

ELECTRON MICROSCOPE UNIT
ANNUAL REPORT
1998

Director

B.T. Sewell

Principal Technical Officer

D.A. Gerneke

Chief Technical Officer (Part Time)

J. Duncan

Senior Technical Officer

M.A. Jaffer

Senior Technical Officer

M. Waldron

Photographic Assistant

W. Williams

April 1999

TERMS OF REFERENCE

The Electron Microscope Unit is an Inter-faculty facility. The following terms of reference were approved by Senate (PC 11/87) and confirmed by GPC (1/2/88).

"The prime objective of the EM Unit is the provision of a dedicated service to the University's research and teaching community."

"The Unit should aim at a high level of maintenance of the instruments, with a minimum of down-time".

"The Unit should ensure the provision of an adequate basic teaching in electron microscopy for users".

The Senate (PC 11/87) also approved the establishment of an E M Unit Steering Committee.

HIGHLIGHTS OF 1998

FORMATION OF THE ELECTRON MICROSCOPE UNIT ADVISORY BOARD

The Electron Microscope Steering Committee has proposed a governance structure for the Unit which more adequately reflects its interfaculty nature and which should be appropriate in an era of devolved financial responsibility. The formation of the Electron Microscope Unit Advisory Board was approved by the General Purposes Committee, the University Research Committee and the Deans of the faculties of Science, Engineering and Health Sciences during the year. The board will have fourteen members and will report to the Chairman of the University Research Committee and will advise the Director of the Unit and monitor the activities of the Unit. The Advisory Board will commence work in 1999. The terms of reference and initial composition can be found in Appendix 1.

CAMPAIGN FOR THE PURCHASE OF NEW TRANSMISSION ELECTRON MICROSCOPE

It has become apparent in recent years that the situation regarding the availability of modern transmission electron microscopy facilities in the Western Cape is unsatisfactory. The most recently acquired instrument in the region was purchased in 1987 and is located at the Department of Virology at Stellenbosch University Medical School. Several meetings were held with the chairmen of the UEC and URC to discuss the need and potential strategies for obtaining the necessary funds for the purchase of a TEM which would satisfy the needs of researchers at UCT. It is imperative that strong regional support be obtained. This has been forthcoming from academics at UWC and UPE. The UEC has agreed to reserve funds in excess of R1m per annum towards the purchase of an instrument in 2002. Dr Anton Botha has been informed of our intentions and has offered advice concerning an approach to the NRF for partial funding.

STAFF PROMOTION

Mrs Miranda Waldron was promoted *ad hominem* from Technical Officer to Senior Technical Officer.

MEETINGS OF THE ELECTRON MICROSCOPE STEERING COMMITTEE

During 1998 the Unit reported to the Electron Microscope Steering Committee which was a technical subcommittee of the Equipment Committee chaired by the dean of the Faculty of Science, Professor V.C. Moran. The committee comprised the director of the Unit, five members of academic staff and three members of technical staff. The members were Associate Professor B.T. Sewell (EM Unit), Associate Professor H.P. Linder (Botany), Professor J.J. Gurney (Geological Sciences), Professor B.B. Rawdon (Anatomy and Cell Biology), Professor J.A. Thomson (Microbiology), Associate Professor R.D. Knutsen (Materials Engineering), Mr D.A. Gerneke (EM Unit), Mr R.S. Rickard (Geological Sciences) and Mrs H. Ilsley (Anatomical Pathology). In addition Associate Professor R.B. Tait (Mechanical Engineering) was co-opted onto the Committee.

A Meeting of the Electron Microscope Steering Committee was held on 8 April 1998. With this meeting the Committee effectively completed its work in anticipation of the formation of the Electron Microscope Unit Advisory Board.

USE OF THE UNIT

Services provided by the Unit during 1998 are listed in Table 1.

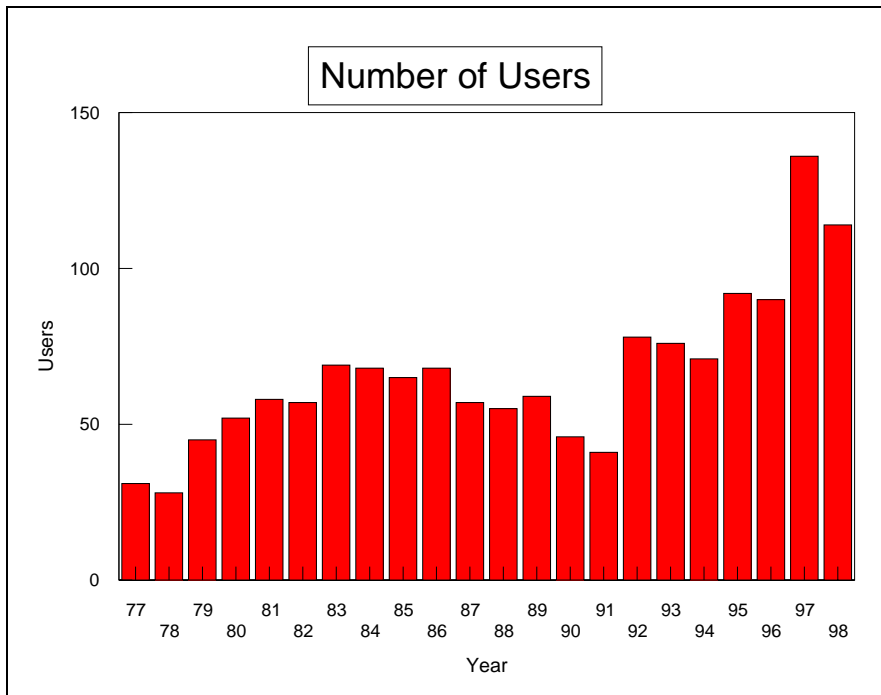


Figure1: Number of users of microscopy facilities per year since 1977.

One hundred and fourteen people made use of the microscopy services of the Electron Microscope Unit in 1998. In addition a further 109 users utilized services other than those related to microscopy notably the Imaging Centre and CD writing facilities.

The names and departments of the users are listed in Table 7.

