

ELECTRON MICROSCOPE UNIT
ANNUAL REPORT
2003

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

August 2004

HIGHLIGHTS OF 2003

PURCHASE OF LEO 912 TEM

The refurbished Leo 912 (120kV) microscope, new 2k x 2k camera and tomography software were delivered and installed during May and June. The microscope has a built-in energy filter and is enhanced by fitting our existing SIT camera for a cost of R70k, which came from the EMU equipment budget - this enables rapid specimen scanning. Mohamed Jaffer, Brendon Price, Liz vd Merwe and Trevor Sewell were trained as operators and will provide access to other users. In order to accommodate the new LEO 912, the Zeiss EM109 was decommissioned, packed and stored in the Unit. We have committed ourselves to attempting to raise an additional R3m more for 200kV EFTEM to meet the needs of materials engineering. If we raise this money the 912 will be taken back, the cameras and s/w will be transferred to the new instrument.

IIDMM ELECTRON MICROSCOPY FACILITY

The plans formulated over several years to create a satellite of the Electron Microscope Unit in the IIDMM were scrapped by the Acting Director of the Institute. The reasons advanced were lack of funds and the fact that resources were readily available on the upper campus. Building modifications necessary to accommodate EM equipment were deleted from the plans and were not implemented. The Director of the EMU wishes to express his dissatisfaction at the lack of process leading to the undoing of years of planning and work in an apparently ad hoc fashion. It is very difficult to take University planning processes seriously under these conditions..

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. 6 students enrolled in the programme in 2003. 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.

RETIREMENT OF MR. WILLIAMS

Mr. William Williams (departmental assistant in the EMU) took early retirement at the end of 2003. His contribution to the University over more than 30 years is greatly appreciated. His post was filled in January 2004 by the re-deployment of Mr. Sean Karriem from the Chemistry Department.

APPOINTMENT OF DR. VARSANI

Dr. Arvind Varsani was appointed as a lecturer in the Structural Biology programme.

BUILDING ALTERATIONS

Before the new Leo 912 microscope was installed, the room was repainted and new flooring and a lab bench were installed.

MEETINGS OF THE ELECTRON MICROSCOPE UNIT COMMITTEE

A meeting of the EMU Committee was held on 19 August 2003. Those attending were Professor L. Nassimbeni (Acting Chairman), Professors D. Reddy, E.P. Rybicki, W. Gevers and A. Azad, Associate Professors C. Lang and B T Sewell, with Ms C. Windvogel and Ms J Erasmus in attendance. The meeting approved the 2002 annual report and budget for 2004.

MAJOR EQUIPMENT PURCHASES IN 2003

The following capital items were purchased: Leo 912 TEM, TV adaptor for Leo TEM, differential gun pumping system for Leo TEM, zeolite trap for Leo TEM, Diatome diamond knife, Leo 912 film holder, fluorescent screen for Zeiss 109. Money for the Cryo holder (R200k) was raised by application to the

NRF equipment programme and money for the differential pumping system (R200k) was raised by application to THRIP.

USE OF THE UNIT

Services provided by the Unit during 2003 are listed in Table 1. Frequent usage was made of all key services of the Unit. Interestingly the EMU has become a vendor for liquid nitrogen and printing services for some non-microscope users.

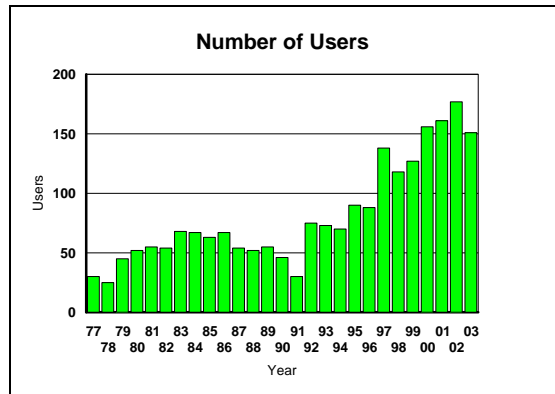


Fig 1: Number of users of microscopy facilities per year since 1977

One hundred and forty eight people made use of the microscopy services of the Electron Microscope Unit in 2003. In addition, a further 21 users utilized services other than those related to microscopy, notably the Imaging Centre, CD writing and liquid nitrogen purchase. Approximately 1131 litres of liquid nitrogen were supplied to other departments from the Unit. 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 2440 hours in 2003 which is 741 hours higher than the usage in 2002. This increase is largely due to the fact that the S200 was used for 942 hours EBSD, compared with 188 hours in 2002. There was a slight decrease in the time spent on the other instruments, due to down time and the introduction of the Leo 912 halfway through the year.

