

ELECTRON MICROSCOPE UNIT

ANNUAL REPORT

2005

Director	B.T. Sewell
Principal Technical Officer (Part Time)	J. Duncan
Chief Technical Officer	M. Jaffer
Chief Scientific Officer	B. Weber
Chief Technical Officer	M. Waldron
Departmental Assistant	S. Karriem

HIGHLIGHTS OF 2005

EMPLOYMENT OF DR BRANDON WEBER

Dr Weber replaced Dr Price at the beginning of the year. Dr Weber completed his PhD in the Department of Chemical Pathology and a post-doc in the Department of Pharmacology and has experience in Molecular Biology and TEM.

BUILDING ALTERATIONS

The user's darkroom in the Unit was converted into an office for students. Two windows were constructed and benches, power points and network cables were installed.

SECURITY SYSTEM

A security system comprising four cameras monitoring the entrances to the unit was installed following a spate of thefts from the Unit. This was not a budgeted item. The thefts have ceased.

THE EMBO WORLD PROGRAMME COURSE ON "FUNCTIONAL MICROSCOPY OF HOST PATHOGEN INTERACTIONS"

The EMU raised money for and hosted the EMBO course on "Functional microscopy of host pathogen interactions". A full report is attached as an Appendix.

MEETINGS OF THE ELECTRON MICROSCOPE UNIT COMMITTEE

A meeting of the EMU Committee was held on 16 August 2005. Those attending were Professor C. de la Rey (Chairman), Professors R.B Tait, B.D. Reddy, M.I. Parker, G. Kotwal, E.P. Rybicki, Associate Professor B T Sewell and Doctors K. Marcus and A. Wilkinson, with Mrs V. Thomas and Mrs C. Windvogel in attendance. Apologies were received from Associate Professors C. Lang and R. Knutsen. The meeting approved the 2004 annual report.

MAJOR EQUIPMENT PURCHASES IN 2005

New equipment: Sonicator, Security system.

Repairs and replacements: New anode and Wehnelt retaining ring for 912, vacuum pump, power supply for 912, parts for leak detector, spectrophotometer.

SUMMARY OF DELIVERABLES MEASURED AGAINST TARGETS

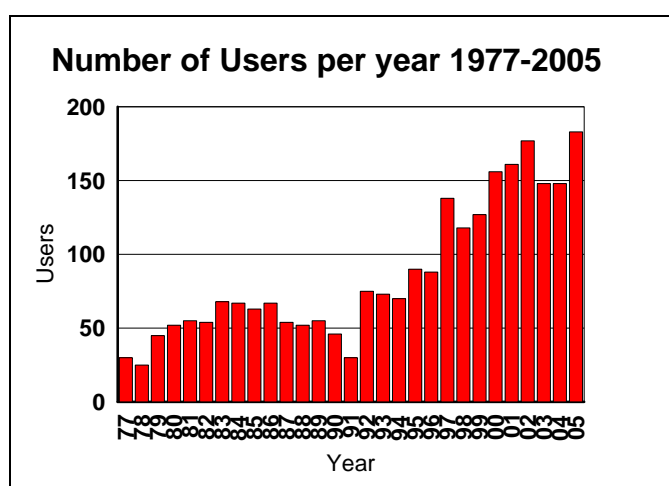
EM services will be provided for 70-100 users per year	147	Exceeded
Non-EM services will be provided for 10-40 users per year.	16	Met
10-20 users per year will be trained to use microscopes on an individual basis.	17 trained	Met
10-20 students per year will attend the course "Introduction to Microscopy for Biologists"	26 students attended	Exceeded
EM practical sessions will be arranged for undergraduate, honours and masters students or groups		Met
New courses will be developed according to demand	MCB3015 Structural Biology	Met
5 students per year will complete the MSc programme in Structural Biology	2 graduated	Not met
Existing instrumentation will be maintained		Met
Existing instrumentation will be adapted to meet the needs of researchers where possible.		Met
Unit staff will collaborate in whatever ways are feasible with active researchers in order to further their research goals		Met
Unit staff will undergo training as appropriate in order to		Met

support the research activities of users.		
New (minor) equipment will be purchased enhance the Unit's capability in focussed areas in support of currently active research projects		Met
The IT infrastructure will be improved and modernised		Met
Experiments in providing web based services will take place		Not met
Donors will be sought to provide funding for new electron microscopes		In process
Research goals to be supported by the new TEM will be properly formulated in collaboration with our partners.		In process
The part of the building in which the Unit is housed will be maintained and enhanced to meet current and emerging needs		Met
The Unit will communicate its role and capabilities to users and potential users.		
The Unit will participate in the activities of the Microscopy Society of Southern Africa		Met
Members of the Unit will attend international conferences as appropriate		Met
The cost and fee structure of the Unit will be reviewed in order to create a workable system which optimises cost recovery		Met
Structures to accommodate and support current and future usage of electron microscopes and other related equipment located away from the Unit will be put in place		Not met by us - but is clear the brief of CEF now

USE OF THE UNIT

Services provided by the Unit during 2005 are listed in Table 1. Frequent usage was made of all key services of the Unit.

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



147 people made use of the microscopy services of the Electron Microscope Unit in 2005, this is the highest number to date. A further 16 users utilized services other than those related to microscopy, notably printing theses and liquid nitrogen collection. Approximately 925 liters of liquid nitrogen were supplied to other departments from the Unit.