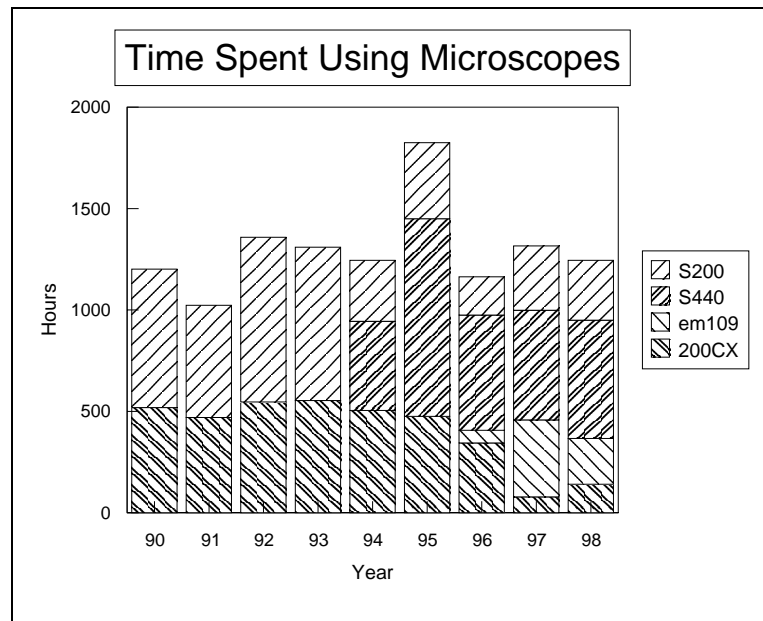


Figure 2: Time spent using the Unit's microscopes since 1990.

Total time spent using the Unit's microscopes was 1245 hours in 1998.

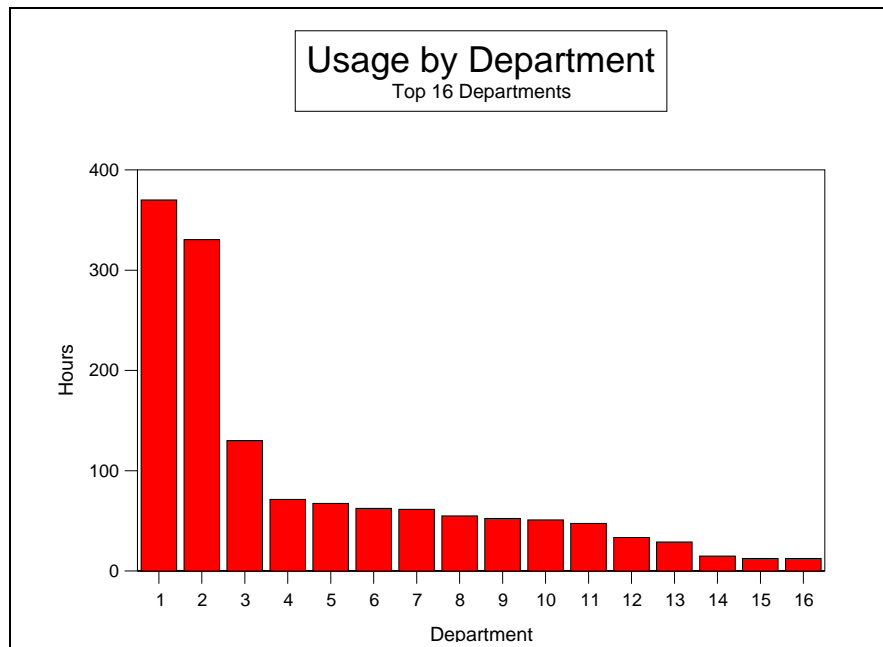


Figure 3: Microscope usage by department.

The key is as follows:

1	Botany	9	Biochemistry
2	Materials Engineering	10	Medical Biochemistry
3	Liver Research	11	Stellenbosch University
4	Geological Sciences	12	Mechanical Engineering
5	Zoology	13	Microbiology
6	Chemical Engineering	14	Mathematics
7	Cardiothoracic Surgery	15	Cape Technikon
8	Chemistry	16	Physics

Use made of the Unit by Stellenbosch and UWC students declined but the importance of the Unit as a regional centre was emphasised by the use that was made by other academic users including users from the Cape Technikon, University of Botswana, University of Zimbabwe and the University of Cameroon and by the large number of commercial clients.

ELECTRON MICROSCOPES AND ASSOCIATED EQUIPMENT

LEO STEREOSCAN S440

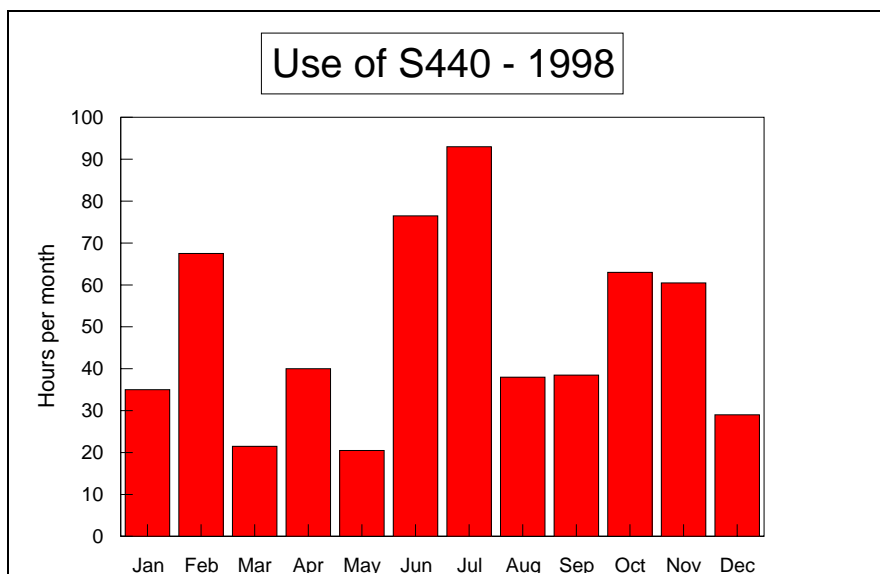


Figure 4: Use of the Leica S440 SEM

The S440 was used for a total of 583 hours which is slightly higher than the usage for 1997. The S440 was taken out of service for two weeks in March so that it could be thoroughly cleaned. After the cleaning a vacuum leak was encountered and repaired. Demand for this instrument remained high and it remains the prime facility offered to the region by the Unit.

CAMBRIDGE S200 SEM AND KEVEX 7000 ANALYSIS SYSTEM

The S200 was used in total for 295 hours, which is comparable with 1997. The instrument worked reliably. The Kevex system was not used in 1998 and is currently not operational. The air-conditioning unit for the room in which the S200 was replaced because it had become prone to failure.

