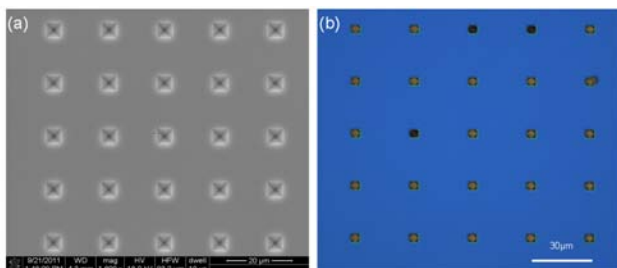


## Helping physicians diagnose Meningococcal Meningitis

The Victorian Government Small Technologies Industry Uptake Program (STIUP) has been very effective in linking the capabilities of the MCN to industry partners for prototype development. Biodetectors Pty Ltd, a successful applicant of the STIUP program, aimed at completing a trial fabrication and demonstration of diagnostic reagents on a simple, cost effective diagnostic platform called the MultiView (MV) Biochip.

The Biochip technology has the potential to provide physicians with real-time analysis of biological samples. A specific application may include the rapid diagnosis of highly aggressive pathogens such as meningococcal meningitis. In this instance, early detection can drastically change the prognosis of a patient. Meningococcal disease



Above: (a) Scanning electron micrograph (SEM) of an array of pyramidal wells on the Silicon master with an inter-well spacing of 12µm, and (b) optical image of a microarray on the the Silicon master filled with fluorescent microbeads, coverage = 88%

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carries a high mortality rate if not treated quickly, and within the space of a few hours, the progression of the illness can cause loss of limbs and death.

The Biochip prototype, was carried out and completed at MCN using intellectual property held by Biodetectors Pty Ltd. The fabrication process involved a range of techniques such as photolithography, wet etching, soft lithography and confocal microscopy, involving use of both the cleanroom and bio-chemical laboratories at MCN.

The fabrication of the prototype was completed in December 2011 and demonstrates the ability to carry out a project from design to complete prototype.

## MCN hosts CSIRO's microfluidic enzyme research

Enzymes, organic catalysts capable of facilitating physicochemical and biological reactions, have captured the attention of industry and the scientific community alike. In nature, enzymes are used to catalyse and break down proteins. New methods of synthetic production have vastly broadened the applications of such enzymes to include food processing, textile and paper production, biological detergents and farming, medical and therapeutic processes, fuel production and sustainability practices.

According to Florian Lapierre, of the CSIRO, one of the major challenges of synthetic enzyme production lies not in the overall yield size, but achieving a product that is of consistently high quality. Using the soft lithography capabilities within the MCN's cleanroom facility, a micro droplet sorting device has been fabricated and is currently undergoing extensive testing. The prototype is capable of generating amino acid emulsions, synthesizing proteins (via electrically induced coalescence) detection and subsequent sorting of high quality enzyme.

The result is a purified sample, which can then be used for catalytic processes or stored for later use. The project, hosted by the MCN, demonstrates how the fabrication and characterization capabilities of the facility are supporting and meeting the needs of Australian researchers.



Above: Microfluidic device designs for the production of high quality enzymes

## Equipment Update....

### Our new Malvern Zetasizer Nano ZS

Particle characterization is an important step in the study of nanoparticulate systems. Knowledge of the particle size and surface zeta potential under various conditions (e.g., pH, ionic strength, dispersant) are key to understanding the stability of particle dispersions. The Malvern Zetasizer Nano ZS, a combined particle sizer and zeta potential unit, is now available at MCN. It can measure the hydrodynamic size (0.6 nm – 5 µm) of particles under Brownian motion, the zeta potential of particles in the size range of 5 nm – 10 µm, as well as estimate the molecular weight of polymers and proteins up to  $2 \times 10^7$  Da with minimal sample volume. Measurement may be performed in either aqueous solutions or organic solvents. An added feature of the Zetasizer Nano ZS is a fully automated titrator, allowing the measurement of zeta potential as a function of pH, conductivity or concentration of an additive.