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

Total time spent using the Unit’s microscopes was 3117 hours in 2005, which is substantially more than in 2004. This is because of relatively high usage of the S200 SEM by Materials Engineering for EBSD runs and the increase in usage of the JEOL 1200EX TEM by Structural Biology MSc students.

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

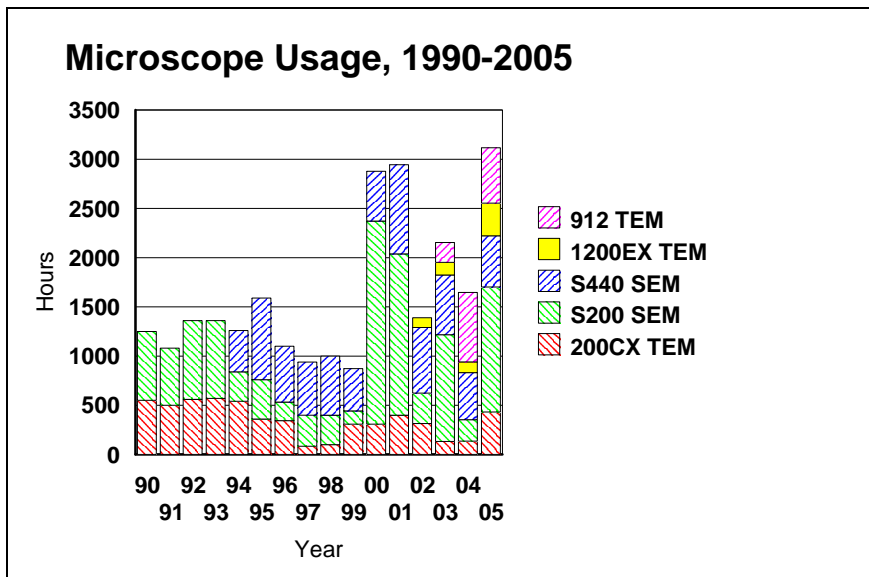
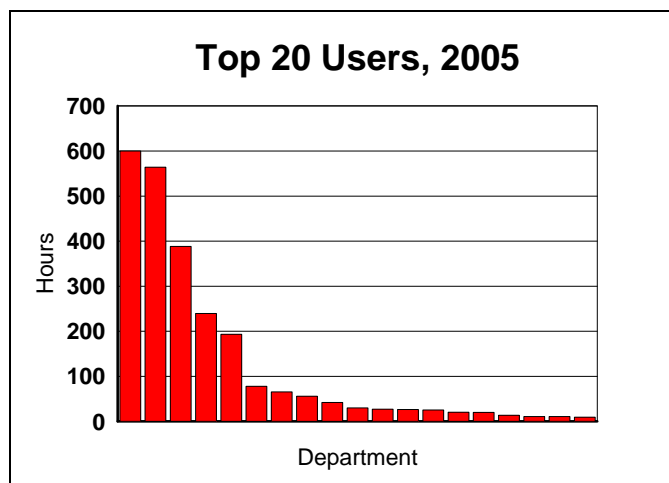


Figure 3 : Microscope usage by department, institution or company



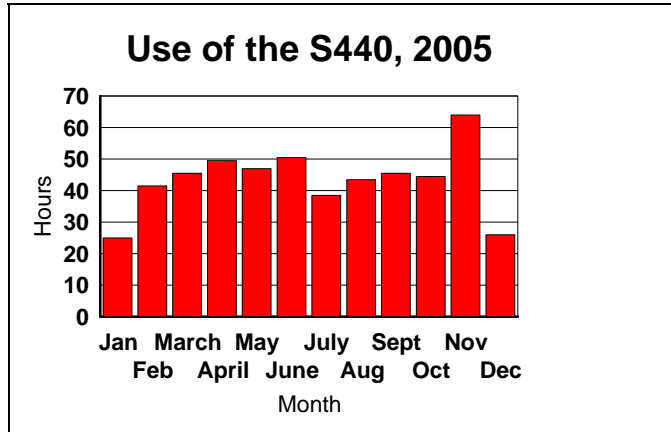
Order is as follows:

- | | | | |
|----|---------------------------------|----|------------------------------|
| 1 | Materials Engineering (600 hrs) | 11 | Hatter Inst. (27 hrs) |
| 2 | MCB (564 hrs) | 12 | Cardiology (27 hrs) |
| 3 | Structural Biology (389 hrs) | 13 | Geological Sciences (26 hrs) |
| 4 | Chemical Engineering (240 hrs) | 14 | IIDMM (20 hrs) |
| 5 | Inst.Polymer Science (194 hrs) | 15 | Cape Technikon (20 hrs) |
| 6 | Pharmacology (78 hrs) | 16 | US Chemistry (14 hrs) |
| 7 | IThemba Labs (65 hrs) | 17 | Chemistry (11 hrs) |
| 8 | UWC Chemistry (56 hrs) | 18 | Zoology (11 hrs) |
| 9 | Physics (42 hrs) | 19 | Human Biology (10 hrs) |
| 10 | Medical Virology (30 hrs) | 20 | UWC, Biotechnology (8hrs) |

