

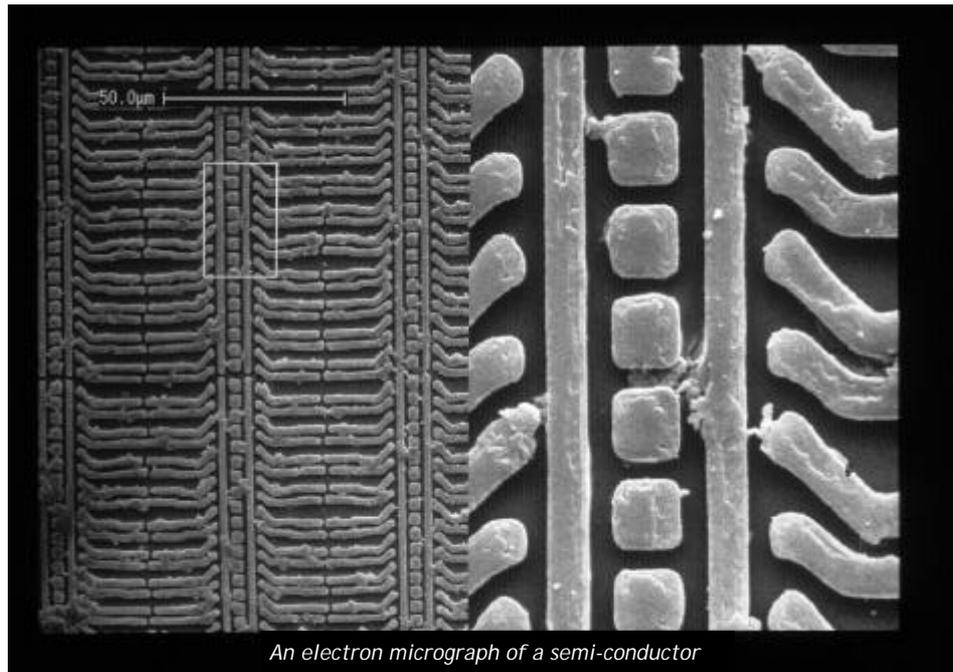
# Materials Monthly

Volume 1, Issue 2

August 2000

Centre for Science and Engineering of Materials

## Magnifying Materials



An electron micrograph of a semi-conductor

### Microscopy and Microanalysis Consortium ACT

“One of the vital steps in the emergence of the field of materials science and engineering (MSE) was the ability to demonstrate things visually. The major breakthrough came from the widespread introduction of transmission and scanning electron microscopy in the 1950-1960’s. These technologies transformed the power of the new integrated science of MSE and led to dramatic advances in the understanding of the microstructure and properties of materials (Cahn, 1999).”

The Electron Microscopy Unit (EMU) and other microscopy facilities at ANU play a crucial role in a wide variety of materials research projects on campus.

The high cost of state-of-the-art microscopy equipment makes it increasingly difficult for individual institutions to stay at the forefront of materials visualisation. One obvious strategy is to share equipment between institutions.

For example, the ANU EMU and a number of other microscopy sites both at the ANU (eg electron microprobe in RSES, Scanning Force Microscopy Unit in RSPHYSSE, JCSMR EM Unit) and elsewhere in the ACT (eg ADFA, UCAN, AGSO, AFP) already share various resources and offer access to researchers from other institutions.

It is hoped that these cooperative processes can be consolidated and made easier with the development of a recognised group, the Microscopy and Microanalysis Consortium of the ACT (MACACT). MACACT will also enable the local institutions to compete more effectively with larger institutions (eg. Queensland, Sydney) for large infrastructure grants (ARC etc).

More information about the consortium is available on the website <http://www.anu.edu.au/EMU/MACACT/index.html>

#### What's Inside

- 2 Direct from the Director
- 3 Advanced Materials Dept of Engineering
- 4 Books, Jobs, Scholarships
- 5 Rural Opportunities For your diary
- 6 Communication Contacts



# Direct from the Director

Phil Evans, Forestry Department

One of the reasons for establishing CSEM was to foster interdisciplinary research and education in materials at the ANU. The bimonthly seminar series has created a forum at which we can meet each other and exchange ideas. Through such contact a number of interesting collaborative research projects have developed most notably between Applied Maths (RSPHysSE) and Forestry and Geology (Faculty of Science) and between Engineering (FEIT) and a number of research schools. CSEM would now like to assist in further developing such links and in developing new collaborative research projects.