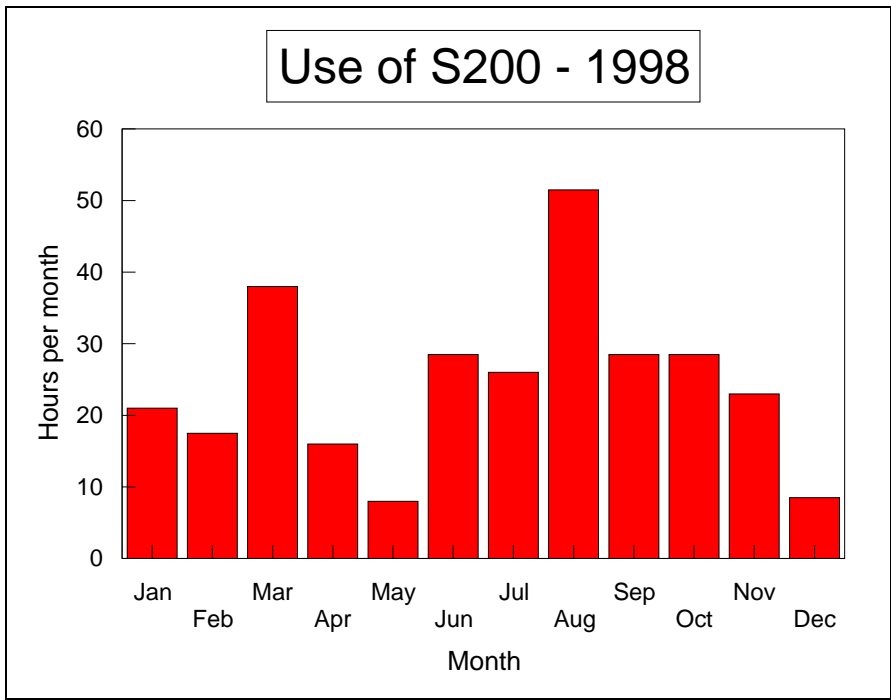


Figure 5: Use of the Cambridge S200 SEM

JEOL 200CX TEM

Use of the 200CX TEM rose to 141 hours from the very low figure of the previous year.

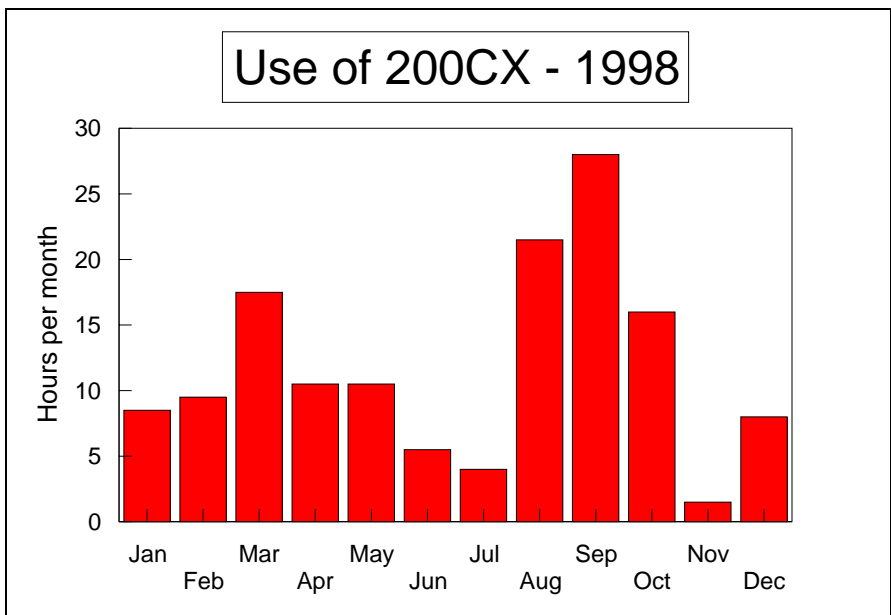


Figure 6: Use of the Jeol 200CX TEM

In spite of increasing instability it was decided to keep the 200CX available for use while options were fully investigated. It was finally taken out of service in October after the director had met with the MD of JEOL UK and been assured of their support during the service operation. The high voltage tank was dismantled by Mr Duncan and one major and several minor faults were repaired. After this the instrument was stable and the characteristics of the high voltage tank met or exceeded the manufacturer's specifications. It should be noted that the circuit diagrams and manuals supplied by the manufacturer did not conform to the circuitry in the tank and that in order to find the fault it was necessary to work in vicinity of extremely high voltages. The solution offered by the manufacturer was an exchange of the tank at a cost of over R130 000. It is of considerable credit to Mr Duncan that the repair was effected with very low cost to the University. It is unfortunate that difficulties in communication between ourselves, the local agent and the manufacturer resulted in a long repair cycle.

ZEISS EM109 TEM

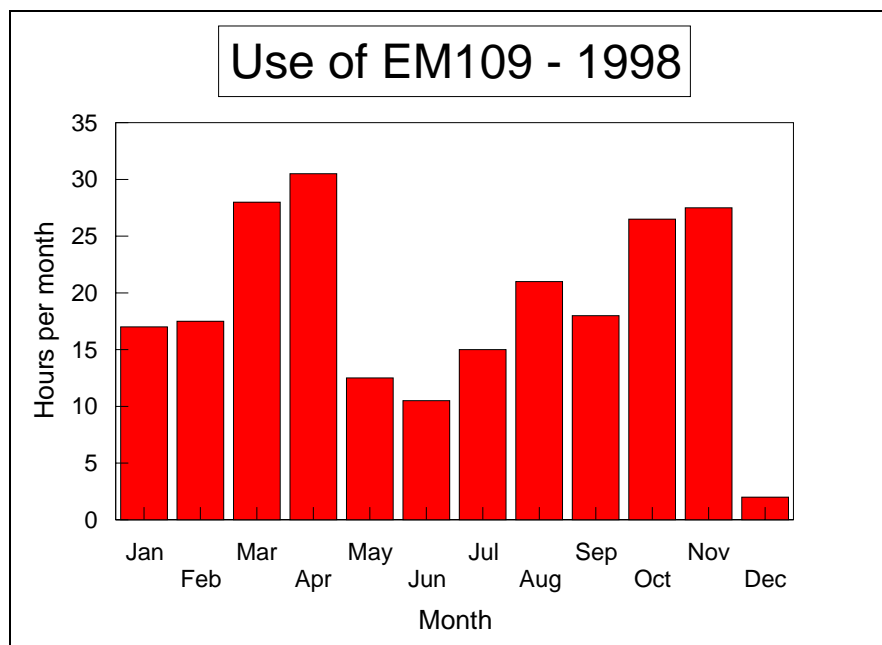


Figure 7: Use of the Zeiss EM109 TEM

A total of 226 hours were logged for this instrument for 1998. This figure is substantially lower than the number of hours logged in 1997 even though it appeared to be just as busy. It is well suited to routine biological use and it can be used by students in their introduction to microscopy. The instrument required only routine maintenance during 1998.

