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# ANU ELECTRON MICROSCOPY UNIT

## Report to Council for 1992

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5. SUMMARY

The Unit will be subject to an external review in April 1993.  
Further information is available from the School Secretary, RSBS.

## 1. STAFF OF THE UNIT IN 1992

Facility Coordinator: Dr Sally Stowe MSc Hons(Auck), PhD

Senior Technical Officers: Mr Roger Heady BAppSc(CCAE), Grad Dip Elec  
(CCA), Grad Dip Res Man (CCA)  
Mr David Llewellyn Dip Eng(BruceTAFE)  
Mr David Vowles Dip Appl Phys (WAIT)

Technical Officers: Mr Alan Lee BSc(Griffith), Dip Ed(Qld)  
Mr Michael Ciszewski B Tech (Brunel)

Laboratory Technician: Miss Lily (Ruolan) Shen Dip T C  
M(Guangzhou)

## 2. FACILITIES AND ADMINISTRATION

The Unit is a central facility for electron microscopy and associated techniques, serving the IAS and the Faculties. It is used to some extent by several other Universities and, on a commercial basis, by a variety of outside organisations.

The Unit is housed within RSBS, and its administrative arrangements are detailed in circular 2498/1988. The Management Committee, appointed or co-opted for two-year renewable terms, currently consists of Prof. B.E.S. Gunning, RSBS (Chairman); Dr P.Cooper, BOZO; Dr P.Evans, Forestry; Dr A.Hardham, RSBS; Dr A.McLaren, RSES; Dr A.Perry, RSPHYSSE; Dr S.Stowe, EMU (*ex officio*). Major equipment held by the unit includes six electron microscopes and a variety of ancillary equipment for specimen preparation and imaging. A full description of the services offered is given in a handout, "Notes for New Users" available from the Unit.

## 3. MAJOR EVENTS IN 1992

This year a third scanning electron microscope was purchased to replace the oldest transmission microscope. The Unit now has three SEMs and three TEMs, more closely reflecting the distribution of user demand. The new instrument, a Hitachi 2250-N, can be used as a routine instrument and also, in "low vacuum" mode, to view untreated specimens at lower magnifications. It will be used as an experimental platform, with manipulators and a tensile stage, to allow researchers the opportunity for more interactive, experimental work within the chamber. It will also introduce detection modes not currently available, initially monochromatic cathodoluminescence and absorbed current.

A 200kV TEM no longer needed in the Research School of Chemistry has been transferred to the Geology Department. The ANU EMU was responsible for its transport and recommissioning, maintenance work and running expenses are being shared by the Department and the ANU EMU. It is intended that the instrument, which is 12 years old, be kept running as long as major repairs are not needed.

A new image analysis area has been set up, linking light microscopes, video camera and recorder, digitising tablet and a PC.

In February, six of the Unit staff attended the biennial conference of the Australian Society for Electron Microscopy in Perth. Two posters were presented by staff.

#### 4. MEASURES OF PERFORMANCE

##### 4.1 Teaching

The post-graduate workshop series begun last year was continued, with the help of speakers from RSES and the Visual Science Centre. The facilities were utilised for part of four undergraduate courses by Forestry, BOZO, BAMBI and also by the University of Canberra (National Centre for Cultural Heritage Sciences Study). Honours students from UC used the Unit, and some staff members also have an association with courses at UC and the TAFE.

##### 4.2 Publications:

1991, not previously listed:

Rae AD, Thompson JG, Withers RL. (1991) Structure refinement of commensurately modulated bismuth tungstate,  $\text{Bi}_2\text{WO}_6$ . Acta Cryst. B47:870-881

1992:

1. Ayress MA, Corrège T (1992) On *Semicytherura pulchra* (Coles and Whatney). The Stereo-Atlas of Ostracod Shells 19(13):57-60

2. Ayress MA, Corrège T (1992) On *Heinia cuneata* Ayress and Corrège sp. nov. The Stereo-Atlas of Ostracod Shells

3. Baskin TI, Busby CH, Fowke LC, Sammut M, Gubler F (1992) Improvements in immunostaining samples embedded in methacrylate: localization of microtubules and other antigens throughout developing organs in plants of diverse taxa. Planta

4. Blest AD, Stowe S, Carter M, Tsukitani Y. (1992) Manipulation of phototransductive membrane turnover by crab photoreceptors *in vitro*: effects of two protein kinase activators, SC-9 and phorbol ester in the presence of a protein phosphatase inhibitor, okadaic acid. J. Comp. Physiol. A 170:189-199