In May I visited the Princeton Materials Institute (PMI) on which CSEM is loosely modeled and talked with Robert Cava (Deputy Director) about the strategies that PMI have used to enhance interdisciplinary research in materials at Princeton. He agreed that a seminar series, with suitable bribes (food and wine), is useful, but they have found that holding one day symposia on specific topics is a much more effective way of developing interdisciplinary research projects. For example a symposium last year on computational materials generated such a level of interest that PMI has formed a computational materials group consisting of six scientists that now work part-time in the institute (see <http://www.princeton.edu/~pmi/>). I believe a similar approach could work at the ANU as I am aware of a number of areas where scientists are working on broadly similar problems and materials, for example, self assembling materials, nanotechnology etc. Therefore, I would like to establish a half day materials symposium series, starting with 'self assembling materials' in order to encourage interdisciplinary research between the various groups at ANU. Funding will be made available to support collaborative research projects arising from such symposia.

Please contact me with your views on the suggested symposium series, future topics etc, and suggested speakers (name, subject, availability etc) for the symposium on self assembling materials. I look forward to hearing from you.

# Materials on Campus:



## Advanced Materials Group

### Polymers and Composites

The field of fibre reinforced/polymer matrix materials spans from the tightly controlled aerospace applications with high strength/modulus graphite fibres, modified epoxy resins, to theoretical fibre/matrix volume fractions, chopped glass fibres, low volume fractions and inexpensive polyester resin matrices. Engineering opportunities for composite materials exist now, not only in aerospace and low-end applications, but also in ship building (ADI minehunter frigates), buildings and civil engineering structures (light-weight bridges), automotive (sport and racing cars), rail transport and marine structures.

#### Staff Involved in Polymers and Composites:

Ms Bronwyn Fox  
Dr Shankar Kalyanasundaram  
Mr Darius Krivanek  
Dr Adrian Lowe  
Dr Zbigniew Stachurski  
Mr Dejan Stevanovic

For more information see:

<http://engn.anu.edu.au/advmaterials.html>

### Research Directions

The research directions of the materials group include

advanced composite materials and simulation and modelling of the manufacturing processes. Specific goals of the research program include:

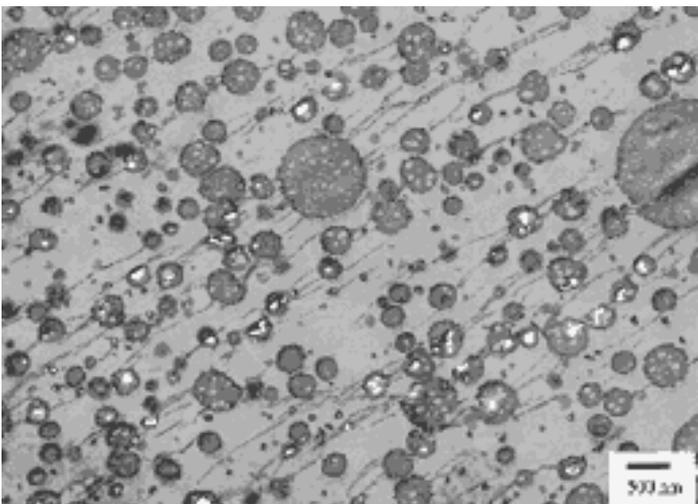
- to develop and expand the scientific and engineering foundations of mechanics and material engineering of the composite and polymer materials and the associated manufacturing processes.
- bridge the collaborative work between academic institutions and industries in the area of composite and polymer materials and manufacturing.
- provide assistance to operators of aircraft in the maintenance and repair of composite and adhesively bound airframe structures.
- to develop advanced wood and other bio-based composite materials to compete with less sustainable alternative like plastics, metals and ceramics.

### Polymers

- microstructure development in network forming polymers
- particle growth mechanisms in polymer blends
- poisson's ratio of viscoelastic materials yield strength of amorphous polymers
- polymer toughening

### Composites

- dinkum impact tester
- composite delamination and impact
- thermoplastic toughening of epoxy resins
- design of a composite shear test fixture
- laser holographic methods
- recycled plastics and natural fibres
- interphase modelling of composites
- interlayer toughening mechanisms in composites
- finite element modelling of composite fracture behaviour.
- targeted institutional links program



Micrograph of rubber-toughened polymer deformed under tension (Jar, B.)



