

ELECTRON MICROSCOPE UNIT
ANNUAL REPORT
2002

Director	B.T. Sewell
Principal Technical Officer (Part Time)	J. Duncan
Chief Technical Officer	M.A. Jaffer
Chief Scientific Officer	B. Price
Chief Technical Officer	M. Waldron
Photographic Assistant	W. Williams

July 2003

TERMS OF REFERENCE

- (a) To advise the Equipment Committee (EC) and through it the University Research Committee (URC) on provision of electron microscopy services to the University's teaching and research community;
- (b) to receive, and report to the EC and URC on the annual report, strategic plan, and operational plan of the Director of the Electron Microscope Unit (EMU).

PROCEDURES

- (a) The EMU is a University facility. It receives its budget through the URC and the EC. For administrative convenience only the financial administration of the EMU is handled by the Science Faculty Office (but the financial reports of the EMU form part of the overall financial report of the EC and the URC, and not of the Science Faculty).
- (b) The EMU Committee (EMUC) is established in the Research Cluster. The Chair of the EMUC submits an annual report to the Chair of the EC, who in turn submits a consolidated annual report to the Chair of the URC. These reports are the vehicles for accounting for the work of the EC and EMUC respectively and for this reason these reports must indicate what the EMU and the EMUC have achieved relative to agreed goals and place the URC chair in a position to judge how well the EMUC has performed.
- (c) The Chair of the EMUC, acts as the line manager for the Director of the EMU.

HIGHLIGHTS OF 2002

APPLICATION TO THE CARNEGIE CORPORATION OF NEW YORK FOR FUNDING FOR A JOINT UWC/UCT MASTERS PROGRAMME IN STRUCTURAL BIOLOGY

USD1.09m was awarded by the Carnegie Corporation of New York for the creation of a Joint Masters Programme in Structural Biology. The first intake of students was at the beginning of 2003. Twelve UCT and three UWC academics are involved in the programme which also involves the National NMR facility at Stellenbosch. The director of the Electron Microscope Unit is the programme convenor and this item is reported here for information purposes. Reporting on the Masters Programme will be done separately.

However the Structural Biology programme will impinge on the EMU in a number of important ways including: The computer systems of the programme have been closely integrated with those of the Unit as a matter of operational necessity, the Unit is providing technical and logistic support for the x-ray diffraction apparatus located at UWC, the director is teaching in the programme and devising projects for the student dissertations and staff of the EMU are being retrained to cope with microscopy for structure determination purposes, thereby placing higher demands on them than ever before.

15TH INTERNATIONAL CONGRESS ON ELECTRON MICROSCOPY

The Congress was held in Durban and four members of staff from the unit attended. The biological sciences programme was organized by the director. Two talks and five posters were presented from staff at the EMU.

BUILDING ALTERATIONS

Alterations were carried out to a dark room previously used to develop films from the SEMs. One wall was knocked down so the existing lab was extended into the old dark room. New flooring was laid and a new sink and benches were erected. The new glassware washer was installed in the extended lab. This creates considerably more usable space and better flow in the Unit's specimen preparation area.

STAFF PROMOTIONS

Mr. Duncan was promoted to Principal Technical Officer (part time) and Mrs. Waldron was promoted to Chief Technical Officer.

MEETINGS OF THE ELECTRON MICROSCOPE UNIT ADVISORY BOARD

A meeting of the EMU Advisory Board was held on 22 July 2002. Those attending were Professor D. Reddy (Chairman), A/Prof C. de la Rey, Professors L. Nassimbeni, G. Kotwal, Associate Professors E.P. Rybicki, R. Knutsen, C. Lang and B T Sewell, with Ms S. Kom and Ms Z Mdledle in attendance. The meeting approved the 2001 annual report. Concern was expressed that the way in which the financial reports had been presented for the last ten years no longer met the requirements of the finance department

and Mr Abu Adams was delegated to assist in rectifying this. Strategies for raising funds for new electron microscopes were discussed

A special meeting of the EMU advisory board was convened on 14 October 2002 to consider offers of electron microscopes made by to the director by FEI, Jeol and LEO. The meeting was attended by Prof L. Nassimbeni, Prof D. Reddy, Prof G. Kotwal, Prof A. Azad, Professor E.P. Rybicki, A/Profs B.T. Sewell, R. Knutsen and D. Lang. All three offers were discussed and the offers of FEI and Jeol were rejected.

The offer of Leo was accepted - the essential details being: 1. Leo will supply us with a refurbished 912 (120kV) microscope, new 2k x 2k camera and tomography software. The microscope will not have cryo capability - this costs R800k more. It has a built in energy filter. I will enhance the microscope by fitting our existing SIT camera for a cost of R70k which will come from the EMU equipment budget - this will enable rapid specimen scanning. 2. We will pay Leo R3m. 3. We commit ourselves to attempting to raise R3m more for a Leo 922. If we raise this money the 912 will be taken back, the cameras and s/w will be transferred to the 922 which will have 200kV, cryo capability and a cryo holder in addition to the energy filter. If we do not raise the money the 912 etc. will remain our property. 4. The 912 will initially be installed in the room occupied by the EM109 which will be mothballed and parked. Mohamed Jaffer, Brendon Price, Liz vd Merwe and I will be trained as operators and will provide access to other users. 5. When the new IIDMM EMU is built and we have money for a technician then: If we have R3m we will install the 922 there, return the 912 and re-instate the EM109 in its current location. If we do not have the money then the 912 goes to IIDMM EMU and the EM109 is re-instated.

MAJOR EQUIPMENT PURCHASES IN 2002

The following capital items were purchased: Fraction collector, glassware dishwasher, humidifier, pH meter and chromatography column. Computer facilities were upgraded.

USE OF THE UNIT

Services provided by the Unit during 2002 are listed in Table 1. Frequent usage was made of all key services of the Unit, with printing and CD writing still being popular with non-microscope users.