ELECTRON MICROSCOPES AND ASSOCIATED EQUIPMENT

LEO STEREOSCAN S440

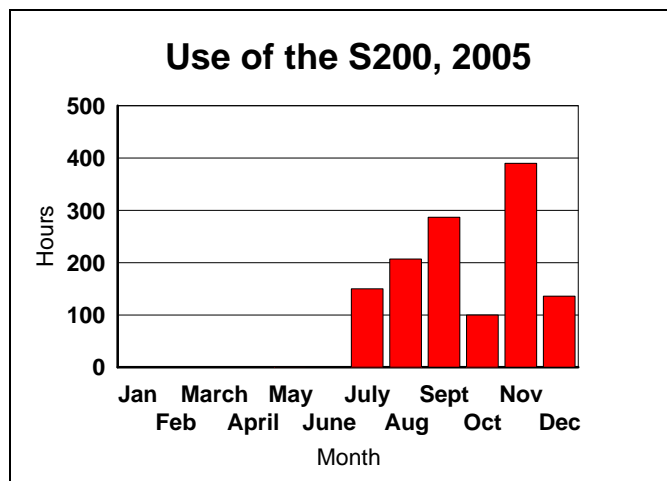
Figure 4: Use of the Leica S440 SEM



The S440 was used for a total of 521 hours which is a slight increase on the usage for 2004 (478 hours). There were fewer people from UCT who made use of the instrument in 2005 (59, compared to 76 people in 2004). On the other hand, there was an increase in outside users, from 33 in 2004 to 48 in 2005. A large number of the outside users were from the Chemistry Department at the University of the Western Cape. The trend of less SEM based projects in favor of using SEM to confirm or illustrate research, continued in 2005. The instrument was down for 2 days, as a result of power cuts.

CAMBRIDGE S200 SEM

Figure 5: Use of the Cambridge S200 SEM

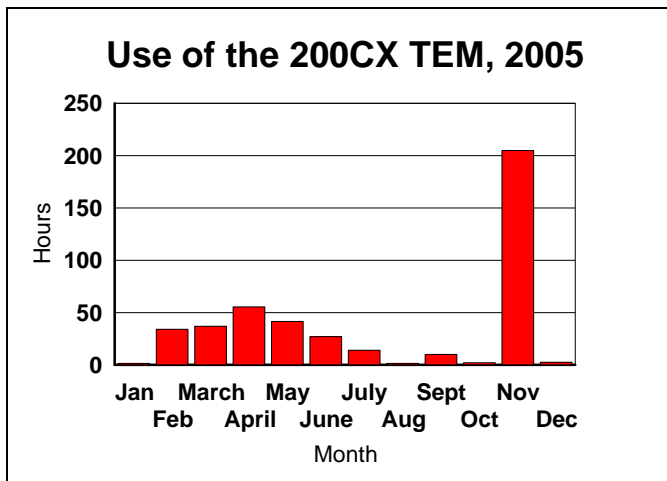


The S200 was used in total for 1270 hours, which is an increase in usage from 2004. The S200 was used solely for EBSD, which involves running the microscope for 24-36 hours at a time. This instrument is ideal for this type of analysis because it is stable and seldom in demand for other work. The pattern of EBSD usage was similar to 2004 in that the machine was not used at all in the first half of the year. This was because the student was having problems with sample preparation and did not get suitable samples

until July. Although the microscope is set up for EBSD work, it also serves as a back up for the S440 SEM.

JEOL 200CX TEM

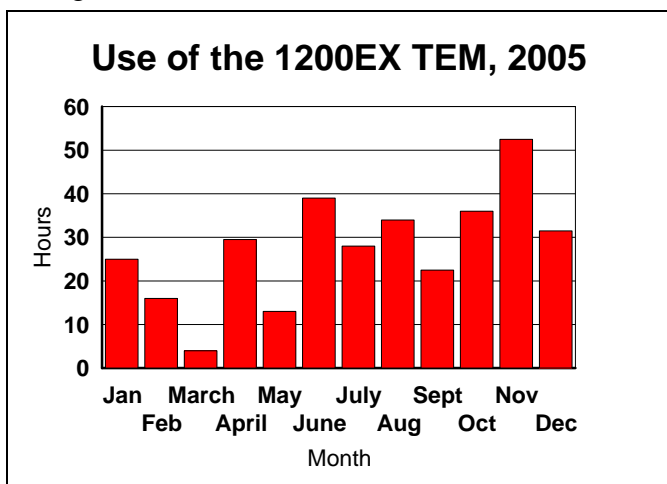
Figure 6: Use of the Jeol 200CX TEM.



Use of the 200CX TEM was 431.5 hours, a large increase in usage from 2004 (135.5 hours). As can be seen from figure 6, there was a large increase in usage in November, this coincided with the LEO 912 TEM being down. 16 people used the 200CX in 2005. The microscope’s reliability is severely compromised by its age and it is gradually failing at a number of points, in spite of this, people are using this microscope. The instrument will be scrapped in the near future, to make way for the a second hand 200kv FEG TEM.

JEOL 1200EX

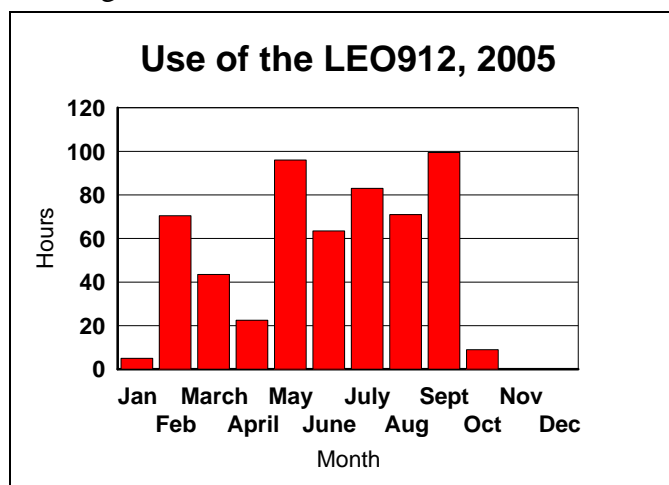
Figure 7: Use of the Jeol 1200EX TEM.