OTHER MAJOR EQUIPMENT

ULTRAMICROTOME

Use of the ultramicrotome was 345.5 hours which is comparable to that of 1997. Considerable use continued to be made of the cryomicrotomy and immunolabelling facilities by the departments of Biochemistry, Botany, Medical Biochemistry, Medicine, Microbiology and Zoology.

TEACHING AND EXTENSION

USER COURSES

The five day intensive course aimed at honours and post graduate students, "Introduction to Microscopy for Biologists", was held twice and attended by a total of 12 people, including 1 from UWC.

23/2/1998-27/2/1998	3 Honours students from Anatomy and Cell Biology, 1 from Zoology and 1 from Botany
23/4/1998-30/4/1998	3 Honours students from Pharmacology, 3 from Chemical Engineering and a Masters student from Microbiology at UWC

INDIVIDUAL TRAINING

Eight students from the departments of Materials Engineering, Biochemistry, Microbiology and Zoology were trained to operate the 200CX, one person was trained to operate the S200, Five new users from the departments of Botany, Microbiology and Chemical Engineering were trained to use the EM109 and eight new users from the departments of Biochemistry, Botany, Chemical Engineering, Materials Engineering, Microbiology and Zoology were trained to operate the ultramicrotome.

SCHOOL VISITS

A group of 20 pupils from Camps Bay visited on 12 February and approximately 50 pupils from Bishops visited on 17 February.

STUDENT PRACTICALS

Third year Botany students attended a practical on thin sectioning and TEM conducted by the Unit.

YEAR OF SCIENCE AND TECHNOLOGY

The Unit created a display for the YEAST '98 exhibition at the Waterfront held from 6-13 March. A member of the Unit staff was present throughout the exhibition.

RESEARCH ACTIVITY

Research was generally carried out in collaboration with other departments and laboratories. One part-time PhD student, Mr Jaffer, is registered.

Electron Tomographic studies of the chromatin fibre:

B.T. Sewell and M.A. Jaffer.

Chromatin in the cell nucleus is compacted through a series of folding events. The first of these foldings is the formation of nucleosomes. This is well understood. The nucleosomes are then formed into fibres which have a diameter of about 30 nm. The structure of the fibres remains unknown. Electron tomography is a method which could lead to the structure determination of the fibre at the level of resolution necessary for understanding of its folding.

Studies on otoliths

M.E. Waldron and D.A. Gerneke

Banding in otoliths from mackerel (*Trachurus trachurus*) are used to determine the age of the fish. The bands are laid down daily but details of their formation are not fully understood. Studies of the bands by imaging methods have been undertaken in order to gain some understanding of this.

Development of a STEM detector

D.A. Gerneke, D. Bolton

Investigations into the improvement in the design of a transmitted electron detector over those supplied by commercial manufacturers was undertaken. A prototype detector was constructed and tested.

The Ageing of Abalone

D.A. Gerneke, G. Hawkes and R. Day (University of Melbourne, Australia)

Imaging using secondary and backscattered electrons and cathodoluminescence of manganese labelled Abalone shells was carried out for the purpose of understanding the mechanism of shell growth.

Single particle reconstruction

B.T. Sewell

A project to determine the structure of GroEL mutants has been started in collaboration with Professor Helen Saibil at Birkbeck College in London. Cryo micrographs are being taken in London and the images are being processed using the computers belonging to the Visualization Centre at UCT. One structure was determined at 2.5nm resolution and work on others was commenced.

PUBLICATIONS

Publications, for 1997, that resulted from research in which the EM Unit staff have been directly involved are listed:-

Conference Proceedings

- Gerneke, D., Hawkes, G., and Day, R. 1998. The use of cathodoluminescence, backscatter and EBSD in the SEM to microcharacterize shell layers of the black-tip abalone (*Haliotis rubra*). ACEM-15, Hobart, Tasmania. p50
- Gerneke, D. and Bolton, D. 1998. The design and optimization of the transmitted electron (STEM) detector for the SEM. ACEM-15, Hobart, Tasmania. P78.
- Waldron, M.E. and Kerstan, M. 1998. Age and reader validation in horse mackerel (*Trachurus trachurus*) otoliths Second International Symposium on Fish Otolith Research and Application. Bergen, Norway, 20-25th June, 1998.
- Westall, F., McKay, D.S., Gibson, E.K., de Wit, M.J., Dann, J., Gerneke, D. and de Ronde, C.E.J., 1998 Terrestrial biomarkers for early life on Earth as analogues of possible Martian life forms: examples of mineral-replaced bacteria and biofilms from the 3.5-3.3 Ga Barberton greenstone belt, South Africa. Martian meteorites workshop, LPI, Nov. 1998.
- Westall, F., Morris, P., de Wit, M.J., Dann, J., de Ronde, C.E.J., Gerneke, D., McKay, D.S., and Gibson, E.K. 1998 Microbial mat evidence for life's variety in 3.5-3.3 Ga sediments from the Barberton greenstone belt, South Africa. Geological Society of America Annual Meeting, Toronto, Oct. 1998.
- Westall F and Gerneke D, 1998. Electron microscope methods in the search for the earliest forms of life on Earth (in 3.5-3.3 Ga cherts from the Barberton greenstone belt, South Africa): applications for extra-terrestrial life studies. SPIE, Instruments, Methods and Missions in Astrobiology, San Diego, July, 1998.
- Westall, F., Gobbi, P., Mazzotti, G., Gerneke, D., Stark, R., Drobek, T., and Heckl, W., 1998. Combined SEM (secondary electrons, backscatter, cathodoluminescence) and atomic force microscope investigation of the carbonate globules in Martian meteorite ALH84001: preliminary results. SPIE, Instruments, Methods and Missions in Astrobiology, San Diego, July, 1998.
- Westall, F. de Wit, M.J., Dann, J., Gerneke, D., and de Ronde, C.E.J. 1998 Fossil biofilms and bacteria from 3.5 Ga cherts, Barberton, South Africa. Geoscience 98, Keele, UK, April 1998.
- Westall, F., de Wit, M., Dann, J., van der Gaast, S., de Ronde, C.E.J., and Gerneke, D. 1998 Hydrothermal sediments and fossil bacteria from the Early Archean of South Africa as analogues for early life on Mars. 29th Lunar and Planetary Science Conference, Houston, March 1998.