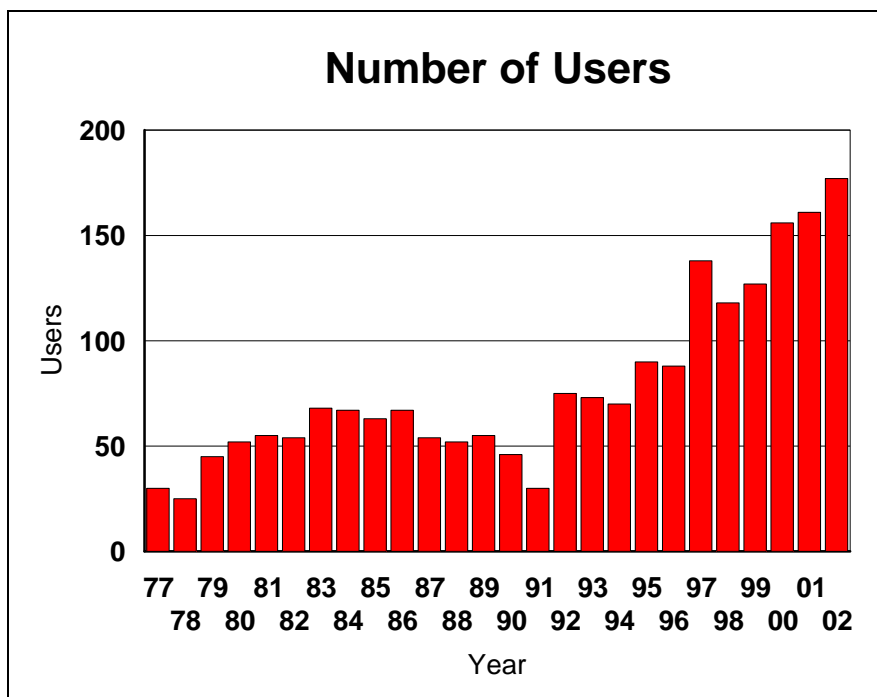


Fig 1 Number of users of microscopy facilities per year since 1977

178 people made use of the microscopy services of the Electron Microscope Unit in 2002. In addition, a further 16 users utilized services other than those related to microscopy, notably the Imaging Centre and CD writing facilities. The Imaging Centre was also heavily used by EM Users.

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

Total time spent using the Unit’s microscopes was 1699 hours in 2002 which is about a third of the usage in 2001. This decrease is almost entirely due to the fact that the S200 was little used for EBSD because few specimens were prepared by the Centre for Materials Engineering. Other contributing factors included reduced use of the S440 SEM due to failures of the EHT board and the vacuum pump resulting in almost six weeks of downtime. Usage of the TEMs was also slightly decreased due to an effort to reduce “one time” users and encourage more long term TEM based research projects.

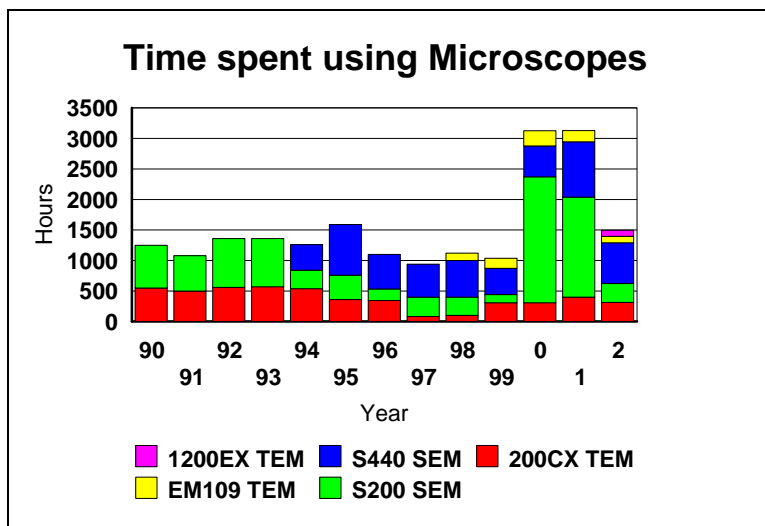


Figure 2: EM Unit’s microscope usage hours since 1990.

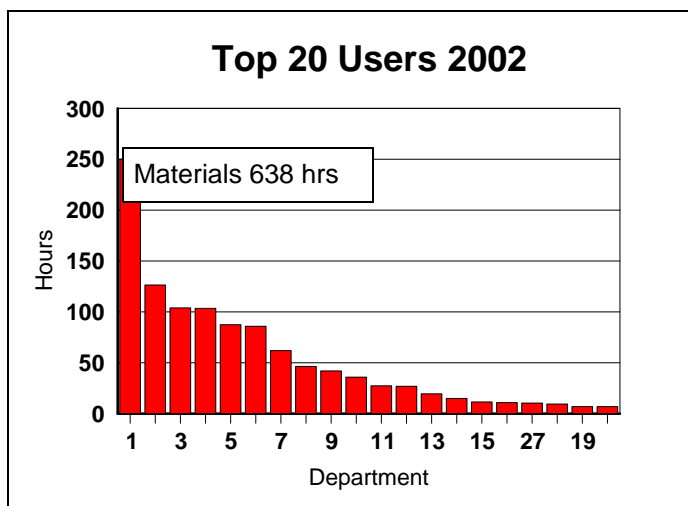


Figure 3: Microscope usage by department, institution or company

Order is as follows:

1	Materials Engineering	11	iThemba Labs
2	Chemical Engineering	12	Namakwa Sands
3	University of Stellenbosch	13	MCM
4	MCB	14	UWC
5	Chemistry	15	Botany
6	EMU	16	Medical Micro
7	Human Biology	17	Antomical Pathology