The Zetasizer Nano ZS may be used in the study of organic and inorganic nanoparticles, ceramics, pigments and inks, emulsions and pharmaceuticals. It complements the nanoparticle imaging instrumentation already available at the facility, including SEM and AFM. In addition to the Anton Paar SurPASS Electrokinetic Analyzer (for zeta

potential measurements on *planar solid surfaces*), capabilities have now been extended to the measurement of the zeta potential of *particles* using the Nano ZS. The Zetasizer Nano ZS is housed in the Testing and Integration Lab (Biolab) at MCN. For access, please contact Varsha Lal on 9902 9657 or at [varsha.lal@monash.edu](mailto:varsha.lal@monash.edu).



Above: The Malvern Zetasizer Nano ZS allows users to characterise a range of particles using minimal sample volume.

### Our new Ozone Cleaner

The ozone cleaner is now available for use within the reconfigurable lab at MCN. It is designed for cleaning and removing organic materials from a variety of substrate materials. The process involves the use of UV radiation, ozone and heat and can also be applied to pre cleaning wafers, improving surface wettability and photoresist desmudging. The ozone cleaner can be used for cleaning silicon wafers prior to experiments involving self-assembly of gold nanoparticles as this changes and improves surface chemistry of the wafers.



Above: The Ozone Cleaner, provides users with a non-chemical alternative for removing organic materials from surfaces.

### Our new UV Vis Spectrophotometer

The UV Vis Spectrophotometer at MCN is an instrument ideally used to determine absorption by measuring the percentage of light transmitted through a sample. The instrument is capable of measuring absorbance for the wavelength range of 190nm to 1100nm. The spectrophotometer can be used for measuring the spectrum of inorganic gold nanoparticles. The synthesis of these nanoparticles is a technique particularly useful for self-assembly studies.

### Our new Broad Beam Ion Source

End-Hall broad beam ion sources output a high current and low energy beam that is useful, most notably, for treatment of substrates prior to thermal or electron beam evaporation. The beam is designed to be charge neutral, allowing fabrication of dielectrics and processing of electrostatically sensitive substrates. Installation of this complementary tool within the Intlvac e-beam evaporator will improve film consistency, quality, and adhesion for a broad range of substrates. Also noteworthy is the capability to perform ion-beam assisted depositions which are useful for augmenting film density and supplanting, in some cases, the use of an adhesion layer.

## Equipment Update....

### Our new Wire Bonders

The ability to reliably form electrical interconnections to a device is a critical step in the microfabrication process. To meet this need, the MCN will have acquired (in-kind from CSIRO) two Kulicke & Soffa wire bonding systems, commissioned in late March.

The K&S model 4524 Ball Bonder is a dual mode (semi-automatic and manual) gold wire wire bonding instrument capable of performing a wide range of bonding tasks, from simple discrete devices to complex hybrid and microwave devices. Model 4524 is

also equipped with a programmable Negative Electronic Flame-Off system which affords tight control of ball size for precision bonding work. The K&S model 4526 Auto-Stepback Wedge Bonder is designed for aluminum and gold wire, and gold ribbon. It is especially suited for precision applications requiring tight control of tail length and loop formation or where a large bonding area is required. Additionally, the geometry of the bonding head allows for bonding within deep cavities and the bonding mechanism features programmable loop formation with real-time fine adjust.



*Above: The Kulicke & Soffa Ball and Wedge Bonders are available to all licensed users of the MCN*

### How to include the MCN in your next ARC grant application

Thinking of using the MCN for your next research project? You may be eligible for government assistance via your ARC and NHMRC grant.

The MCN has prepared a how-to guide outlining how to complete each stage of the application. To access the document, visit <http://nanomelbourne.com/arc-and-nhmrc-applicants>, or for project advice contact [MCN-enquiries@monash.edu](mailto:MCN-enquiries@monash.edu).