Published Conference Proceedings

- Sewell, B.T., and Buirski-Burger, N. 1998. Can computer based education save science education in South Africa? Proceedings of the Sixth Annual Meeting of the Southern African Association for Research in Mathematics and Science Education. 439-445.
- Nelwamonde, A., Jaffer, M.A., Sewell, B.T. and Dakora, F.D. 1998 Silicon nutritional effects on plant growth and mechanical strength of symbiotic cowpea plants. Communications of the Electron Microscopy Society of Southern Africa **28**: 52
- Lang, C.I., Gerneke, D.A., and Shechtman, D. 1998 The Influence of heat treatment on $Al_{70}Pd_{20}Mn_{10}$

Chapters in Books

Westall, F., Gobbi, P., Gerneke, D. and Mazzotti, G. 1998. Ultrastructure in the carbonate globules of Martian meteorite ALH84001. In J. Chela-Flore and F. Raulin (Eds.) "Exobiology: Matter, Energy, and Information in the Origin and Evolution of Life in the Universe". Kluwer, Amsterdam, 245-250.

Published Papers

Westall, F. and Gerneke, D. 1998. Electron microscope methods in the search for the earliest forms of life on Earth (in 3.5-3.3 Ga cherts from the Barberton greenstone belt, South Africa): applications for extraterrestrial life studies. *SPIE*, 3441, 158-169.

Westall, F., Gobbi, P., Mazzotti, G., Gerneke, D., Stark, R., Drobek, T., and Heckl, W. 1998. Combined SEM (secondary electrons, backscatter, cathodoluminescence) and atomic force microscope investigation of the carbonate globules in Martian meteorite ALH84001: preliminary results. *SPIE* **3441**: 225-233.

Waldron M.E., 1998 Annual ring validation of the South African sardine, *Sardinops sagax* using daily growth increments. In *Benguela Dynamics: Impacts of Variability on Shelf-Sea Environments and their Living Resources*. Pillar, S.C., Moloney, C.L., Payne, A.I.L. and F.A. Shillington (Eds). *S.Afr. J. Mar. Sci* 19: 425-430.

Publications by Users of the Unit

The following list includes those papers given to the Unit by users. It is unfortunately not a complete list of published work that has been conducted in the Unit. A great deal of the work done by users is published only as conference proceedings, such work is not reflected here.

Board, W. S., and Frimmel, H. E., 1998, Fluid evolution and mineralising potential in the external Gariep Belt: *Journal of African Earth Sciences*, v. 27/1A, p. 29-30.

Bruyns, P., The relationships of *Whitesloanea crassa*. *Edinburgh Journal of Botany* 55: 27-37 1998.

Dace, H., Sherwin, H.W., Illing, N. and Farrant, J.M. 1998. Use of metabolic inhibitors to elucidate mechanisms of recovery from desiccation stress in the resurrection plant *Xerophyta humilis*. *Plant Growth Regulation*, 24, 171-177.

Farrant, J.M. and Sherwin, H.S. 1998. Mechanisms of desiccation tolerance in seeds and resurrection plants. 109-120. In *Progress in Seed Research: Proceedings of the second international conference on seed science and technology* (eds. A. G. Taylor, and X-L Huang). Communication services of the New York State Agricultural Experiment Station, Geneva, NY.

Farrant, J.M. and Waters C. 1998. Ultrastructural and biophysical changes in developing embryos of *Aesculus hippocastanum* L. in relation to the acquisition of tolerance to drying. *Planta* (In Press).

Foelling, P., Frimmel, H. E., and Zartman, R. E., 1998, Chemostratigraphic correlation and Pb-Pb dating of metasedimentary sequences in the Gariep Belt: Evidence for two different diamictites *Journal of African Earth Sciences*, v. 27, p. 76-77.

Malan, H. and Farrant, J.M. 1998. Effects of the metal pollutants cadmium and nickel on soybean seed development. *Seed Science Research*, 8, 445-453.

Musil, C.F., Newton, R.J., and Farrant. J.M. 1998. Ultraviolet irradiation effects on serotinous *Leucodendron laureolum* seeds: altered seed physiology, ultrastructure and seedling performance. *Plant Ecology*, 139, 25-34.

Pauw, A. 1998. Pollen transfer on birds' tongues. *Nature* 394: 731-2.

Sherwin, H.W and Farrant, J.M. 1998. Protection mechanism against excess light in the resurrection plants *Craterostigma wilmsii* and *Xerophyta viscosa*. *Plant Growth Regulation* 24, 203-210.

Sherwin, H.W, Pammenter, N.W., van der Wiligen, C., February, E. and Farrant, J.M. 1998. Wood anatomy and water relations of the resurrection plant *Myrothamnus flabellifolia*. *Annals of Botany*, 81, 567-575.

Roeger, H. P., Moller K. P. and O'Connor C. T., 1998 Effects of in-situ CVD using tetraethoxysilane on the catalytic and sorption properties of ZSM-5., *Microporous and Mesoporous Materials*, 21, 607.

Weber R.W., Moller K.P., Unger M. and O'Connor C.T. 1998, The chemical vapour and liquid deposition of tetraethoxysilane on the external surface of ZSM-5, *Microporous and Mesoporous Materials*, 23, 179.

M.Sc and Ph.D. Theses

Board, W. S., 1998, Fluid evolution and mineralising potential in the outer margin of the southern Gariep Belt: MSc, Geology

Chetty, D., 1998, Geochemical fingerprinting of carbonate wallrock alteration at major base metal sulphide deposits in the Otavi Mountain Land, Namibia: MSc Geology

Duckham, A. 1998 The formation of copper type shear bands in Al-1Mg and their influence on recrystallisation behaviour. Ph.D. Materials Engineering.

Machio, N., 1998, Influence of composition and thermomechanical processing on microstructure evolution in AISI 430 ferritic stainless steel. M.Sc. in Applied Science (Materials Engineering)

Wittridge, N.J. 1998 A microtexture based analysis of surface roughening in ductile metals during tensile deformation. Ph.D. Materials Engineering.

FINANCE

Details of the Unit's accounts are presented in Tables 2, 3, 4, 5 and 6.

OTHER MATTERS

ILLNESS.

Mr Gerneke was absent on sick leave for two months and utilised two months vacation leave to aid his recovery.

CONTACT LEAVE

Professor Sewell utilised one month's contact leave in September in order to establish the collaboration with Professor Saibil.

CONFERENCES ATTENDED BY STAFF.

Mr Gerneke attended the 15th Australian Congress on Electron Microscopy in Hobart, Tasmania and subsequently visited several microscopy laboratories in Australia. Mrs Waldron attended the Second International Symposium on Fish Otolith Research and Application. Bergen, Norway. Professor Sewell attended the Sixth Annual Meeting of the Southern African Association for Research in Mathematics and Science Education in Pretoria and the 14th International Congress on Electron Microscopy in Cancun, Mexico.