8	Geological Science	18	Archaeology
9	Virology	19	Zoology
10	ARC	20	Cape Heart

ELECTRON MICROSCOPES AND ASSOCIATED EQUIPMENT
LEO STEREOSCAN S440

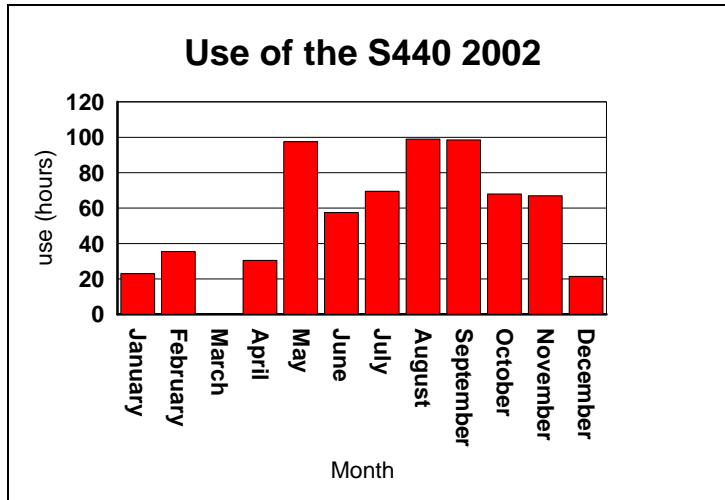


Figure 4: Use of the Leica S440 SEM.

The S440 was used for a total of 667.5 hours which is a decrease on the usage for 2001. Fifty six people from UCT made use of the instrument and there were 34 outside users. Use of this instrument remains the most popular service rendered by the Unit. The instrument was down for approximately 6 weeks in February, March and April due to a failure of the EHT board. The ion pump that was damaged in 2001 was replaced in April, so the instrument is now operating with a LaB₆ filament again.

CAMBRIDGE S200 SEM

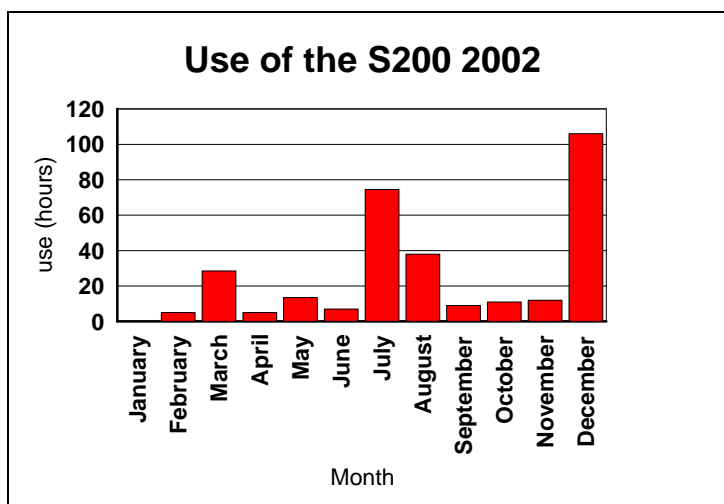


Figure 5: Use of the Cambridge S200 SEM.

The S200 was used in total for 309.5 hours, which is a huge decrease in usage from 2001. Two people used the EBSD and eighteen people, eight of whom were not from UCT, used the instrument for secondary electron imaging. The instrument worked reliably and was used as a back-up when the S440 was down. The decrease in user hours is due to a decrease in time spent by Materials Engineering on EBSD.

JEOL 200CX TEM

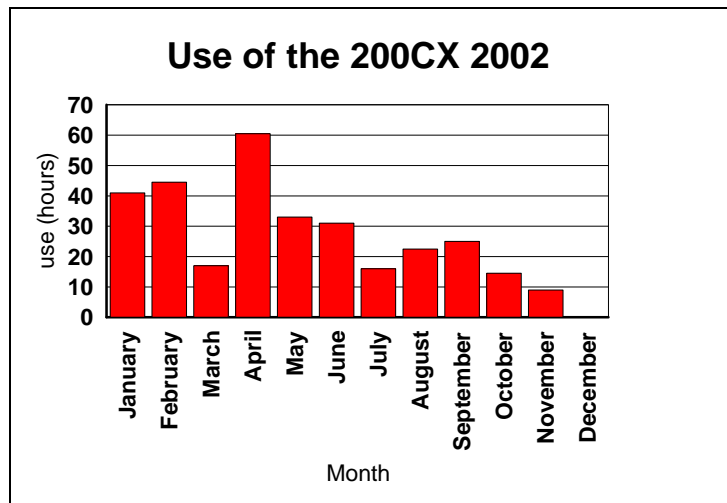


Figure 6: Use of the Jeol 200CX TEM.

Use of the 200CX TEM was 314 hours, a slight decrease in usage from 2001. It was used by 22 people from UCT and 5 outside users. The instrument continues to operate as our prime TEM. Its reliability is severely compromised by its age and it is gradually failing at a number of points. In spite of this, demand remains high. Continued expensive maintenance of this instrument will remain imperative until funds for a new TEM of at least equivalent capability are found.

ZEISS EM109 TEM

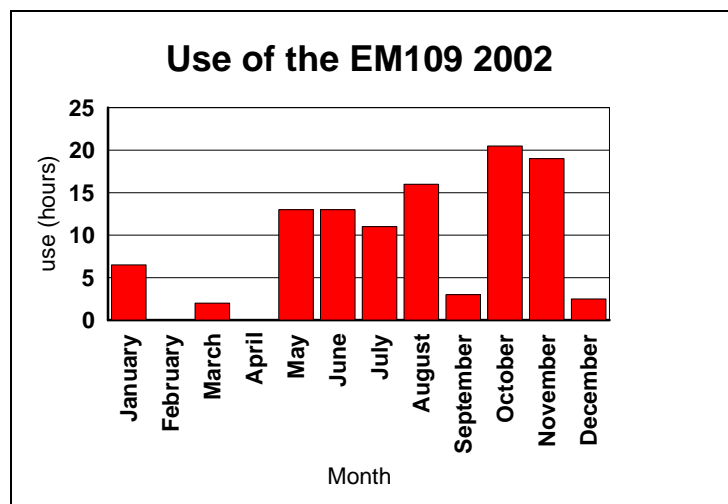


Figure 7: Use of the Zeiss EM109 TEM.