## New Books/Proceedings 2000

available through DA information services, [www.dadirect.com.au](http://www.dadirect.com.au)

**Supercritical Fluids** - Debenedetti, Peters & Kiran

**Handbook of Porous Media** - Vafai

**Biophysics** - Glaser

**FRC 2000: Composites for the Millenium** - Gibson

**Polymers** - Walton & Lorimer

**Nanostructured Films and Coatings** - Chow, Ovid'ko & Tsakalagos

**Polymers from Renewable Resources** - Scholz & Gross

**Materials Instability** - Martinez-Mardones, Worner & Wolgraef

**Ceramics Are More Than Clay Alone** - Bormans

**Intermetallics and Superalloys** - Morris

**Raman Spectroscopy for Chemical Analysis** - McCreery

**Raman Scattering in Materials Science** - Weber & Merlin

**Finite Element Modelling of Composite Materials and Structures** - Matthews, Hitchings & Soutis

**Impact Behaviour of Fibre-Reinforced Composite Materials & Structures** - Reid & Zhou

**Forensic & Environmental Detection of Explosives** - Yino

**Polymer Modification: principles, techniques and applications** - Meister

**Failure Analysis of Industrial Composite Materials** - Rodopoulos, Gdoutos & Pilakoutas

**Evolutionary Algorithms in Molecular Design** - Clark

**Green Chemistry: recent advances in synthesis and chemical processing** - Anastas, Bartlett, & Williamson

**Apparent and Microscopic Contact Angles** - Drelich, Laskowski & Mittal

**Characterisation of Porous Solids V** - Unger, Kreysa & Baselt

**Scanning Tunneling Microscopy and its Application Second Edition** - Bai

**Compound Semiconductors 1999** - Ploog & Weimann

**Ultrafast Phenomena in Semiconductors** - Tsen

**Microchip Fabrication, Fourth Edition** - Van Zant & Chapman

**Photofunctional Zeolites** - Anpo

**Dictionary of Civil and Environmental Engineering** - Webster

available through Harcourt Australia Pty Ltd, (02) 9517 8999

### **Handbook of Advanced Electronic and Photonic Materials and Devices (10 volume set)**

Over 100 state-of-the-art review chapters written by more than 200 world-leading experts from 25 different countries

## The First Materials Undergraduate Student for 2001

The new Materials Forensics stream promoted by CSEM (see [www.anu.edu.au/CSEM/Newmat.htm](http://www.anu.edu.au/CSEM/Newmat.htm)) has already attracted an extremely high calibre student. Allyson Hine, plans to switch from her ANU BPsych/BLaw studies to pursue a combined degree in Materials Science and Law. Allyson is extremely enthusiastic and looks forward to meeting many of the materials scientists on campus as she progresses through her studies.

## Jobs & Scholarships

### **RSES Postdocs and Research Fellows**

The Research School of Earth Sciences seeks to appoint research scientists in the following areas:

Stable Isotope Geochemist, Ore Genesis: The appointee will contribute to the application of stable isotope geochemistry to the understanding of the genesis of metalliferous ore deposit. Enquiries: Dr Ian Campbell, email: [Ian.Campbell@anu.edu.au](mailto:Ian.Campbell@anu.edu.au)  
tel: (02) 6249 4366

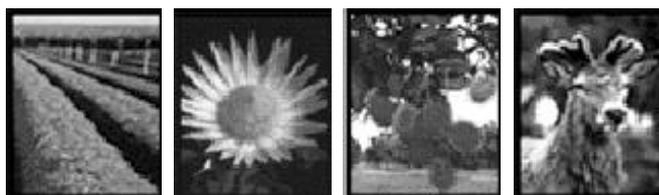
### **ANU Summer Research Scholarship**

Undergrad/Honours students - thinking of Honours or Postgrad research in the future? Get a head start now!

A summer research scholarship is an exceptional opportunity, giving you insight into what research is all about with leading scholars in your field.

See [www.anu.edu.au/graduate/srs](http://www.anu.edu.au/graduate/srs), closes 31 August

# Rural Research & Development Opportunities



The RIRDC is inviting research agencies to submit preliminary research proposals for R&D support in 2001-2002 and subsequent years.

Each year RIRDC produces a prospectus to identify their key priorities. It is a working document for researchers to prepare applications to RIRDC that reflect these current R&D priorities.