WORKSHOP ON ENERGY DISPERSIVE SPECTROSCOPY

Mr Gerneke organized a two day workshop on Energy Dispersive Spectroscopy which was conducted in the Unit by Dr Brendan Griffin of the University of Western Australia in Perth. Ten people attended.

WORKSHOP ON CRYOMICROSCOPY

Mr Jaffer has participated in the establishment of a National Initiative on Cryomicroscopy. The group held a workshop in Durban from 4-8 May 1998 in which he participated. He reported on the workshop on behalf of the National Initiative at the MSSA meeting.

SERVICE TO INDUSTRIAL AND OTHER EXTERNAL USERS

The Unit offers its facilities on an ad hoc basis to external users. Clients exploiting these services during 1998 were Adamastor Trust, Atlantis Diesel Engines, Aswan Consulting, Patterson and Cooke, Cybertracker, CSIR, Engen, Envig, Kynoch Fertilizer, Mineral Services, Nampak, Plascon, SA Nylon Spinners, Scientific Services, Sea Fisheries Research Institute, Twee Jongegezellen, Visicare and Warner Lambert.

ENHANCEMENT OF ENERGY DISPERSIVE SPECTROSCOPY SERVICE

Mr Gerneke prepared a set of EDS standards for Dr Lang in the department of Materials Engineering and used them as a basis for full quantitative analysis of her samples. This was the first time that analysis with standards has been performed with our current hardware and software and its use established the methodology. Mrs Waldron has been trained to perform qualitative and standardless quantitative analysis.

BACKSCATTER DETECTOR

Mr Gerneke has extensively tested the CENTAURUS, a new type of backscattered electron detector which was lent to the Unit by its manufacturer, KE Developments (Toft, UK). The system performs well and Mr Gerneke presented the results comparisons with a conventional detector at the MSSA meeting.

MICROSCOPY SOCIETY OF SOUTHERN AFRICA CONFERENCE 1998

The 37th Annual Meeting of the MSSA was held at Rand Afrikaans University from 1-4 December 1998. Prof Sewell, Mr Jaffer and Mr Gerneke attended.

VISITORS TO THE UNIT

Professor Victor Ngu from the University of Cameroon and a former vice-chancellor of that institution spent a week in the Unit preparing samples of HIV infected cells. Dr Alice Warley from the Combined Medical Schools of Guy's and St Thomas's Hospitals visited the Unit.

CLEANING THE UNIT

A satisfactory solution to the problem was finally reached due to the intervention of the Director of Finance. Three cleaners from the Botany Department do a concerted clean-up twice a week.

SUMMARY

Members of the Unit were extremely active during 1998. Existing services were maintained and generally well used. The 200CX TEM was finally repaired after a long period of unreliability.

A new governance structure for the Unit which conforms to the new structure of the University has been established.

The commitment by the University to purchase a new TEM in 2002 and subsequent decision to accumulate money towards this end is extremely significant and seen as highly supportive of all those involved in microscopy.

I wish to express my sincere thanks for all the support the Unit has received from Prof. V C Moran, as the Chairman of the Electron Microscope Steering Committee, and the committee members who played an active role in the continued functioning of the Unit.

Prepared by: Associate Professor B.T. Sewell

Director

3 March 1999

TABLE 1
Services Offered by the Unit during 1998

Service	Comment
Access to 200CX TEM	Service not available in Oct/Nov. Used by 28 staff and students.
Access to S440 SEM	Heavily used by 94 people
Access to S200 SEM	Used by 32 people
Access to the EM109 TEM	Used by 39 people
Training on 200CX	Eight users were trained
Training on S440 SEM	No new users were trained
Training on S200	One new user was trained
Training on the EM109 TEM	Used in courses. Five users individually trained
Access to Ultracut S Ultramicrotome	Well used by 48 people
Training on Ultracut S	Eight new users were trained
Sectioning of blocks supplied by the user	Well used
Embedding of biological specimens	Well used
Sputter Coating of specimens supplied by user	Very popular service
Critical point drying of specimens supplied by the user	Very popular service
Access to darkroom facilities	Used
Printing of EM films	Service used to capacity
Preparation of slides of electron micrographs for lecture purposes	Used
Access to optical microscopy facilities	Used
Access to Image Analysis (GENIAS)	Used for teaching image analysis.
Access to Image Processing and Analysis (Visilog)	Not used.
Element analysis by EDS	Well used.
"Introduction to EM for Biologists"	This course was held twice.
Access to specimen polisher	Used
Access to high vacuum coating plant and accessories	Adequately used
Store of EM consumables	Used by all our users
Access to prep lab	Used
Collection of books and journals on microscopy	Well used
Access to Joyce Loebel microdensitometry facilities	Not used - the instrument has been taken out of service and mothballed.
Vacuum Leak Detection	Used by the Physics department and by the Unit. The instrument has been recalibrated.
Production of CD ROMS	Over 50 were produced
Digitization of transparent media on LS4500	Well used
Production of slides from digital images	Used
Digitization of video tape	Used
Production of digital videos	Used
Dye sublimation printer	Used

TABLE 2
Equipment Expenditure

Equipment	Source of Funds	Cost
Computers, Computer Upgrades and Software	Contribution from ITEC	R 23 400.64
	Contribution from EMU	R 10 936.85
Air Conditioner	Maintenance Grant	R 8 000.00
	TOTAL	<u>R 42 337.49</u>

TABLE 3
External Services: Fund 001258

Opening Balance of Funds	R 15 577.73
Income	
Sales	R 20 057.13
	<hr/>
TOTAL	R 20 057.13
Expenditure	
Computer Software	R 1 961.50
Equipment Registered Assets (Computer Upgrades)	R 10 936.85
Operating Expenses	R 342.50
Stationery	R 38.25
Telephone Calls/Rentals	R 1 337.18
Local and International Conferences	R 7 000.00
Equipment - non asset	R 63.00
	<hr/>
TOTAL	R 21 679.28
Closing Balance 1997	R 13 955.58

TABLE 4
Departmental Grant: Fund 000516

Opening Balance of Funds	R 0.00
Income	
Annual Grant	R 32 579.99
ITEC	R 23 490.64
	<hr/>
TOTAL	R 56 070.63
Expenditure	
Cleaning Materials	R 1 109.45
Computer Expenses	R 8 646.31
Gas - General	R 7 332.34
Maintenance Department Charges	R 30.00
Operating Expenses	R 3 500.99
Books	R 683.82
Printing / Photocopy	R 1 055.64
Postage , Telephones and Fax	R 9 260.38
Repairs and Maintenance General	R 143.96
Stationery	R 847.10
Fixed Assets (Computers)	R 23 460.64
	<hr/>
TOTAL	R 56 070.63
Closing Balance 1997	R 0.00