Use of this instrument decreased slightly to 106.5 hours. It was used by 17 people from UCT and 5 outside users. The microscope worked reliably through the year

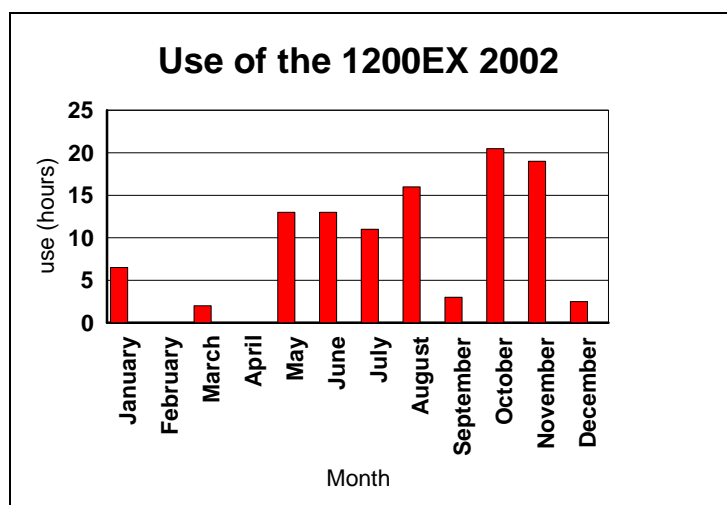


Figure 8: Use of the Jeol 1200EX TEM.

The Jeol 1200EX was fully operational and was used for a total of 99.5 hours, by 4 users from UCT. At the present time this instrument is being used primarily for the Director’s research.

OTHER MAJOR EQUIPMENT

ULTRAMICROTOME

Use of the ultramicrotome was 209.5 hours which is a small increase on its use during 2001. The departments of Chemical Engineering, Materials Engineering and Cape Heart Centre used the cryo-ultramicrotomy facilities.

LIGHT MICROSCOPY

All the light microscopes were used during the year, the Zeiss Axiocam still being a very popular attachment. The Hoffman modulation contrast microscope was used extensively for work on sardine otoliths.

IMAGING CENTRE

The imaging centre continued to be popular for printing and scanning slides and negatives. The HP2000C printer had a high usage and was used for printing several theses.

THE ELECTRON MICROSCOPE UNIT BRANCH IN THE INSTITUTE OF MOLECULAR MEDICINE

The proposal that the branch of the EMU and staffed by a technical officer responsible to the Director of the EMU advanced to the extent that space provision for it in the IIDMM’s Wernher and Beit South wing was drawn up by Andrew Nimmo, one of the architects involved in the IIDMM project. The location (which will be ready in March-April 2004) was chosen even though it was separate from the majority of “molecular” activities because this building would be equipped with cooling water and air-conditioning. However the issue of the EMU establishing a branch in the IIDMM has been reopened through continuing discussion with Dr Denise Roditi of the NHLs, Professor Lafras Steyn, head of the department of Clinical Laboratory Sciences and Professor Wieland Gevers, Interim Director of the IIDMM. At the present stage it appears that funds will not be made available for the technical officer post and the proposed branch will not be opened for this reason and because it is now felt that IIDMM researchers should use a consolidated UCT EM service based on the upper campus. Decisions regarding the fate of the three Hitachi H600 microscopes also depend on the outcome of discussions between the

different parties concerned. The director of the EMU has expressed his opinion but has not so far been invited to participate in the discussions.

THE ELECTRON MICROSCOPE IN THE CENTRE FOR MATERIALS ENGINEERING

A decision was taken to move the S200 scanning electron microscope from the Centre for Materials Engineering to the EMU for storage in the intermediate term and ultimately either sale of the intact instrument (unlikely) or use of the instrument as parts to maintain the S200 in the Unit (likely).

Arrangements were made to move and store the instrument and thus free the space currently occupied by the instrument for alternative use. Professor K. Bennett was informed of the impending move and decided against it, taking responsibility himself for the disposal of the instrument. No further action will be taken on this matter by the Unit.

TEACHING AND EXTENSION

SCANNING ELECTRON MICROSCOPY COMPUTER BASED COURSE

A comprehensive course on scanning electron microscopy previously delivered as SEM School has been revised and made available through our website. The work to accomplish this was done by Mr. Price, Mrs. Waldron and Professor Delpierre. Although it has not yet reached its final form the course has attracted several international enquiries.

INDIVIDUAL TRAINING

Five users from the departments of Chemical Engineering, Materials Engineering and Molecular and Cell Biology were trained to operate the 200CX,. Six users from the departments of Human Biology, Chemical Engineering and Molecular and Cell Biology were trained to use the EM109. Seven students from Marine and Coastal Management, Materials Engineering, Geological Sciences, Chemical Engineering (University of Stellenbosch), Chemical Engineering and Human Biology were trained to operate the S440. Two new users from Agricultural Research Council and Materials Engineering were trained to use the S200 and eight new users from the departments of Human Biology, Plascon, Chemical Engineering, Polymer Science (University of Stellenbosch) and Molecular and Cell biology were trained to operate the ultramicrotome.

SCHOOL VISITS

Two A level learners from Wynberg High School visited in March 2002. A group of nine teachers on a training course organised by the Schools Development Unit visited on 10th May.

MICROSCOPY FOR BIOLOGISTS

The Microscopy for Biologists course was held from 29 April - 3 May and attended by 10 MCB honours students.

RESEARCH ACTIVITY

Research was generally carried out in collaboration with other departments and laboratories.

The following projects which depend on the initiatives of Unit members were active during 2002:

Studies on otoliths

M.E. Waldron

A study was commenced on juvenile anchovy caught between 1998 and 2000 at the moment, preparation of the otoliths for SEM is being carried out. Ms Margit Wihelm handed in her MSc on anchovy otoliths and Mr. Elliott Weni continued his MSc on sardine otoliths

Studies of GroEL mutants

B.T. Sewell

Further progress was made with the structure of GroEL mutants in collaboration with Professor Helen Saibil at Birkbeck College in London. The effect of temperature on the structure of the E461K mutant was studied.