Some of the identified programs and priorities *encompass materials research:*

## Sub-program 1.1

**New Plant Products** – aims to identify, evaluate, test market and develop species, processes or products with prospects for commercial viability. Two components of the research program: Extractive and Fibre Crops and Miscellaneous Crops and Activities provide funding opportunities for ANU scientists.

## Sub-program 2.2

**Agroforestry and Farm Forestry** - aims to promote optimised direct returns from tree products; currently seeking proposals in the area of biomass utilisation for energy.

## Sub-program 2.4

**Essential Oils and Plant Extracts** – aims to develop new and improved varieties and species for Australian conditions and international markets. It is also noted that Australia must maintain its comparative advantage as a reliable supplier of clean, good quality and unique oils and extracts based on the use of high technology in both production and extraction.

## Sub-program 2.6

**Rare Natural Animal Fibres** – aims to identify and research fibre properties required by processors to produce yarn, fabric and garments demanded further along the value-adding chain. It also plans to continue support for blending R&D between rare fibres, traditional fibres such as wool and cotton and synthetic fibres.

The complete prospectus can be downloaded from <http://www.rirdc.gov.au/prospectus/index.htm>. Detailed information to assist with your application is also available here.

## For Your Diary

- **ANU Open Day** Sept 2  
CSEM is seeking your assistance in providing materials for our display and in manning the desk in the Union
- **Scanning Electron Microscopy Masterclass** Oct 3-5  
ANU Electron Microscopy Unit, queries [stowe@rsbs.anu.edu.au](mailto:stowe@rsbs.anu.edu.au)
- **CSEM Seminar** Oct 4  
Geoff Wasteneys, Plant Cell Biology, RSBS
- **5th Pacific Rim Bio-Based Composites Symposium** Dec 10-13  
hosted by ANU at Rydges Canberra Hotel, Canberra
- **PICMET '01** (Portland Int. Conf. on Management of Eng. and Tech.) Jul 29 - Aug 2, 2001  
Theme: *“Technology Management in the Knowledge Era: Life in the e-World”*

# Communication News

**Materials Forensics BSc** - in collaboration with CIT's BAppSci in Forensic Investigation we have developed a Materials Forensics course which is attracting a lot of attention. See [www.anu.edu.au/CSEM/Newmat.htm](http://www.anu.edu.au/CSEM/Newmat.htm) for details of this and other proposed materials 'streams'.

**Web Info** - we were invited to place the revamped materials science BSc option on the ANU's central prospective student's "New Courses" site - this is getting a large number of hits ([www.anu.edu.au/psi/course/newcourses.html](http://www.anu.edu.au/psi/course/newcourses.html)).

**CSEM Web Site** - the CSEM site has undergone a very partial and temporary change of appearance and now has links to undergraduate information. The entire site will be re-modelled over the next few months.

**New Promotional Materials** - graphic designer, Simon Yates of SYGA Interactive Design, is currently developing a folder design and information sheet template for CSEM.

# CSEM

Centre for Science and Engineering of Materials

#### Faculties

Department of Chemistry  
Department of Engineering  
Department of Forestry  
Department of Geology  
Department of Physics

#### Institute of Advanced Studies

Research School of Biological Sciences  
Research School of Chemistry  
Research School of Earth Sciences  
John Curtin School of Medical Research  
Research School of Physical Sciences and Engineering

#### Institute of the Arts

Materials Workshop

# Materials Monthly

Volume 1, Issue 2

August 2000

# Contacting CSEM

Phil Evans, Director

Phone: +61 2 6249 3628

Email: [phil.evans@anu.edu.au](mailto:phil.evans@anu.edu.au)

Jenny Edwards, Promotions Officer

Phone: +61 2 6249 3525

Email: [jennifer.edwards@anu.edu.au](mailto:jennifer.edwards@anu.edu.au)

Amanda Cook, Administration Officer

Phone: +61 2 6249 3525

Email: [amanda.cook@anu.edu.au](mailto:amanda.cook@anu.edu.au)

Fax: +61 2 6249 0746

Postal: Department of Forestry, Australian National University, ACT 0200

Location: Department of Forestry, Wood Sciences Building, Linnaeus Way, ANU

We welcome any feedback, enquiries or contributions.

Please let us know if you wish to be added to our electronic or postal mailing lists.

[www.anu.edu.au/CSEM](http://www.anu.edu.au/CSEM)