TABLE 5**Consumables Store: Fund 000933**

Opening Balance of Funds	R 31 858.51
Income	
Internal Recoveries	R 32 346.27
TOTAL	<u>R 32 346.27</u>
Expenditure	
Computer Consumables	R 7 024.04
Materials and Consumables	R 18 672.38
Postage	R 140.00
Repair and Maintenance	R 2 693.62
Stationery	R 3 402.20
Utilities	R 136.46
TOTAL	<u>R 32 068.70</u>
Closing Balance of Funds 1997	R 32 136.08

TABLE 6
Maintenance: Fund 000995

Opening Balance of Funds	R 34 814.82
Income	
Internal Recoveries	R 55 526.48
	<hr/>
TOTAL	R 55 526.48
Expenditure	
Computer Software	R 1 326.80
Operating Expenses	R 11 119.31
Postage	R 0.39
Repair and Maintenance	R 19 684.94
Rentals	R 150.00
Equipment (Registered Assets)	R 2 486.00
Printing and Photocopying	R 812.20
Stationery	R 102.50
Travel	R 350.00
Transfer to No 2 Portfolio	R 20 000
	<hr/>
TOTAL	R 56 032.14
Closing Balance of Funds 1996	R 34 309.16

TABLE 7
Users of the Unit

Adamastor Trust	Darge, Colin	Staff	
Anatomy & Cell Biology	Koubovec	MSc	
	Lee-Oliver, Daja	Hons	
	Magugula, N	Hons	
	Slater, C	MSc	
ADE	Hunt, J	Staff	
Archaeology	Henshilwood, Chris	Staff	
	Horwitz, David	BSc	
	Lee-Thorpe, J	Staff	
	Miller, D	Staff	
	Russel, Tembe	Staff	
	Stevenson, Craig	Staff	
Architecture	De Mendoca, Lizette	BSc	
	Le Grange, L	BArch	
Aswan Consulting	Swan, Patrick	Staff	
Biochemistry	Jason, Laure	PhD	
	Koonjul, Prium	PhD	
	Lindsay, G	Staff	
	Roussow, Pauline	PhD	
	Rumbak, Elaine	Staff	
	Sales, Kurt	MSc	
	Von Wechmar B	Staff	
Botany	Cooper, Keren	MSc	
	Dace, Halford.	MSc	
	Dlamini, Titus.		BSc
	Eccles, N	Hons	
	Farrant, Jill.	Staff	
	Higgins, Steve	PhD	
	Klak, Cornelia	MSc	
	Kruger, Lynette	MSc	
	Golding, Janice	MSc	
	Lechmere-Oertel, Richard	MSc	
	Linder, Peter,	Staff	
	Malan, Heather	PhD	
	Mundree, Sagadevan	Staff	
	Newlamonde, Martin.	MSc	
	Newton, Rose	PhD	
	Ochura, John	PhD	
	Pauw, Anton	MSc	
	Raimondo, Tilla	Hons	
	Richardson	Staff	
	Ronse De Craene, Louis	Staff	
	Sherwin, Heather	Staff	
	Surio, Veronique	Staff	
	Turner, Hubert	Staff	
	Vicre, Maite	PhD	
	Von Hase, A	MSc	
	Wilson, Terry	MSc	
Cape Technikon,			
Dept Mech Eng	Martin, Wickus	Mtech	
Dept Chem Eng	Nel, Wihaan	Mtech	

Cardiothoracic Surgery	Zhang, YingZing	Staff		
	Davids, Lester	PhD		
	Johnson, Mark	Staff		
	Prager, Michael	Staff		
Cardiovascular Research	Adler, Uschi	Staff		
	Millam, Ross	Staff		
Chemistry	Bretherton, Tracy	PhD		
	Craig, Tracy	PhD		
	Dodds,Devric	PhD		
	Hibbert, Barbara	PhD		
	Mavuso, Winile	PhD		
	Nassimbeni, Luigi	Staff		
	Rogers, Alan	Staff		
Chemical Engineering	Beautement, Craig	MSc		
	Dickason, Greg	MSc		
	Dunstan, Andrew	MSc		
	Gigaba,Zonke	MSc		
	McDonald, Andrea	Staff		
	Moon, Jo-Ann	PhD		
	Mouton, Duane	MSc		
	Ncwadi, Mpumelelo	MSc		
	Petrik, Lesley.	Staff		
	Potgeiter, Thomas	PhD		
	Robinson, Andrew	MSc		
	Von Blottwitz, Harro	Staff		
	Von Schalkwyk, Erna,		MSc	
	Civil Engineering	Kalumba, Denis	MSc	
		Ojungu, Isaac	BSc	
Construction Economics	Cattel, Keith	Staff		
Cooke and Patterson	Cooke, R	Staff		
CSIR	Pretorius, Julius	Staff		
CyberTracker	Liebenberg, Louis	Staff		
Electrical Engineering	Forbes, Keith	BSc		
Energy Research Inst.	Wicking-Baird, Mark.	Staff		
EnGeo	Tyson, Susie	MSc		
ENGEN	Cracknell, Bob		Staff	
English	Will, Gerhardt	MA		
Envig	Van Noordwyk, Marike	Staff		
Fitzpatrick Institute	Crowe, Tim	Staff		
Geological Sciences	Berg, Wolfgang	Staff		
	Board, Warwick	MSc		
	Campbell, Alex	MSc		
	Chinn, Ingrid	PhD		
	Dun, J	Hons		
	Frimmel, H	Staff		
	Ghosh, Joy	PhD		
	Menzies, Andrew	PhD		
	Minter, Laurie	Staff		
	Mofokeng, Siphon	MSc		
	Mulabisana, Jeff	Hons		
	Willis, J	Staff		
	Westerlund, Kalle	MSc		
	Geomatics	Dingle, M	PhD	