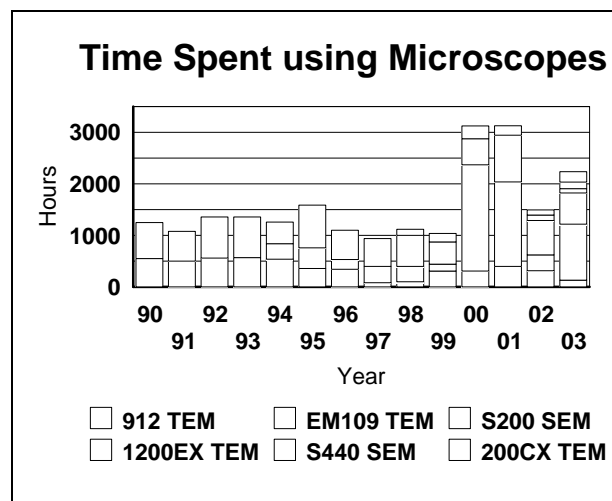


Figure 2: EM Unit's microscope usage hours since 1990.

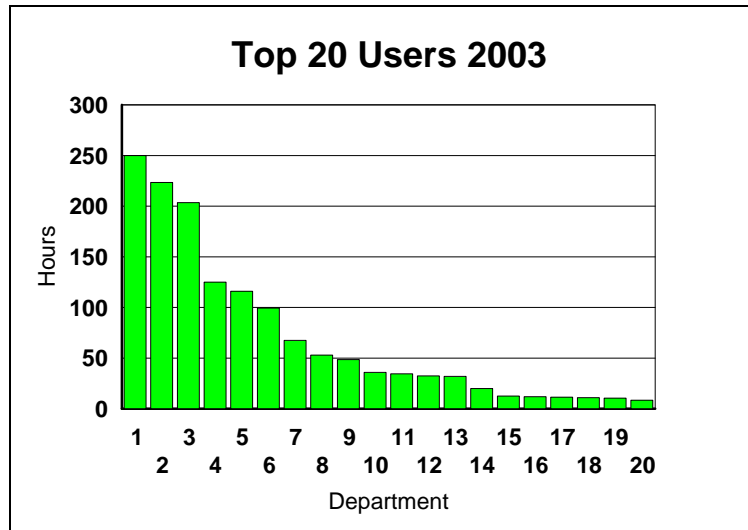


Figure 3: Microscope usage by department, institution or company

Order is as follows:

1	Materials Engineering (1041 hrs)	11	Virology (34.5 hrs)
2	Human Biology (224 hrs)	12	Zoology (32.5 hrs)
3	EMU (203 hrs)	13	Physics (32 hrs)
4	MCB (125 hrs)	14	Namakwa Sands (20 hrs)
5	University of Stellenbosch (116 hrs)	15	Cape Technikon (12.5 hrs)
6	Chemical Engineering (100 hrs)	16	Chemistry (12 hrs)
7	UWC (67.5 hrs)	17	Patterson & Cooke (11.5 hrs)
8	Geological Science (53 hrs)	18	Pharmacology (11 hrs)
9	180 Degrees (48.5 hrs)	19	iThemba labs (10.5 hr)
10	Department of Agriculture (36 hrs)	20	Botany (8 hrs)

ELECTRON MICROSCOPES AND ASSOCIATED EQUIPMENT

LEO STEREOSCAN S440

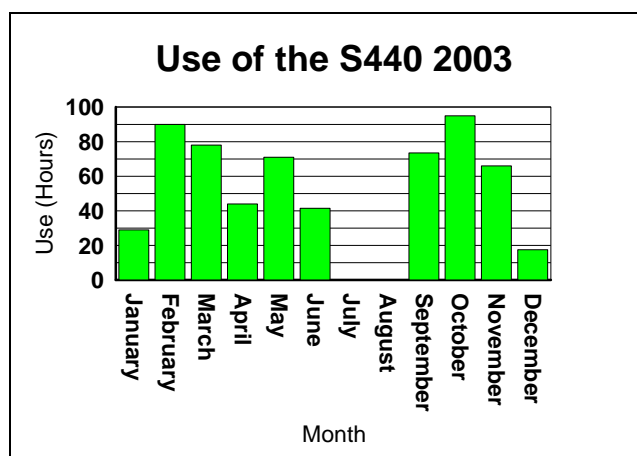


Figure 4: Use of the Leica S440 SEM

The S440 was used for a total of 605.5 hours which is a slight decrease on the usage for 2002. Forty nine people from UCT made use of the instrument and there were 35 outside users. Use of this instrument remains the most popular service rendered by the Unit. The microscope was down for approximately 8 weeks in July and August due to a damaged turbo pump, turbo pump controller,

vacuum logic board and IG pump power supply. The damage occurred as a direct result of a power cut to the building and a possible failure of the vacuum protection system. Despite considerable efforts to repair the vacuum board and turbo pump controller, new components had ultimately to be purchased from LEO.