Structure of the nitrilase from Bacillus pumilus, Pseudomonas stutzeri and Gloeocercospora sorghi
M.N Berman, P.R. Meyers, B.T. Sewell, B Price and P Chang

The cyanide degrading enzymes are of potential industrial significance. We have solved three structures at varying resolutions by single particle techniques and made substantial progress on the structure of the pH 5.4 fibrous form of the cyanide dihydratase from *B. pumilus*. Progress was made towards the creation of an atomic model on the basis of homology with two known structures.

PUBLICATIONS

Publications, for 2002, that resulted from research in which the EM Unit staff have been directly involved are listed:-

Botes, L., Price, B., Waldron M., and Pitcher, G. 2002. A simple and rapid scanning electron microscope preparative technique for delicate gymnodinioid dinoflagellates. *Microscopy Research and Technique* **59** 2:128-130

Egan T J, Combrinck J. M, Egan J., Hearn G R., Marques H M, Ntente S, Sewell B.T, Smith P.J., Taylor D, Van Schalkwyk D A. and Walden, J.C. 2002. Fate of haem iron in the malaria parasite *Plasmodium falciparum*. *Biochem. J.* **365**:343-347

Kirsch, R., Jaffer, M.A., Woodburne, V.E., Sewell, B.T., Kelly, S.L., Kirsch, R.E. and Shephard, E.G. 2002. Fibrinogen is degraded and internalized during incubation with neutrophils, and fibrinogen products localize to electron lucent vesicles. *Biochem J.* **364**(2) 403-412

Prozesky, V.M., Gerneke, D A. and Springhorn, K.S. 2002. The use of electron backscattering as fast imaging technique with molecular beams. *Nuclear Instruments and Methods in Physics Research B* **181**:244-248

Published Conference Proceedings

Botes L., Price B., Waldron M. and Pitcher G. Scanning electron microscope preparative technique for delicate 'gymnodinioid' dinoflagellates.

Botes L. and Waldron M.E. Preparation of delicate gymnodinioid dinoflagellates for scanning electron microscopy.

Price B., Chang P., Jandhyala D.M., Benedik M. and Sewell B.T. The quaternary structure of *Gloeocercospora sorghi* nitrilase (cyanide hydratase) as revealed by negative staining.

Saibil H., Ranson N., Farr G., Fenton W., Horwich A, Sewell B.T., Roseman A., Chen S. and Gowen B. Functional cycle of chaperonins studied by single particle cryo EM.

Sewell B.T., Berman M.N., Meyers P.R., Jandhyala D.M. and Benedik M. pH dependent quaternary structural transitions in the cyanide degrading nitrilase from *Bacillus pumilus*.

Varsani A., Jaffer M.A, Williamson A. and Rybicki E, Deletion and point mutation products of the human papillomavirus type 16 major capsid gene.

Waldron M. and Simpson K. Analysis of foraminifera at Knysna, South Africa.

Westerlund K. and Waldron M. Examination of growth zones in diamonds using cathodoluminescence.

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.

Compton, J.S., Mulabisana, J. and McMillan, I. 2002 Origin and age of phosphorite from the Last Glacial Maximum to Holocene transgressive succession off the Orange River, South Africa. *Marine Geology* **186**, 243-261.

Cooper, K. and Farrant, J.M. 2002. Recovery of the resurrection plant *Craterostigma wilmsii* from desiccation: protection vs repair. *Journal of Experimental Botany* **53**, 1805-1813.

Duckham A, Knutsen RD and Engler O. 2002. Moderation of the Recrystallization Texture by Nucleation at Copper-Type Shear Bands in Al-1Mg. *Acta Materialia*, **50**, No 11:2881-2893

Eksteen, J.J., Frank, S.J., Reuter, M.A., 2002. Dynamic structures in variance based data reconciliations for a chromite smelting furnace. *Minerals Engineering*, **15**, 11:931-943,

Klak, C., T.A. Hedderson & H.P. Linder. 2003. A molecular systematic study of the *Lampranthus* - group (Aizoaceae) based on the chloroplast trnL-trnF, and nuclear ITS and 5s NTS sequence data. *Systematic Botany*: 28:

Knutsen R.D and Wittridge N.J. 2002. Modelling surface ridging in ferritic stainless steel. *Mat. Sci. Technol.***18**, No 11:1279-1285.

Li, J, Sanderson, R.D. And Jacobs, E.P. 2002. Non-invasive visualization of the fouling of microfiltration membranes by ultrasonic time-domain reflectometry. *Journal of Membrane Science* **201**:17-29.

Li, J, Sanderson, R.D., Hallbauer, D.K. And Hallbauer-Zadorozhnaya, V.Y. 2002. Measurement and modelling of organic fouling deposition in ultrafiltration by ultrasonic transfer signals and reflections. *Desalination*, **146**: 177-185

Li J, Sanderson, R.D. and Jakcobs, E.P. 2002. Ultrasonic cleaning of nylon microfiltration membranes fouled by Kraft paper mill effluent. *Journal of membrane Science*, **205**:247-257

Li, J, Hallubauer-Zadorozhnaya, Y., Hallbauer D.K. And Sanderson, R.D. 2002. Cake-layer deposition, growth and compressibility during microfiltration measured and modeled using a noninvasive ultrasonic technique. *Industrial and engineering chemistry research* **41**:4116-4125

Mowla, S.B., Thomson, J.A., Farrant, J.M. and Mundree, S.G. 2002 A novel stress-inducible antioxidant enzyme identified from the resurrection plant *Xerophyta viscosa*. *Planta* **215**, 716-726.

Newton, R.J., Bond W.J. & Farrant J.M. 2002. Seed development, morphology and quality testing in selected species of the nut-fruited Restionaceae. *South African Journal of Botany* **68**, 226-230

Ronse Decraene, L.P. Linder, H.P. And Smets, E.F. 2002. Floral ontogenetic evidence in support of the *Willdenowia* Clade of South African Restionaceae. *J Plant Res.* **114**:329-342

Walters, C., Farrant, J.M., Pammenter, N.W. and Berjak, P. 2002. Desiccation and Damage. In *Desiccation and Plant Survival*. (Eds M. Black and H. Pritchard). CAB International, London.