The Jeol 1200EX was fully operational all year and was used for a total of 331 hours, a large increase from 2004. The main usage of this instrument remains the Structural Biology MSc students and the Nitrilase project, The instrument was also used as a back up when the Leo912 was down or fully booked, hence the higher usage in November, when the LEO912 was down. Twenty three people used this instrument.

LEO 912

Figure 8: Use of the LEO 912 TEM



This instrument was used for a total of 563.5 hours by 49 people. The decrease in hours from last year was because the instrument was down in April for 2 weeks due to power supply problems and for 2.5 months at the end of the year because of electronic board failure. It is proving to be the most popular instrument, used by a wide range of researchers.

OTHER MAJOR EQUIPMENT

ULTRAMICROTOME

Use of the ultramicrotome was 377 hours, an increase in the usage in 2004. The departments of Medical Virology, MCB and Institute of Polymer Science used the cryo-ultramicrotomy facilities.

LIGHT MICROSCOPY

All the light microscopes and Zeiss Axiocam continue to be used throughout the year. The fluorescent microscope was mainly used by MCB students and was serviced by Zeiss in October.

FREEZE SUBSTITUTION

Five students made use of the freeze substitution facilities, one from Chemistry, one from Medical Virology, one from ARC - Infrutec, Stelenbosch and two from MCB,

MSSA 2005

MSSA annual conference was held in Durban this year. Prof. Sewell, M Waldron and the Structural Biology MSc students attended the conference.

TEACHING AND EXTENSION

INDIVIDUAL TRAINING

Instrument	Department	Number of Users
Leo 912	MCB	6
	Anatomical Pathology	1
	Chemical Engineering	1
	Medical Virology	1
	Institute of Polymer Science	1

	Structural Biology	1
Jeol 1200EX	MCB	2
	Hatter Institute	1
	Structural Biology	1
	Chemistry (University of Stellenbosch)	1
Jeol 200CX	Chemistry	1
	MCB	1
	Chemical Engineering	1
Leo S440	Chemical Engineering	3
	Physics	2
	CME	1
	Chemistry(UWC)	1
S200	CME	1
Ultramicrotome	MCB	7
	Institute of Polymer Science	3
	Chemical Engineering	2
	Chemistry (university of Stellenbosch)	1

SCHOOL VISITS

Two A level students from Hout Bay International School visited at the end of January. Three A Level students and 15 grade 10 students from Bishops visited in February.

MICROSCOPY FOR BIOLOGISTS

The Microscopy for Biologists course was held in March and attended by 26 MCB honours students.

STRUCTURAL BIOLOGY MSC STUDENTS

Three students from the Structural Biology Masters programme spent 2 weeks in the Unit learning cryo-microscopy as part of their coursework.

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 2005:

Chromatin octamers

T.D. Frouws, H-G. Patterson, B.T. Sewell

The structure of the tubular crystals of histone octamers was re-visited yielding new insights into chromatin packing.

Glutamine synthetase

J. Van Rooyen, V. Abratt, B.T.Sewell

The structure of GSIII from *Bacteroides fragilis* was determined by cryo-FEGTEM

Structure of the nitrilase from Bacillus pumilus, Pseudomonas stutzeri, Rhodococcus rhodochrous and Gloeocercospora sorghi

B.T. Sewell, R.N. Thuku, M.P. Scheffer

The nitrilases are of potential industrial significance. Considerable progress was made on the structures of all. Two papers were published, several more are in preparation.

PUBLICATIONS

Publications for 2005 that resulted from research in which the EM Unit staff have been directly involved are listed:-