5. Blest AD, Stowe S, Carter M, O'Gara E, Delaney A (1992) Light-dependent endocytosis of crab rhabdomeral membrane potentiated by okadaic acid is reduced by either of two inhibitors of protein kinase C, or by a  $\text{Ca}^{2+}$ -channel-blocking agent, diltiazem. J Comp Physiol A 171:523-532

6. Claridge AW, Tanton MT, Seebeck JH, Cork SJ, Cunningham, RB (1992) Establishment of ectomycorrhizae on the roots of two species of *Eucalyptus* from fungal spores contained in the faeces

of the long-nosed potoroo (*Potorous tridactylus*) Aust J Ecol  
17:207-217

7. Corrège T (1992) On *Ionesia marecorallinensis* Corrège sp. nov.  
The Stereo-Atlas of Ostracod Shells

8. Corrège T, Ayress M, Drapala V (1992) On *Swainocythere nanseni*  
(Joy and Clark). The Stereo-Atlas of Ostracod Shells

9. Davis AR, Gunning BES (1992) The modified stomata of the floral  
nectary of *Vicia faba* L. 1. Development, anatomy and  
ultrastructure. Protoplasma 166:134-152.

10. Davis AR, Gunning BES (1992) The modified stomata of the  
floral nectary of *Vicia faba* L. 2. Stomatal number and  
distribution as selection criteria for breeding for high nectar  
sugar production. Acta Horticulturae 288:329-334

11. Ducker WA, Senden TJ, Pashley RM (1992) Measurement of forces  
in liquids using a force microscope. Langmuir 8:1831-1836

12. Hardham AR (1992) Cell Biology of pathogenesis. Ann Rev Plant  
Mol Biol

13. Kershaw JR, Taylor GH. (1992) Properties of Gondwana coals with  
emphasis on the Permian coals of Australia and South Africa. Fuel  
Processing Technol. 31:97-118

14. Ladouceur F, Love JD, Senden TJ (1992) Measurements of surface  
roughness in buried channel waveguides. Electronics Letters  
28:1321-1322

15. Marotte LR, Rice FL, Waite PME (1992) The morphology and  
innervation of facial vibrissae in the tammar wallaby, *Macropus  
eugenii*. J Anat. 180:401-418

16. McQueen KG, Caldwell JR, Millsted PW, (1992) Additional  
minerals at the Paddy's River Mine ACT: An Update. Aust.  
Mineralogist 6:49-54

17. Meagher, L. (1992) Direct measurement of forces between silica  
surfaces in aqueous  $\text{CaCl}_2$  solutions using an atomic force  
microscope. J Colloid and Interface Science 152: 293-295

18. O'Carroll DC, Osorio D, James AC, Bush T (1992) Local feedback  
mediated via amacrine cells in the insect optic lobe. J Comp.  
Physiol. A 171: 447-456

19. Pang LSK, Wilson MA, Taylor GH, FitzGerald JD, Brunckhorst LF.  
(1992) Formation of unusual graphitic structures during fullerene  
production. Carbon 30:1130-1132

20. Qin TK, Gullan PJ (1992) A revision of the Australian  
pulvariine soft scales (Insecta: Hemiptera: Coccidae). J Natural  
History 26:

21. Saxby JD, Chatfield P, Taylor GH, FitzGerald JD, Kaplan IR, Lu  
S-T. Effect of clay minerals on products from coal maturation.  
Org. Geochem.

22.Schmid S, Withers RL, Thompson JG (1992) The incommensurately modulated  $(1-x)\text{Ta}_2\text{O}_5 \cdot x\text{WO}_3$ .  $0 \leq x \leq 0.267$  solid solution. J Solid State Chem. 99:226-242

23.Senden TJ (1992) Force Microscopy - a new tool probes deeper into colloidal science. Chemistry in Australia

24.Senden TJ, Ducker WA. (1992) Surface roughness of plasma-treated mica. Langmuir 8: 733-735

25.Skotnicki ML, Mackenzie AM, Torronen M, Brunt AA, Gibbs AJ. Cardamine chlorotic fleck virus, a new carnovirus from the Australian alps. Aust. Plant Pathology.