M.Sc Theses

Chuba, D (Botany) Phylogenetic relationships of the genus *Andreaea* Hedw. (Andreaeaceae, Bryophyta) as inferred from rps4 and trnL-F sequences and morphology

Cooper, K (Botany) The effect of drying rate on the resurrection species *Craterostigma wilmsii* (homoiochlorophyllous) and *Xerophyta humilis* (poikilochlorophyllous).

Du Toit, C (Wine Biotechnology, University of Stellenbosch) The evaluation of bacteriocins and enzymes for biopreservation of wine .

Fewell, S (Materials Engineering) The particle erosion of steel by magnetite.

Jaffer, A. (Chemical Engineering) An investigation into the mechanism of bioleaching of a predominantly-chalcopyrite concentrate with mesophiles

Jaufeerally, H. (Civil Engineering): Performance and properties of structural concrete made with corex slag

Malherbe, D. (Wine Biotechnology, University of Stellenbosch) Expression of the *Aspergillus niger* glucose oxidase gene in *Saccharomyces cerevisiae*.

McKenna, N .(Geological Science) A study of the diamonds, diamond inclusion minerals and other mantle minerals from the Swarttruggens Kimberlite, South Africa

Naidu, T. (Mechanical Engineering) A fracture mechanics study of the fracture toughness testing techniques applied to brittle materials

Ndlovu S. (Materials Engineering) The erosion of WC-CO coatings

Patil, R. (Materials Engineering) An investigation into the impact fracture behaviour of poly (propylene-ethylene) copolymers using an instrumented low temperature drop weight impact tester

Peterson, K. (Chemical Engineering) Copper sulphide precipitation in a fluidised bed reactor

Schwegmann, A. (Virology) Identification of proteins that interact with brain factor-1 and characterization of these interactions

Van Dyk, L.(Chemical Engineering, University of Stellenbosch) The production of granular activated carbon from agricultural waste products

Westalle, K. (Molecular and Cell Biology) The role of a Polyphenol from *Myrothamnus flabellifolius* in the protection of membranes during desiccation-using liposomes as a model membrane system

PhD Theses

Ah Tow, Lemese, (Molecular and Cell Biology) Characterization of the ompB operon of *Vibrio cholerae* 569B and its role in melanogenesis

Cave, Lisa (Geological Sciences): Apophyllite weathering and the aqueous geochemistry of a Karoo breccia pipe.

Iyer, Revel (Botany) Systematics of the Gracilariaceae (Rhodophyta) of Southern Africa

Wilkenhoner, Uwe (Chemical Engineering) Aromatic hydroxylations over titanium-substituted crystalline silicates.

Topic, Mira. (Materials Engineering). The effect of drawing strain on the fatigue behaviour of stainless and carbon steel wires.

Sales, Kurt (Medical Microbiology). Expression and functional role of cyclooxygenase enzymes in cervical carcinoma

FINANCE

Details of the Unit's accounts are presented in Table 2.

OTHER MATTERS

LEAVE BY THE DIRECTOR

The director was in England from 3 Feb to 18 Feb in order to continue his collaboration with Professor Saibil. He went to Germany from 19 Feb to 22 Feb in order to use a Leo 912 to do determine the iron distribution in Plasmodium and to see the Bruker x-ray diffraction apparatus. He attended the Biophysical Society Discussions in Asilomar, California from 18 to 22 April and visited Professor Benedik in Houston from 23 to 28 April during which time a draft of a paper was prepared and a roadmap for future collaboration was drawn up. He also visited the Rigaku office and saw their x-ray diffraction systems. The director also visited the University of the Witwatersrand on 12 and 13 August in order to publicise the Structural Biology Programme.

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 2002 were: Henkel Technologies, Kantey and Templer, iThemba Labs, National Botanical Institute, Namakwa Sands, Marine and Coastal Management, One Eighty Degrees, Patterson and Cooke, Pfizer, Plascon, Shell, Somchem, SudChemie.

VISITORS TO THE UNIT

Karen Usdin, Richard Tyrell, Helen Saibil, Mike Lawrence, Alan Roseman, Bernard Heymann. Professor Saibil and Drs Lawrence, Roseman and Heymann all gave lectures on aspects of Structural Biology.

Professor Jozef van Landuyt Professor of Physics and Crystallography, University of Antwerp was visiting UCT and had a guided tour round the EM Unit. Dr David Fergusson from the Oxford Hair Clinic gave a lecture on Scanning Electron Microscopy of hair.

SUMMARY

The Unit put substantial effort into directing its efforts towards providing research assistance for its users and towards publication of work done by its members. Some of this has borne fruit in terms of a substantially increased publication and thesis count by its users. The profile of the Unit and its director was raised locally and internationally by organizing part of the 15th International Congress on Electron Microscopy and by setting up of the Joint UCT/UWC Programme in Structural Biology. A decision to purchase a Leo 912 was made - this will have a significant impact on electron microscopy at UCT and in South Africa.

Prepared by: Associate Professor B.T. Sewell

Director

23 July 2003

TABLE 1
Services Offered by the Unit during 2002

Service	Comment
Access to 200CX TEM	Used by 27 people
Access to 1200EXII TEM	Used by 4 people
Access to S440 SEM	Used by 90 people
Access to S200 SEM	Used by 20 people
Access to the EM109 TEM	Used by 22 people
Training on 200CX	5 users were trained
Training on S440 SEM	7 new users were trained
Training on S200	2 new users were trained
Training on the EM109 TEM	Used in courses. 7 users individually trained
Access to Ultracut S Ultramicrotome	Used by 34 people
Training on Ultracut S	8 new users were trained
Cryo-microtomy and immunolabelling	Well used
Sectioning of blocks supplied by the user	Well used
Embedding of biological specimens in methacrylate and epoxy	Well used
Freeze substitution	Well used
Sputter Coating of specimens supplied by user	Very popular service
Critical point drying of specimens supplied by the user	Very popular service
User access to darkroom facilities	Not used
Printing of EM films	Service used
Preparation of slides of electron micrographs for lecture purposes	Not used
Access to optical microscopy facilities	Used
Access to Image Analysis (GENIAS)	Not used.
Access to Image Processing and Analysis (Visilog)	Used
Element analysis by EDS	Well used.
"Introduction to EM for Biologists"	This course was held once.
Access to specimen polisher	Well used
Access to high vacuum coating plant and accessories	Adequately used
Store of EM consumables	Used by most users
Access to prep lab	Well used
Collection of books and journals on microscopy	Used
Vacuum Leak Detection	Not used
Production of CD ROMS	Very popular
Digitization of transparent media on LS4500	Well used
Production of slides from digital images	Not used
Digitization of video tape	Not used
Production of digital videos	Not used
Dye sublimation printer	Used
High quality ink-jet printer	Very popular
Flat bed scanner	Well Used

