, Cheng W, "DNA - based plasmonic nanoarchitectures: from structural design to emerging applications", Wiley interdisciplinary reviews. Nanomedicine and nanobiotechnology

• Neeson M, Tabor R, Grieser F, Dagastine R, Chan D. "Compound sessile drops", Soft Matter, (2012).

• Chen Y, Ouyang Z, Gu M, Cheng W, "Mechanically strong, optically transparent, giant metal superlattice nanomembranes from ultrathin gold nanowires", Advanced Materials (2012)

To access these and other publications, visit nanomelbourne.com/publications.

Last chance to WIN!

Submissions are closing soon for the inaugural Image of the Year Competition. All users are eligible to enter for a chance to win a $200 dinner certificate at Enzo's restaurant. Please note that there is no limit to the number of times you can enter, nor on the theme of your images. For more info visit http://goo.gl/EeSQe.

Do you need simulation?

The MCN has been awarded funding to determine what software and computing tools are needed to support nanotechnology research and product development in Australia. If you need access to design and simulation tools for your project or product, you should attend the consultation sessions that are being held in Victoria during October. See http://goo.gl/mfxEj for more information.

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