### Upcoming event: Nano workshop

Come and learn the basics of nanofabrication from leading scientists and process engineers. During late April, the MCN is hosting a workshop covering nanofabrication techniques for graduate students, post-docs and industry researchers. The workshop will include presentations on:

- E-beam evaporation, Atomic layer deposition & Sputtering
- Lithography – UV, E-beam & Nanoimprint
- Plasma enhanced chemical vapor deposition (PECVD)
- Etching – Wet & Dry
- Advanced characterisation

Information on how to access training and equipment at the MCN facility will also be provided, as well as the opportunity to discuss current and future projects with MCN Instrument Managers. For more information visit [www.nanomelbourne.com](http://www.nanomelbourne.com) or register your interest via [MCN-enquiries@monash.edu](mailto:MCN-enquiries@monash.edu). Please note numbers will be limited.

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

### Outcomes of the MCN user survey

During the month of January, the MCN commenced an initiative to actively improve its level of customer service and client satisfaction. By engaging the existing user community and encouraging them to provide feedback on their experiences, the MCN gave users the opportunity to make suggestions on how the MCN could better meet the needs of current and prospective clients. The outcomes of the survey have yielded physical improvements (such as the commissioning of a bike rack & locker facility) as well as plans to implement a user forum and further improvements to the website, [nanomelbourne.com](http://nanomelbourne.com).

The MCN would like to thank those who participated in these recent MCN user surveys. We welcome any future suggestions and feedback; these can be supplied confidentially online via: <http://nanomelbourne.com/contact-us>.

### NT12 Conference in Brisbane

The Thirteenth international Conference on the Science and Application of Nanotubes, chaired by MCN Collaboration Committee member Ian Chen, is scheduled to take place during June 2012, in Brisbane, Australia. The conference presents a comprehensive program in carbon and non-carbon nanotube technologies, incorporating the most exciting and current results in the research, development and applications of nanotubes and related materials. Further information regarding the NT12 conference can be found at <http://www.nt12.org/>.

**April 2012**

## Beyond Vendor Week 2012

During February the Melbourne Centre for Nanofabrication opened its doors to the nanofabrication community to host the MCN Vendor Week 2012. The three day event, aptly themed "A showcase of nanotechnology, present & future", commenced with a series of seminar sessions facilitated by esteemed local and international guests.



*Above : Ang Li of Bruker facilitates a workshop session in the Class 10,000 Cleanroom area, suggesting how to improve imaging of user samples.*

Event highlights included an impressive presentation simulating the correction of proximity and process effects during E-beam lithography. Seminars describing cutting edge developments in laser microscopy and spectrophotometry, reactive ion etching and the mechanical characterization of nanostructured bio-materials were just some of the topics explored by guest speakers. Specialised workshop sessions, held in the Class 100 and Class 10,000 areas of the MCN facility were performed on the Mask Aligner, Hot Embosser and Atomic Force Microscope. The technology showcase provided participants with the opportunity to explore the MCN facility in full operation, whilst being informed on the latest tools and techniques in nanotechnology and nanofabrication.



*Above: Christian Loebbe of Sciotech suggests techniques for optimising the JPK Biological AFM during a demonstration session in the MCN Biolab.*

To view all the latest MCN projects visit [www.nanomelbourne.com/projects](http://www.nanomelbourne.com/projects)

## MCN featured journals

The MCN Staff and user community regularly feature their research in academic and industry based journals. Highlights include:

- Khee Chaw Ng, Indika B. Udagedara, Ivan D. Rukhlenko, Yi Chen, Yue Tang, Malin Premaratne, and Wenlong Cheng, "Free-Standing Plasmonic-Nanorod Superlattice Sheets", ACS Nano, (2012)
- James R. Friend and Leslie Y. Yeo, "Microscale acoustofluidics: microfluidics driven via acoustics and ultrasonics", Reviews of Modern Physics, 83 : 647-704, (2011).

To access these and other MCN publications, visit [www.nanomelbourne.com/publications](http://www.nanomelbourne.com/publications)

## MCN hits the airwaves on Triple R

MCN Instrument Manager, Doug Mair joined the cast of Triple R's Einstein A Go Go program (Dr Shane, Dr Ray and Dr Fiona) to introduce the wonders of nanofabrication to listeners.

You can hear the whole show in the podcast below:  
[http://traffic.libsyn.com/rrrfm/Einstein\\_A\\_Go\\_Go-26\\_February\\_2012.mp3](http://traffic.libsyn.com/rrrfm/Einstein_A_Go_Go-26_February_2012.mp3)



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