Table 2

Electron Microscope Unit								
Actual Income and Expenditure for 2002								
Notes								
Total								
Operating								
Ext Services								
Equipment								
Consumable store								
Maintenance								
Structural Biology								
Fund 000516								
Fund 001258								
Fund 170025								
Fund 000933								
Fund 000995								
Fund 231270								
Opening balance		182,836	-	128,691	-	28,919	25,226	
Surplus/(Deficit) for the year		113,287	(1,048,375)	74,057	(201,592)	2,668	72,191	1,214,338
Income		4,750,228	-	162,969	3,000,000	57,445	149,921	1,379,892
Direct expenditure		(4,636,941)	(1,048,375)	(88,912)	(3,201,592)	(54,778)	(77,731)	(165,554)
Closing balance		296,123	(1,048,375)	202,748	(201,592)	31,587	97,417	1,214,338
Income:		1,655,728	-	162,969	3,000,000	57,445	149,921	1,379,892
Budget allocation		-						
Fees:	Facilities - internal	154,236		58,645		45,134	50,458	
Fees:	Facilities - external	88,866		76,555		12,311		
Fees:	Consultation - internal	-						
Fees:	Consultation - external	-						
Fees:	Teaching	-						
Subsidy:	Teaching	-						
Subsidy:	Research	-						
Donations		1,379,892						1,379,892
Investment income		32,734		27,770			4,964	
Invested fund transfer					3,000,000		94,500	
Brought Forward		-						
Expenditure		4,636,941	1,048,375	88,912	3,201,592	54,778	77,731	165,554
Staffing:	Total	8,588	964,836	-	-	-	8,588	-
Staffing:	Academic - recurrent	-						
	Technical - recurrent	-						
	Admin - recurrent	-						
Staffing:	Non - recurrent - Acad	-						
	Non - recurrent - Tech	8,588					8,588	
	Non - recurrent - Admin	-						
Admin/operating:		229,759	80,256	19,931	6,452	54,778	23,143	68,350
	Telephone, postage, fax	18,051	16,058	1,826			168	
	Marketing and advertising	60,389						60,389
	PC Consumables	23,073	13,845			9,228		
	PC Components			5,549			5,907	
	PC software	10,818	1,404	2,288			7,127	
	Lab supplies	43,306	11,386	4,744		27,175		
	Photocopying/printing	2,004	2,004					
	Stationery	5,582	2,624			2,958		
	Subscriptions	225	225					
	Books							3,114
	Travel	17,743	9,992	2,723			180	4,847
	Conferences	5,630	5,630					
	Cleaning, other R&M	405	295	110				
	Utilities	23,394	7,099	336		15,417	543	
	Operating	55	55					
	Petty cash	2,350	1,639	226			484	
	Floats	3,300	3,300					
	Insurance			2,128				
	Reimbursements				6,452			
	Repair and Maintenance	13,434	4,699				8,735	
Fieldwork/CPD	Funded partially via fees	-						
Space	Minor Works	-						
Furniture		3,283	3,283					
Equipment:	Teaching/research/service	3,349,805		65,098	3,187,503			97,204
Equipment:	Support	-						
	R&M: equipment	57,521		3,884	7,637		46,000	
FinAid		-						

2002 User list

*indicates Microscope users

Agricultural Research Council

	Lamberts, Clyde	MSc*
Disease Management	Vries, Filicity	MSc*
Weed Pathology	Den Breeyen, A	Staff*
	Lennox, C	Staff*
	Serdani, M	Staff*
	Van Rooi, C	Staff*
Anatomical Pathology	Egan, Joanne	MSc*
	Kirsch, Richard	Staff*
Archaeology	Codron, J	MSc*
	Cope, M	Staff*
	Miller, Duncan	Staff*
Botany	Aguilar, Gonzalo	Staff
	Dakora, Felix	Staff*
	Evans, D	Hons
	February, E	Staff
	Hedderson, T	Staff
	Iyer, KR	PhD*
	Mbaki, M	MSc*
	Spriggs, Amy	PhD*
	Tronchin, E	MSc*
	Trinder-Smith, T	Staff
	Verboom, T	PhD
	Whitehouse, C	Staff
	Zeenat	Hons
Cape Technikon, Dept Chem Eng	Soloman, Marshal	Staff*
	McLeod, Bertin	Mtech*
Cape Heart Centre	Davies, Neil	Staff*
	Higham, Lawrence	Staff*
	Maquanint, Kibrett	Staff*
	Samodien, Nazlia	Staff*
Chemistry	Allie, Shameez	MSc*
	De Vries, E	PhD*
	Deppa, N	PhD*
	Durrbaum, Dawn	PhD*
	Freddy	Hons
	Jappie, D	PhD*
	Linder, P	Staff
	Nassimbeni, Luigi	Staff*
	Ncokasi, Kanyile	Msc*
	Ntsiki, Moseli	Hons*
	Ramon, Gaelle	PhD*
	Siele, Tewolde	MSc*
Chemical Engineering	Achaw, Osei-Wusu	Staff*
	Agako, Frans	Hons*
	Balasundaram	PhD*
	Chirinos, Ada	PhD*

