Research Infrastructures - A Platform for International Collaboration

Rosie Hicks, CEO ANFF, 3 May 2016
Australian National Fabrication Facility

A company established under NCRIS to provide nano and micro-fabrication facilities for Australia’s researchers

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative
What is ANFF?
- 19 universities and CSIRO in a national network of open-access laboratories
- 94.4 FTE ANFF staff
- >500 tools across Australia

How?
- $138 m Federal Government
- $31 m State Governments
- $10 m CSIRO
- $29 m participating institutions
- Leveraging $89 m in-kind

Total investment approaching $300 m

Providing nano and micro-fabrication facilities for Australia's researchers
Melbourne Centre for Nanofabrication

Chemo & bio manipulation of nanostructures (including lithography); packing of components into functional devices; and rapid prototyping
The Australian Research Landscape

Categories of research infrastructure funding programs

- Institution or local level: e.g. RIBG
- Project: e.g. ARC LIEF
- Integrated national facilities: e.g. NCRIS
- Systemic or Strategic Infrastructure: e.g. NCRIS
- Landmark Infrastructure: e.g. Australian Research Vessel

More Collaborative Governance and Access Regimes
Increasing Need for Collaborative Engagement, Nationally and Internationally
Increasing International Significance
Increasing Level of Funding and Commitment
National Research Priorities

- Cybersecurity
- Transport
- Food
- Soil & Water
- Photonics
- Advanced Materials
- Nano-electronics-bio
- Nano-bio
- Energy
- Climate Change
- Resources
- Advanced Manufacturing
- Health
Energy

- Mimicking leaves to transform sunlight into chemical energy
  - Super-absorber metasurfaces: metal nanoparticles / semiconductor thin film / mirror

- Taking the heat out of solar
  - Efficiently-cooled plasmonic amorphous silicon solar cells integrated with a nano-coated heat-pipe plate

- Novel materials for better batteries
  - Enhanced lithium storage in ZnFe2O4 – C nanocomposite for improved charge storage and extended lifespan
S3 – Smart Sensing & Structures

• Detecting milk spoilage
  – Multi-layer glass bonding technology for microfluidic devices to create sensors for enzymes indicating milk spoilage

• Measuring movement of MEMS cantilevers
  – On-chip laser sensing to detect movement of chemically functionalised MEMS cantilevers

• Nano-flowers for molecular sensing
  – Surface Enhanced Raman Scattering (SERS) microscopy using guided assembly of nanoparticles
Supporting world-class R&D in FY15…

- 2672 users
- 192,639 hours of access
- 32,754 hours of industry-based projects
- 608 peer reviewed publications in 2015

![User Hours Chart]

- **2007/08**
- **2008/09**
- **2009/10**
- **2010/11**
- **2011/12**
- **2012/13**
- **2013/14**
- **2014/15**
- **Forecast 2015/16**
ANFF supports every stage across the entire discovery chain

Fundamental research and proof-of-concept → Material, component or device design → Prototyping → Characterisation → Pilot scale manufacture

...along the discovery chain

[Logos of various organizations]
ANFF Research Showcase

25–26 November
Brisbane Convention Centre

The 2015 ANFF Research Showcase, ANFF – the home of tomorrow’s entrepreneurs, will be held on 25 and 26 November 2015 at the Brisbane Convention Centre.

The event is our annual gathering for ANFF staff and users from across the organisation to get together, exchange information and explore collaborative opportunities. This year we’re focusing on the innovative research carried out in the facilities and ANFF’s role in supporting entrepreneurs.

Entrepreneurs play a key role in a country’s economy and must be equipped with the skills to take new ideas to market. ANFF fosters entrepreneurship by training researchers in the micro and nano-fabrication skills necessary to prototype devices and advanced materials.

ANFF enables users to investigate and develop new ideas that have longer term implications, and also provides the facility to take publicly funded research along the pathways to creating commercial outcomes that will ensure the competitiveness of the Australian economy into the future.

The 2015 ANFF Research Showcase seeks to contribute to building research-to-business linkages and encourage greater mobility between the two sectors.

We look forward to welcoming you to the event.

Brisbane Convention Centre
Memorial St & Glenelg Street, South Brisbane QLD 4101

Abstract submission closes 30 September 2015

For more information see: http://www.anff.org.au/
2015annualresearchshowcase.html

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ANFF – The home of tomorrow’s entrepreneurs
ANFF – AFOSR First Joint Workshop

Australian National Fabrication Facility Ltd

ANFF - AFOSR Joint Workshop

MELBOURNE, 18 - 19 JULY 2011

www.anff.org.au
www.anff.org.au

For more information see the ANFF website

Search the online capability directory
Acknowledgements

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Extreme lithography: where bottom-up meets top-down

Top down (Lithography) + Bottom up (BCP Self Assembly) = Directed Self Assembly

Raith-150 Patterned Resist
Block Copolymers
Silicon

(a) Resist/SEML coating (b) EBL (c) BCP deposition (d) BCP annealing

Cheng E, University of Queensland using ANFF ACT facilities
Detection of cancer cells in a microfluidic device

Ashworth in Australia (1869): "A case of cancer in which cells similar to those in the tumours were seen in the blood after death". Aust. Med. J. 14: 146–7
Advanced Materials

- Flagship ANFF facility: SiC epitaxial reactor
- Deposited SiC onto 300 mm silicon wafers enabling large scale production
- Applications:
  - Substrate for GaN LEDs
  - Power electronics e.g. PV or electric car drives.

Access to unique capabilities for process scaling
The Nanopatch

Providing a smooth transition from a university to pilot scale production