- Matiru, V.N., Jaffer, M.A., Waldron, M.E. and Dakora, F.D. (2005) Rhizobial infection of African landraces of sorghum (*Sorghum bicolor* L.) and finger millet (*Eleusine coracana* L.) Promotes plant growth and alters tissue nutrient concentration under axenic conditions. *Symbiosis* 40:7-15
- Sewell, B.T., Thuku, R.N., Zhang, X. and Benedik, M. (2005). The oligomeric structure of nitrilases: the effect of mutating interfacial residues on activity. *Annals of the New York Academy of Sciences*. 1053: 153-159
- Sewell B.T. (2005) Treasure from the molecules of life, *Quest* 2:30-33
- Jandhyala,DM, Willson,RC, Sewell,BT and Benedik,MJ.(2005). Analysis of Three Microbial Cyanide Degrading Enzymes. *Applied Microbiology and Biotechnology*. 68, 327-335
- Kuhnert DC, Sayed Y, Mosebi S, Sayed M, Sewell BT, Dirr HW. (2005) Tertiary interactions stabilise the C-terminal region of human glutathione transferase A1-1: a crystallographic and calorimetric study. *J Mol Biol.* 349, 825-38.
- Published Conference Proceedings**
- Frouws, T.D., Patterson, H.G and Sewell, B.T. Structure of the core histone octamer solved by iterative helical real-space reconstruction.
- Thuku, R.N and Sewell, B.T. The quaternary structure of *Rhodococcus rhodochrous* JI nitrilase as revealed by negative staining.
- 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.
- Balsamo, R.A., Vander Willigen, C., Boyko, W, and Farrant, J.(2005). Retention of mobile water during dehydration in the desiccation tolerant grass *Eragrostis nindensis*. *Physiologia Plantarum*, 124, 336-342.
- Bryuns P. (2005). *Stapeliads of Southern Africa and Madagascar*. 2 Vols. Umdaus Press, Hatfield, South Africa. ISSN 1-919766-33-2/34-0
- Clarke, K.G., Johnstone-Robertson, M., Price, B. and Harrison, S.T.L. (2005). Location of glucose oxidase during production by *Aspergillus niger*. *Applied Microbiology and Biotechnology*. Online publication <http://dx.doi.org/10.1007/s00253-005-0031-9>
- Egan, T.J. And Ncokazi, K.K. (2005). Quinoline antimalarials decrease the rate to β -haematin formation. *Journal of Inorganic Biochemistry*. 99:1532-1539
- Illing, N., Denby, K., Collett, H., Shen, A. and Farrant, J.M. (2005). The signature of seeds in resurrection plants: a molecular and physiological comparison of desiccation tolerance in seeds and vegetative tissues. *Integrative and Comparative Biology*. 45, 771-787.
- Jackson K.M., Nzula M.P., Nxumalo S., and Lang C.I. (2005). Mechanical Behaviour of a Pt-Cr Jewellery Alloy Hardened by Nano-Sized Ordered Particles, in *Integrative and Interdisciplinary Aspects of Intermetallics*, ed. M.J. Mills, H. Inui, H. Clemens and C-L. Fu (Mater.Res. Soc. Symp. Proc. 842, Warrendale, PA, 2005) 5.52: 1-6.

Moore, J., Farrant, J.M., Brandt, W. and Lindsey, G.G. (2005) The South African and Namibian populations of the resurrection plant *Myrothamnus flabellifolius* are genetically distinct and display variation in their galloylquinic acid composition. *Journal of Chemical Ecology*. 31, 2823-2834.

Miller, D. Keraan, T. Park-Ross, P. Husemeyer, V. and Lang, C. (2005). Casting platinum Jewellery alloys, The effects of composition on microstructure. *Platinum Metals Review*. 49 (3) 110-117.

Miller, D. Keraan, T. Park-Ross, P. Husemeyer, V. Brey, A. Khan, I and Lang, C. (2005). Casting Platinum Jewellery alloys, Part II: the effects of casting variables on fill and porosity *Platinum Metals Review*, 49 (4) 174-182.

Newell A J H, Bradshaw D J and Harris P J, (2005). The Effect of Heavy Oxidation Upon Flotation and Potential Remedies for Merensky Type Sulfides. *Australasian Institute of Mining and Metallurgy (AusIMM) Carlton, Australia*, 9: 6-9

Somerset, V.S., Petrik, L.F., White, R.A., Klink, M.J., Key, D. and Iwuoha, E. (2005). Alkaline hydrothermal zeolites synthesized from high SiO₂ and Al₂O₃ co-disposal fly ash filtrates. *Fuel*. 84:2312-2329.

Somerset, V.S., Petrik, L.F. Klink M.J ,Etchebers, O., White R., Key, D. and Iwuoha, E. (2005). Acid mine drainage transformation of fly ash into zeolitic crystalline phases. *Fresenius Environmental Bulletin*. 14(11): 1074-1076.

Somerset, V.S., Petrik, L.F. and Iwuoha, E. (2005). Alkaline hydrothermal conversion of fly ash filtrates into zeolites 2: Utilization in wastewater treatment. *Journal of Environmental Science and Health*. 40(8): 1627-1636.

Wilhelm, M R , Painting, S J, Field, J G, Kerstan, M and Durholtz, M D. 2005. Impact of environmental factors on survival of larval and juvenile Cape anchovy, *Engraulis encrasicolus* (G.) In the southern Benguela upwelling region, determined from hatch date distributions: implications for recruitment. *Marine and Freshwater Research*. 56, 561-572

PhD Theses

Doeschate Kim, Molecular and Cell Biology: Pseudoalteromonas sp. strain C4 as a probiotic for farmed South African abalone, *Haliotis midae*

Macey, Brett, Molecular and Cell Biology: Probiotic effect of *Vibrio midae* SY9, *Cryptococcus sp. SSI* and *Debaryomyces hansenii AYI* on the growth and disease resistance of farmed *Haliotis midae*.

McLeary, James, Institute of Polymer Science: Reversible addition-fragmentation transfer polymerization in heterogeneous aqueous media

MSc Theses

Modutwane, Angel, Chemical Engineering: The optimization of the ZSM-5 catalyst activity with respect to crystallinity

Monjane Adérito, Molecular and Cell Biology: Production of diospyrin by *Euclea natalensis* seedlings and in vitro cultures.

Moumakwa, Donald. Materials Engineering: Tribology in coal-fired power plants.

Tshivhase Mmboneni, Chemistry Kinetics of β -haematin formation in benzoic acid / Gifty.

Zizhou Njodzi, Chemical Engineering: Studies on the fed-batch propagation of brewer's yeast in high gravity wort.