	Foster, Tanryn	Hons*
	Claeys, Michael	Staff*
	Johnston-Robertson,M	MSc*
	Lamaiguere, Valerie	MSc*
	Lewis, Alison	Staff*
	Mabaso, Itai	PhD*
	Moon, JoAnn	Phd*
	McPherson, J	Msc*
	Peterson, Karen	MSc*
	Phala, Noko	PhD*
	Roberts, Mandy	MSc*
	Ryan, Dan	PhD*
	Seawoo, Shilpa	MSc*
	Thembu, Sipiwe	MSc*
	Vasic, Suzana	Staff*
	Van Hiller, Rob	Staff*
	Werner, Andreas	PhD*
Civil Engineering	Scott, Alan	MSc*
Dermatology	Khumalo	Staff*
Fine Art	Turok, Karina	MFa*
Geological Sciences	Bailie, Russel	PhD*
	Choudhury, Roy	PhD*
	Compton, John	Staff*
	Minter, Laurie	Staff*
	Middleton, Xavier	MSc*
	Simpson, Keryn	Hons*
	Tredoux, M	Staff*
	Ulansky, Chad	MSc*
	Whitehead, Kerry	MSc*
Henkel technologies	Wrigley, Rochelle	PhD*
Human and Cell Biology	Massyn, Werner	Staff*
	Hsu, Nai-Jan	MSc*
	Mgweba,Thandi	PhD*
	Nikita, Natalya	PhD*
	Van der Merwe, Liz	Staff*
	Versfeld, K	MSc*
iThemba Labs	Budka, Dobruscia	Staff*
	Pryzbilowycz J	Staff*
	Pryzbilowycz W	Staff*
Kantey and Templer Civil Engineering		
	Stevenson, C	Staff*
Materials Engineering	Basson Janet.	Staff*
	Bezuidenhout, J	Hons*
	Fewell, Sean	Msc*
	Keraan, Tauriq	MSc*
	Klaas, Nkosana	MSc*
	Knutsen, Rob	Staff*
	Lang, Candy	Staff*
	Masekoameng, Charles	Hons*
	Moumakwa, Donald	MSc*
	Nzula, Miemie	PhD*
	Ndlovu, Phili	MSc*
	Ochola, Robert	PhD*

	Parker, Sa-aadat	MSc*
	Pike, Craig	MSc*
	Sello, Maitse	MSc*
	Topic, Mira.	PhD*
	Zimba, Joe	PhD*
MCM	Botes, Lizeth	PhD*
	Kock, Erich	HTech*
	Samodien, Fatima	BTech*
Mechanical Engineering	Millar, W	MSc*
	Mndebele, M	Hons*
	Mukuur, G	Staff*
Medical Biochemistry	Thilo, Lutz	Staff*
Medical Microbiology	Tiedt, Fritz	Staff*
Molecular and Cell Biology	Abrahams, Rayaana	MSc*
	Bajic, Jelena	MSc*
	Becker, Inga	Staff*
	Berman, Mark	MSc*
	Brocklehurst, D	Hons
	Cross, Brent	Staff*
	Cooper, Keren	MSc*
	Coyne, Vernon	Staff*
	Denby, Katherine	Staff*
	Eick, G	PhD
	Farrant, Jill.	Staff*
	Gardner, Michael	MSc*
	Hamman, Brigitte	Staff*
	Illing, N	Staff*
	Jaffray, Anne	Staff*
	Klump, H	Staff*
	Lindsay, G	Staff*
	Macey, Brett	MSc*
	Meyers, Paul	Staff *
	Monjane, Aderito	Hons*
	Mowla, Shaheen	PhD*
	Mundree, Sagadevan	Staff*
	Ncanana, Sandile	MSc*
	Rybiki, Ed.	Staff*
	Stuts, Helen	Staff*
	Tobin, Michael	PhD*
	Vander Willigen, Clare	PhD*
	Watford, Sally	PhD*
	Wei, L	Hons*
	Zakarias	MSc*
NBI	Kurzweil, Hubert	Staff*
Namakwa Sands	Philander, Carlo	Staff*
Oceanography	Bernard, Stuart	PhD
	Waldron, Howard	Staff
One Eighty Degrees	Basson, Janet	Staff*
Patterson and Cooke	Van Sittert, Fritz	Staff*
	Clinton	Staff*
Pfizer	Von Balleygoen	Staff*
Physics	Britton, David	Staff
	Comrie, Craig	Staff*
	Driver, Steve	Staff

	Habanyama, Adrian	PhD*
Plascon	Koen, Yolande	PhD*
	Smith, Bertus	PhD*
Shell	Tasche, Tobias	Staff*
Somchem	Michaels, Wynoma	Staff*
Sudchemie	Johnson, Dave	Staff*
University of Stellenbosch		
Botany	Adair, Robin	Staff*
	Dreyer, D	Staff*
	Kumwenda, M	MSc*
	Woldetensal, A	MSc*
Chemical Engineering	Banda, Wezi	MSc*
	Ecksteen, Jaques	PhD*
	Koen, Louis	MSc*
Dentistry	Bosman, J	Staff*
Inst. Polymer Science	Ganeva, Dessi	PhD*
	Gous, Karen	PhD*
	Greyling, Corinne	PhD*
	Laffin, Chris	PhD*
	Li Jianxin	PhD*
	Koen, Louis	PhD*
	McLean, James	PhD*
	Tichikawa Lilian	PhD*
	Van Zyl, Andre	PhD*
Geology	Henning, Esme	MSc*
Orthodontics	Cara, Sharath	PhD*
Soil Science	O'Brien Richard	Staff*
Wine Biothechnology	Du Toit, Corina	Msc*
Viviculture	Van Zyl, Sonnet	MSc*
UNITRA		
Physics	Chikwembani, Sam	Staff*
UWC		
Chemistry	Botha, Subelia	MSc*
	Masters, Gerry	PhD*
	Mudanawe, Makhado	Hons*
	Petrik, Lesley	Staff*
	Vaivars, Guntars,	Staff*
Microbiology	Johns, Jhill	PhD*
Virology	Kohl, Thomas	PhD*
	Versani. Arvind	PhD*
WITS	Annegarn, Harold	Staff*
	Cumbane, Juilo	MSc*
Zoology	Weni, Elliot	MSc*
	Wilhelm, Margit	MSc*

* Microscopy Users (178)
16 non EM users