Kynoch Fertilizer	Sarvan Riaz	Staff	
Liver Research Centre	Johnson, M	MSc	
	Kirsch, Richard	PhD	
	Siziba, Kwanele	PhD	
Materials Engineering	Anderson, Steven	MSc	
	Barton, Stuart	BSc	
	Burger, Victor,	MSc	
	Carr, Andrew	BSc	
	Cotton, Janet.	PhD	
	Duckham, Andrew	MSc	
	Feng, Zheng.	PhD	
	Fourie, Koos	Staff	
	Hohl, Marcel	MSc	
	Lang, Candy	Staff	
	Loedolff, A	MSc	
	Machio C.	MSc	
	Mange, Siyabona	MSc	
	Ngalacane, Mtsumi	MSc	
	Pugsley, Vicky		MSc
	Paulsen, Lucien	BSc	
	Roestoff, Thabang	BSc	
	Sacks, Natasha	MSc	
	Scott, Adam	MSc	
	Sheen, Martin	BSc(hons)	
	Towle, Nick.	MSc	
	Topic, Mira.	Staff	
	Vaughan, Andrew	MSc	
	Wittridge, Nicola	PhD	
Mathematics	Bruyns, Peter.	Staff	
Mechanical Engineering	Mdakane, Nkosinathi	BSc	
	Smith, Mike	MSc	
	Sobey, Scott	BSc	
	Tait, Bob.	Staff	
	Zacny, Kris	BSc	
Medical Biochemistry	Dave, Joel	PhD	
Medical Microbiology	Meyers, Paul	Staff	
	Passmore, Joanne	PhD	
	Van Hamment, Jo	Staff	
	Williamson, Caroline	Staff	
Microbiology	Clarkson, Cailean	BSc	
	Cockcroft, Jennifer	BSc	
	Dube, T	Hons	
	Dodds, Heather	Msc	
	Gardner, Murray	MSc	
	James, D	Staff	
	Jaffray, Anne	PhD	
	Koch, Careena	MSc	
	Koonjul, Priyum	MSc	
	Martin, D	Hons	
	Peterson, Yolande	MSc	
	Rawlings, Doug	Staff	
	Reid, S	Staff	
	Rybicki, Ed.	Staff	
	Schnippenkoetter, Wendelin	PhD	

	Thompson, Jennifer	Staff	
	Van der Walt, Eric	MSc	
	Walford, S	MSc	
Mineral Services	Anckar, Bjorn	Staff	
	Baumgartner, M	Staff	
Multimedia	Deacon, Harriet	Staff	
	Dowling, Tessa	Staff	
	Dunkley, Christine	Staff	
	Loopuyt, Maria	Staff	
	Walton, Marion	Staff	
	Wilson, Fiona	Staff	
NAC	Pineda, Carlos	Staff	
	Przybylowicz, Jolanta	Staff	
NAMPAK	Kieswetter, Griff	Staff	
Oceanography	Boeble, Olaf	Staff	
	Waldron, Howard	Staff	
Ornithology	Froneman, Albert	MSc	
Pharmacology	Adams, Bronwen	PhD	
	Brine, N		
	Gumede, B	Msc	
	Qodi, N		
Physics	Driver, Steve	Staff	
	Harting, S	Staff	
	Hempel, Maren	PhD	
	Rudzani, Nematudi	MSc	
Physiology	Tredoux, C	Staff	
Plascon Research Centre,	De Goede, Stefan	Staff	
	De Wet-Roos, Deon	PhD	
S.A. Nylon Spinners	Austin, R	Staff	
	Dean, G	Staff	
	Kippie, S	Staff	
	Lyth, C	Staff	
	Sharpe, Rob	Staff	
	McConnell, H.	Staff	
	Williams, Paul		Staff
Scientific Services	Moir, Stuart	Staff	
	Hardy, B	Staff	
SFRI	Melo, Yolanda		Staff
Surveying	Knorr, Ute	Staff	
Twee Jongetzellen	Krone, Nicky	Staff	
University of Botswana	Ringose, Sue	Staff	
University of Cameroon	Ngu, Victor	Staff	
University of Stellenbosch			
Geology	Philander, Carlos	MSc	
	Henning, Esme	MSc	
Inst. Polymer Science	Bessarabov, Dimitri.	Staff	
	McLeary, James	MSc	
	Michaels, Wynoma	MSc	
Chemical Engineering	Keuler, Johan	MEng	
	Loftus, Brent	MEng	
	Mouton, D	MSc	
UWC			
Microbiology	Khan, Sehaam	MSc	

	Fielding, Bertram	MSc
	Govin, Vandanna	MSc
	Leate, Neil	Staff
Physics	Adams, D	MSc
	Julies, Basil	Staff
University of Zimbabwe	Hove, Miidzo	PhD
Visicare	Luyt, Ingrid	Staff
Warner Lambert	Wyrley-Birch, Jean	Staff
Zoology	Adair, Robin	Staff
	Adams, Shukri	Hons
	Barnett, Mandy	PhD
	Botes, Lizeth	MSc
	Cooper, Mark.	MSc
	Day, Liz	PhD
	Erasmus, Jean	Staff
	Leseberg, Antje	Hons
	Nicholson, Sue	Staff
	Impson, Fiona	MSc
	Ridgway, Tyrone	Bsc
	Ruck, Kevin	MSc

Total No: 114 Microscope Users + 109 users of other facilities

Terms of Reference of The Electron Microscope Unit Advisory Board

The Electron Microscope Unit is an interfaculty facility which has the following objectives:

- To provide a dedicated service to the University's research and teaching community,
- To maintain the instruments at a high level with a minimum of down-time,
- To provide an adequate basic teaching in electron microscopy for users.

Functions of the Committee:

The Electron Microscope Unit Advisory Board reports to the University Research Committee. It monitors the activities of the Unit and advises the Director of the Electron Microscope Unit on strategies for achieving the objectives of the Electron Microscope Unit as defined by Senate.

Composition:

The Dean of the Faculty of Science *ex officio* (or nominee)

The Dean of the Faculty of Engineering and the Built Environment *ex officio* (or nominee)

The Dean of the Faculty of Health Science *ex officio* (or nominee)

The Chairperson of the University Equipment Committee *ex officio* (or nominee)

The Director of the Electron Microscope Unit *ex officio*

Five members of the academic staff of user departments, at least one of whom must be from each of the faculties of Engineering and the Built Environment, Science and Health Science.

Four members of the technical staff concerned with electron microscopy, one being from the Electron Microscope Unit and one being from each of the faculties of Engineering and the Built Environment, Science and Health Science.

Chairperson:

The nominee of the Chair of the University Research Committee

Servicing Officer:

The EMU technical officer represented on the Advisory Board.

Membership:

Professor VC Moran (Dean of Science, Chair)

Dean of Engineering and the Built Environment or nominee

Professor J.P. Cruse (nominee of the Dean of Health Sciences)

Associate Professor RB Tait (nominee of the Chair of the UEC)

Associate Professor BT Sewell (Director)

Academic members

Professor JJ Gurney (Science)

Associate Professor HP Linder (Science)

Professor JA Thomson (Science)

Professor BB Rawdon (Health Science)

Associate Professor RD Knutsen (Engineering and the Built Environment)

Technical members

Mr DA Gerneke (EMU, Servicing Officer)

Mr RS Rickard (Science)

Ms H Ilsley (Health Science)