26.Stewart AC, Nicholas WL (1992) Structure of the cuticle of *Ceramonema carinatum* (Chromodorida: Ceramonematidae). J Nematol 25:

27.Vasudevan S, Premkumar L, Stowe S, Gage PW, Reiländer H, Chung S-H (1992) Muscarinic acetylcholine receptor produced in recombinant baculovirus infected Sf9 insect cells couples with endogenous G-proteins to activate ion channels. FEBS Lett. 311:7-11

in press:

Balfas J, Groves K, Evans PD. Bonding surface modified karri and jarrah with resorcinol formaldehyde. Holz als Roh und Werkstoff

Blest AD, Stowe S, Delaney A. Diacylglycerols as putative second messengers that regulate phototransductive membrane turnover by arthropods: effects of a diacylglycerol lipase inhibitor, U-57908, and of a diacylglycerol on phototransductive membrane turnover by crab photoreceptors *in vitro*. J Comp Physiol A

Bellwood P, Gillespie R, Thompson GB, Vogel JS, Ardika IW, Datun I. New dates for prehistoric Asian rice. Asian Perspectives:

Claridge AW, Tanton MT, Cunningham RB. Hypogeal fungi in the diet of the long-nosed potaroo (*Potorous tridactylus*) in mixed-species and regrowth eucalypt forest stands in south-eastern Australia. Wildlife Research.

Cooper PD. Mechanisms of haemolymph acid-base regulation in aquatic insects. Phys. Zool.

Hardham AR. Subcellular systems. In: "Biology" ed RB Knox, P Ladiges, B Evans. McGraw-Hill

Higham C, Thosarat R. Khok Phanom Di: Prehistoric adaptation to the world's richest habitat. Harcourt Brace Jovanovich, Fort Worth.

Hyde GJ, Hepler PK, Gubler F, Lancelle SA, Hardham AR. Electron microscopic approaches to the study of zoospore formation in *Phytophthora*. J Computer Aided Microscopy.

Jar, PP-Y B, Davies P, Cantwell WJ, Kausch HH. Deformation and fracture behaviour in mode I delamination of carbon fibre/PEEK composites. Materials Forum

Karaman M, Meagher L, Pashley RM (1992) Surface chemistry of emulsion polymerisation. Langmuir

Pennock GM, Taylor GH, Fitzgerald JD. Microstructure in a series of mesophase-based pitch fibres from Dupont: zones, folds and disinclinations. Carbon

Rudnick RL, McDonough WF, Chappell BW. Carbonatite metasomatism in the northern Tanzanian mantle: petrographic and geochemical characteristics". Earth and Planetary Science Letters

Rutland M, Senden TJ (1992) Adsorption of the Polyoxyethylene nonionic surfactant C12E5 to silica: a study using atomic force microscopy. Langmuir

Srinivasan MV, Zhang SW, Chandrashekara K. Evidence for two distinct movement-detecting systems in insect vision. Naturwiss.

Taylor GH, Pennock GM, Fitzgerald JD, Brunckhorst LF. The influence of Q1 on mesophase structure. Carbon

Taylor GH, Teichmüller M. Observations on fluorite and fluorescent vitrinite with the transmission electron microscope (TEM). Inter J Coal Geology

#### Conference Posters, Abstracts, Reports etc.

Büchen-Osmond C, Portis Jr AR, Andrews TJ. Rubisco activase modifies the appearance of RuBISCO in the electron microscope. Proceedings of the IXth International Congress on Photosynthesis, Nagoya, Japan 1992, Kluwer

Clausen JA, O'Gara E, Delaney A, Blest AD. Immunolocalisation of a 23kDa Ca<sup>2+</sup>-binding protein in the rhabdomeres of arthropods. Proc Aust Soc Biochem and Molecular Biol 36:(Melbourne 1992)

Clausen J A, O'Gara E, Delaney A, Blest AD. A 23kD Ca<sup>2+</sup>-binding protein in arthropod rhabdomeres. In: Structures and Functions of Retinal Proteins. eds JL Rigaud, J Libbey

Cooper PD, Ionic and acid-base regulation in aquatic insects. Symposium on Respiratory and Ionic aspects of Acid-base Regulation in Insects. American Society of Zoologists, Vancouver.

Evans PD, Schmalzl KJ, Michell AJ (1992) Rapid loss of lignin at wood surfaces during natural weathering. International Research Group on Wood Preservation. Document IIRG/WP/2390-92

Stange G, Osmond CB, Stowe S. Carbon dioxide receptors in moths as high resolution sensors of the metabolic performance of food plants. Chemical Senses

Heady R, Evans P. New perspectives on the warty layer in wood of *Callitris glaucophylla*. ACEM-12, Perth 1992

Jar P-Y B, Dowling T, White JW. Transparent semi-crystalline PEEK - a study of microstructure and processing routes. Proceedings of ISPAC'92 (International Symposium of Polymers and Advanced Composites) Hong Kong 1992.

Taylor GH, Shibaoka M, Ohtsuka Y, Brunckhorst LF, Thomas CG. Gasification of brown coal; new information from TEM. 5th Australian Coal Conference, Melbourne 1992

Vowles D, Stowe S. Low cost video imaging and measurement system for Zeiss 109 TEM. ACEM-12, Perth 1992

#### Student Theses:

##### 1991 not previously listed

Shulmeister J. Late Quaternary and Holocene environmental history of Groote Eylandt; Northern Australia. Ph.D Thesis, Geography Dept.