Ongoing projects by users of the Unit

- Beaker, M.** Chemical Engineering: Mapping platinum group minerals in Bushveld samples
- Beaker, J.** Inst. Wine Biotechnology: Transgenic plants expressing Vvpgipl: Analysis of disease resistance pathways.
- Botha, S.** Chemistry, UWC: Preparation of nanofluids for heat transfer application
- Burton, R.** Process Engineering, US: Al-Free Ti-Beta catalyst.
- Carlese, M.** CME: Investigating the hardening behavior of a platinum jewellery alloy.
- Chan, A.** Hatter Inst: Functional role of UCPS in the heart.
- Cheang, V** Chemical Engineering: Preparation of model catalysts for Fischer-Tropsch synthesis.
- Cloete, V.** Polymer Science, US: The development of coatings for recyclable paperboard with minimal moisture vapor transmission rates.
- Delport, E.** Chemical Engineering: Characterization of the Illovo Merebank effluent.
- Dzobo, K.** MCB: Polyphenols in resurrection plants
- Dlamini, S.** CME: A study of the erodent and target material characteristics in erosive wear
- Frahn, M.** Polymer Science, US: Ion-conducting Materials from Polymer Brushes
- Furte, D.** Process Engineering, US: Synthesis of metal oxide nanoparticle catalyst
- Halsey, R.** MCB: Construction and characterization of Chimeric gag VLPs
- Hermont, M-C.** Polymer Science, US: Purpose built block copolymers by emulsion polymerisation.
- Hove, M** .Chemical Engineering: The removal of iron from acid mine drainage by the high density sludge process
- Galada, N.** Biotechnology, UWC: Exploring diversity and ecology of nanoarchaea in hydrothermal biotopes.
- Kramer, J.** Chemistry: Silica based ion exchangers for selective PGM recovery
- Klink, M.** Chemistry, UWC: Novel polyaniline nanotubes
- Koegelenberg, A.** Process Engineering, US: Investigation of the removal efficiency of iron oxide coatings using jet reaction technology and stirred tank vessels
- Kahn, R.** Chemical Engineering: An investigation into the relationship between mineral tailings and filtration efficiency
- Ling, Q.** Chemistry: Characterization of platinum on carbon cathode catalysts
- Maneveldt W.** BCB, UWC: The role of basal crusts in the recruitment of opportunistic algae
- Makara, L.** Chemical Engineering: Fischer-Tropsch hydrocracking
- Mavunda, S.** Chemistry, UWC: Polyamine fly ash composite: Synthesis and characterization
- Manyanga P.** Botany: Systematics of hypodontium
- Mbanjwa, M.** Polymer Science, US: The study of structure - property relationships in polymer layered clay nanocomposites
- McMaster, L.** CPUT: The use of high power ultrasound to disinfect beverages
- McPhearson, C.** Human Biology: Characterization of presumptive corneal endothelium
- Mazaa, M.** Ithemba labs: Nano sciences programme.
- Meletse, T.** CME: Home insulation kit
- McCarthy, J.** Hatter Inst: PKCe and cardioprotection
- Mhlungi, T.** Ithemba Labs: Filled and aligned carbon nanotubes - polymer hybrid nano-composites
- Mortison, L.** Chemical Engineering: Scaling in Solar water heaters
- Ramiah, V.** Polymer Science, US: Synthesis of block polymers using sugar monomers
- Rossouw B.** Process Engineering, US: Gypsum investigation
- Sayer, J.** Human Biology: Albinism and gene therapy
- Sauerbeck, S.** Chemical Engineering: Synthesis of MCM-22 crystals with different Si:Ni ratios
- Silethekwe, N.** CME: Investigation of the hardening behavior of novel platinum alloys
- Shaboodien, G.** Anatomical Pathology: Molecular mechanisms of HIV associated cardiomyopathy.
- Shan, J.** Chemistry, UWC: Electrocatalytic activities in fuel cells
- Schwegmann, A.** IIDMM: Identification of genes involved in the activation of macrophages and subsequent effector "killing" functions against intracellular pathogens.
- Schondelmayer, J.** Dentistry, UWC: Examination of water laser prepared tooth surfaces (enamel and dentin)
- Vatta, L.** Chemistry, US: Application of magnetic nanoparticles as a new means for metal ion separation

van Vuuren, P. Process Engineering, US: Preparation of nanoparticles for the partial oxidation of propene to acrolein.

Welker, C. Chemical Engineering: Stability of ruthenium in the Fischer-Tropsch synthesis.

Yang, L. SAIAMC, UWC. Hydrogen Production

You Qi, Z. Chemical Engineering: Effects of cobalt catalyst structural type on Cr⁺ selectivity in Fischer-Tropsch synthesis.

FINANCE

Details of the Unit's accounts are presented in Table 2. Proposed budget against actual budget for 2005 is shown in Table 3.

OTHER MATTERS

LEAVE BY THE DIRECTOR

The director visited the following Universities in Australia during February 2005, UWA, Perth, UQ, Brisbane and University of Melbourne. The main purpose of the visit was to attend the Lorne conference on protein structure and function and to advise colleagues at the CSIRO on the setting up of cryo-EM. The director also attended the GRC on 3DEM in New London, New Hampshire in June and spent several days at Texas A&M University in July. There were also numerous trips to other South African Universities and to the CSIR in Johannesburg.

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 2005 were: CGI Graphics, Disa cables, Disa Vascular, Engen, Fine Chemical Corporation, Glaxo Smith Kline, Henkel Technologies, iThemba Labs, Marine and Coastal management, One Eighty Degrees, OHI, Pinclip productions, Patterson and Cooke, Saldanha Steel, SANS fibres, Southey and Kantey. These clients almost exclusively use the S440 SEM and the 912 TEM and together accounted for 80.5 hours instrument time.