##### 1992

Antelmi, D. Industrial synthesis of alcohol ethoxylates. Honours thesis, Chemistry Dept.

Bertolini, NA. Morphometric analysis of hair structure in the Strepsirrhini. Dept Archaeology and Anthropology. (Honours thesis)

Coyle, K. The formation of kaolinite:alkaline earth and transition metal halide intercalation complexes and their derivatives. Honours thesis. Geology Department/RSChem.

Davis, A. Physiological and structural aspects of floral nectar secretion. Ph.D Thesis, RSBS

Ducker, W. An Experimental study of surface forces. Ph.D Thesis, RSPHySE

Pirie, JDR. A quantitative assessment of the micro-structural degradation of wood surfaces during weathering. Honours thesis. (Forestry Dept)

Rutland, M. A surface force study of surfactant adsorption. Ph.D Thesis, RSPHySE

Tim Stone. Shell mound origins. Geography Dept

Thomas, ES. The stabilisation of  $\beta$ -cristobalite. Honours Thesis, Dept. Chemistry

Thompson GB. Archaeobotanical investigations at Khok Phanom Di, Central Thailand. Ph.D Thesis, Prehistory Dept., RSPacS.

Zhang S. Fluid transport properties of calcite rocks during isostatic hot-pressing, deformation and subsequent annealing. Ph.D Thesis (RSES)

IN THE FOLLOWING TABLES, FIGURES FOR THE COMBINED UNIT ARE DENOTED BY (\*). OTHER FIGURES REFER TO THE OLD "TEM" UNIT ONLY.

Publications 1985-1992

(Not including abstracts, theses or papers in press)

YEAR	RSBS	OTHER	TOTAL
1985	27	7	34
1986	25	4	29
1987	28	6	34
1988	21	5	26
1989*	5	7	12
1990*	13	12	25
1991*	11	14	25
1992*	10	18	27

4.3 Distribution and Level of Usage 1985-1992

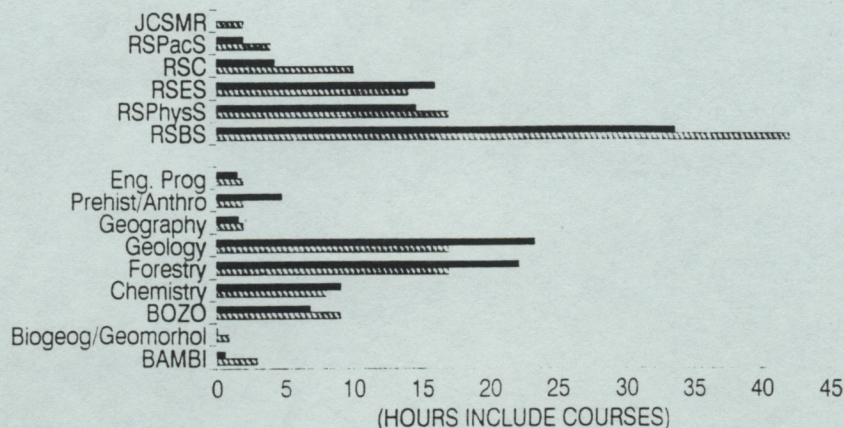
Number of Users 1985-1992

YEAR	RSBS	OTHER IAS	FACULTIES	OTHER	TOTAL USERS
1985	57	7	20	2	86
1986	59	13	15	3	90
1987	54	17	14	5	90
1988	45	13	18	2	78
1989*	25	21	42	19	107
1990*	29	29	55	21	134
1991*	55	40	73	22	190
1992*	42	47	67	26	182

(undergraduate courses and other student groups counted as one)

4.4 Distribution of Users Across ANU

DISTRIBUTION OF USERS  
1992



▨ NUMBER OF USERS    ■ SCOPE HOURS/30

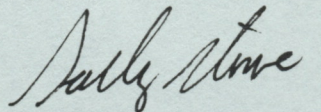


#### 4.5 Non-ANU Users

In 1992 there were (counting student groups as single users) 21 non-ANU users, of whom 11 from other Universities used 118 hours (2.5%) of scope time.

#### 5. Summary

In 1992 the number of users and time spent on the machines in the EM Unit remained roughly constant, without taking into account the instrument in Geology for which the Unit is partly responsible. Publications have shown a slight increase, and the distribution of users across the university was very similar to the preceding year. Use of the image analysis equipment has risen sharply, to about 20% of the time spent on the electron microscopes themselves.



Dr Sally Stowe  
for the EMU Management Committee