VISITORS TO THE UNIT

Dr. Mike Lawrence, Dr. Gwen Nneji, Dr Alan Roseman, Professor Edward Egelman and Professor Tom Blundell

SUMMARY

2005 was another successful year for the Electron Microscope Unit in which the majority of targets were met or exceeded. A solution still needs to be found to satisfy on-going equipment needs. The Unit played a pro-active role in stimulating visualization science at all levels.

Prepared by: Mrs M. Waldron and Associate Professor B.T. Sewell

TABLE 1**Services Offered by the Unit during 2005**

Service	Comment
Access to 200CX TEM	Used by 16 people
Access to 1200EX TEM	Used by 23 people
Access to S440 SEM	Used by 92 people
Access to S200 SEM	Used by 1 person
Access to 912 TEM	Used by 49 people
Training on 200CX	3 new users were trained
Training on the 1200EX TEM	5 new users were trained
Training on S440 SEM	7 new users were trained
Training on the 912 TEM	12 new users were trained
Access to Ultracut S Ultramicrotome	Used by 21 people
Training on Ultracut S	13 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	Used
Sputter Coating of specimens supplied by user	Very popular service
Critical point drying of specimens supplied by the user	Very popular service
Printing of EM films	Service used
Access to optical microscopy facilities	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	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	Used
Production of CD ROMS	Used
Digitization of transparent media on LS4500	Used
High quality ink-jet printer	Very popular
Flat bed scanner	Well Used

Table 2

2005			External					Total
	Operating	Services	Equipment	Consumables	Maintenance			
	000516	001258	170025	000933	000995			
Opening Balance	29,516	241,707	51,300	33,912	158,472		514,907	
Surplus/(Deficit) for the year	(20,671)	4,730	276,092	4,791	(19,846)		245,096	
Income	124,533	63,744	561,175	68,409	154,933		972,794	
Expenditure	(145,204)	(59,014)	(285,083)	(63,618)	(174,779)		(727,698)	
Closing balance	8,845	246,437	327,392	38,703	138,626		760,003	
Income								
Grant Transfers	23,910		306,949				330,859	
Budget allocation	100,623		254,226				354,849	
Internal				58,522	152,693		211,215	
External recoveries		63,744					63,744	
Sales revenue				9,887	2,240		12,127	
Total	124,533	63,744	561,175	68,409	154,933		972,794	
Expenditure								
Staff Training	500							
Admin/Operating						95		
	Tel, Postage, fax	19,772	2,001					
	PC Consumables	5,656	620		1,811			
	PC Components					1,324		
	Photocopying/Printing	3,145						
	Stationery	871	645			1,228		
	Travel & Conferences	19,960	11,334			71,944		
	Cleaning	57	457					
	Utilities	9,792	420		19,881	895		
	Periodicals	2,171						
	Petty cash		1,058					
	Space & Facilities			672				
	Repair & Maintenance	4,093	20,096			85,711		
	General Operating	38,949	12,383	42,323	40,776	11,082		
	Minor Equipment	4,612				2,450		
Equipment		35,626		242,088	1,150	50		
Grant Transfer			10,000					

Table 3

	2005 Proposed Budget	2005 Actual Budget
Staffing: Academic recurrent	1,425,524	1,425,524
Staff Training		500
Administration and Operating Expenses		
Telephone costs	16,601	19,772
Books and Periodicals	1,250	2,171
Computer consumables	4,314	5,656
Laboratory Supplies	10,000	38,949
Equipment (Security system)		24,255
Printing costs	3,760	3,145
Stationery costs	3,314	871
Subscriptions	3,650	
Computer Equipment (non-capital)	9,868	7,313
Office Furniture	4,737	4,058
Teaching Equipment	11,148	4,612
Space Renewal		
Repainting rooms	500	
Other	3,000	
Space and Facilities		
Cleaning	1,677	57
Utilities		
Gas	4,444	9,792
Other	5,659	4,093
Other		
Other Costs	16,700	19,960
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Expenditure	1,526,146	1,570,728
Cost Recoveries		(44,582)
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Total Expenditure	1,526,146	1,526,146

2004 User list

*indicates Microscope users

ARC Infrutec	Burger, A.	Staff*
Botany	Aguilar, G	Staff
	Cramer J	Staff
	Hedderson, T	Staff
	Herron, M.	Staff
	Phelex F.	Staff*
	Smart, P.	Staff
	Trinder-Smith,T	Staff
	Verboom, T	PhD
	Zitha, E.	Hons*
Cape Technikon, Dept Chem Eng Food Biotechnology	Sheldon, M.	Staff*
	McMaster, L.	Staff*
	Voschenic, M	MTech*
Cardiology	Shaboodien, D.	PhD*
Centre for Materials Engineering	Carelse, M.	MSc*
	George, S	Hons*
	Katusha, P.	Hons*
	Knutsen, R.	Staff*
	Lang, C.	Staff*
	Marcus, K.	Staff*
	Marekwa,M.	MSc*
	Meletse, T.	MSc*
	Miller, D.	Staff*
	Moerat, N.	Hons*
	Moumakwa, D	MSc*
	Mpho, M	MSc*
	Nzula, M.	PhD*
	Ofusu, A	Hons*
	Park-Ross, P.	Staff*
	Smit, M	Hons*
	Silethelwe, N.	MSc*
Chemistry	Egan, T.	Staff*
	Mabotha, T.	MSc*
	Webber, D.	MSc*
	Welcome, N.	Hons*
Chemical Engineering	Baskhuizen, D.	MSc*
	Becker, A	MSc*
	Blignaut,A	MSc*
	Cairns, P.	MSc*
	Chang, L	MSc*
	Delpont, E.	MSc*
	Dlamini, T	MSc*
	Fei, Y.	Staff*
	Hove, M.	PhD*

	Khan, P	MSc*
	Lewis, A.	Staff*
	Makara, L.	MSc*
	Mortison,L	PhD*
	Ncokasi, K.	Staff*
	Ntuli, F	MSc*
	Newell, A.	Staff*
	Parolis, L.	Staff*
	Pockock, F.	Staff*
	Ralefala, A	MSc*
	Sauerbeck, S.	Staff*
	Taty C.	PhD*
	Viljoen, E.	PhD*
	Welker, C.	PhD*
	You Q.	PhD*
D Cables	Rykleif B.	Staff*
Disa Vascular	Lehman, M.	Staff*
	Park, K.	Staff*
Engen	Cracknell, B.	Staff*
Fine Chemical Corporation		
	Loedolf, J.	Staff*
Geological Sciences	Compton, J.	Staff*
	Herbert C.	MSc*
	Netshitungulwana R.	PhD*
	Smith, M.	PhD*
Glaxo Smith Kline	Van Balleygooyen, J.	Staff*
Hatter Institute	Chan, A	MSc*
	McCarthy, A	MSc*
Henkel Technologies		
	Werner, H.	Staff*
Human and Cell Biology		
	Mc Phearson	PhD*
	Napier, H.	MSc*
IIDMM	Schwegmann, A.	PhD*
iThemba Labs	Fasasi, P	Staff*
	Mahlungu, G	Staff*
	Mazaa, M	Staff*
	Praise, P	MSc*
	Tshepo, P	MSc*
Molecular and Cell Biology		
	Aderito, V	PhD*
	Brandt, W.	Staff*
	Cooper, K.	Staff*
	Cope, J.	Hons*
	Coyne, V.	Staff*
	Cross, C.	MSc*
	Dzobo,K	MSc*
	Farrant, J.	Staff
	Fereira,R	MSc*
	Halsey, R	MSc*
	Hunt, B	Staff*
	Illing, N	Staff*
	Jaffray, A	Staff*
	Kamngora,A	MSc*

	Lin, E	MSc*
	McCain, J	MSc*
	Meyers, P	Staff *
	Moore, J	MSc*
	Pillay, P	Staff
	Roden, S	MSc
	Rybicki, E	Staff*
	Shamrock, V	MSc
	Shepherd, D	Staff
	Theron, G	MSc
	Visser, V	Staff
Marine and Coastal Management		
	Benedict, H.	Staff*
Mechanical Engineering		
	Tait, B.	Staff*
Medical Biochem	Gordon, P	MSc*
Medical Virology	Mgweba, T.	Staff*
Oceanography	Bernard, S.	PhD
	Waldron, H.	Staff
One Eighty Degrees	Basson, J.	Staff*
OHI	Van Rensburg, B.	Staff*
Patterson and Cooke	Magubane, T	Staff*
	Myburg, H	Staff*
Pharmacology	Hoppe, H.	Staff*
	Weber, B.	MSc*
Physics	Adegebite, O.	PhD*
	Goro, G	PhD*
	Ntosane, T	PhD*
	Nsengiyumva, S	PhD*
	Topic, M.	Staff*
	Sigeau Z.	MSc*
Pinclip Industries	Phibbs, B.	Staff*
Saldanha Steel	Baard, A.	Staff*
	Schlettwein, N.	Staff*
Structural Biology	Ndoriah R.	MSc*
	Frouws, T.	MSc*
	Varsani, A.	Staff*
	van Rooyen J.	MSc*
	Scheffer, M.	MSc*
Southey Kantey	Barnes, N.	Staff*
University of Stellenbosch		
Agriculture	Scoltz, A.	PhD*
Chemistry	Furter, L	PhD*
	Vatta, L.	PhD*
Inst. Polymer Science		
	Al-Kaabi, K	PhD*
	Cloete V	PhD*
	Ganeva, D	PhD*
	Greyling, C	PhD*
	Etmini, H	MSc*
	Frahn, M.	Staff*
	Matahwa, H	PhD*
	Ramiah, V	PhD*

	Skillington, Pauline	Staff*
	Smit, Eugene	MSc*
Process Engineering		
	Blaauw, G	MSc*
	Koegelenberg, P	MSc*
	Rossouw, B	MSc*
	Van der walt, S	PhD*
University of the Western Cape		
BCB	Schondelmeyer, J.	Staff*
	Maneveot, J	MSc*
Chemistry	Botha	MSc*
	Galada, R	MSc*
	Kazi,N	PhD*
	Meyer, D	MSc*
	Ndungu, P	PhD*
	Qi L	MSc*
	Wilson, K	MSc*
	Zimboneni T	MSc*
Zoology	Branch M	Staff*
	Daly, T	Hons*
	Duthie. S	Hons*
	Hockman, Steve	MSc*
	Tummen, S	Hons*

* Microscopy Users 147

Non Microscopy Users: 16