CAMBRIDGE S200 SEM

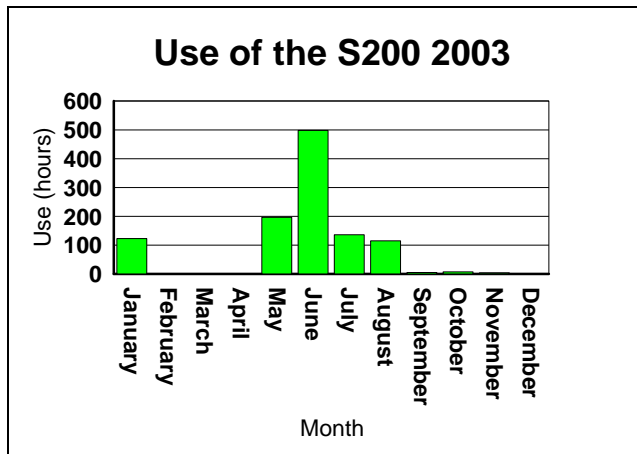


Figure 5: Use of the Cambridge S200 SEM

The S200 was used in total for 1086.5 hours, which is a large increase in usage from 2002. Three people used the EBSD and 14 people, five 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.

JEOL 200CX TEM

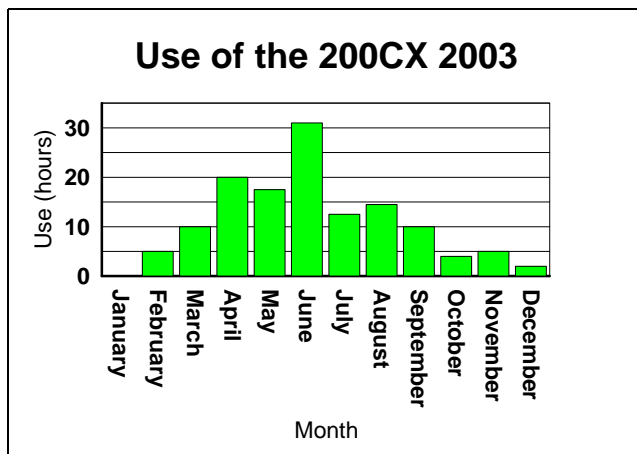


Figure 6: Use of the Jeol 200CX TEM.

Use of the 200CX TEM was 131 hours, a substantial decrease in usage from 2002 (314 hours). It was used by 16 people from UCT and 5 outside users. The decrease in hours is partially due to the decrease in projects from Materials Engineering, and the introduction of the LEO 912 in the second part of the year. The microscopes reliability is severely compromised by its age and it is gradually failing at a number of points. In spite of this, demand remains. Continued expensive maintenance of this instrument will remain imperative until an alternative way of doing experiments requiring the 200kV and versatile tilting capability can be found.

ZEISS EM109 TEM

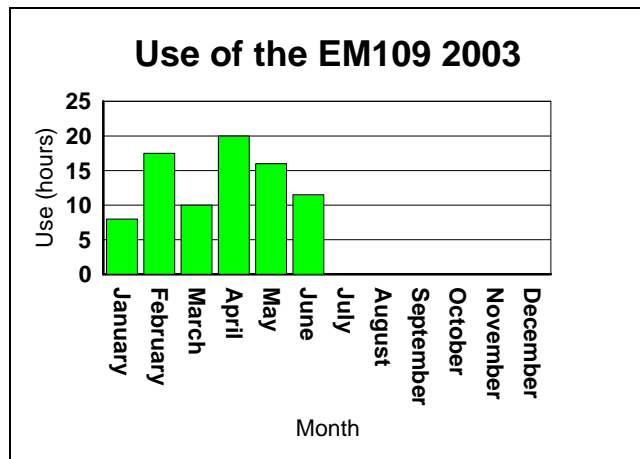


Figure 7: Use of the Zeiss EM109 TEM.

Use of this instrument was 83 hours in the first 6 months of the year. The instrument was decommissioned and put into storage in June to make room for the Leo 912. The 109 was used by 10 people from UCT and 2 outside users and remained a reliable instrument.

JEOL 1200EX

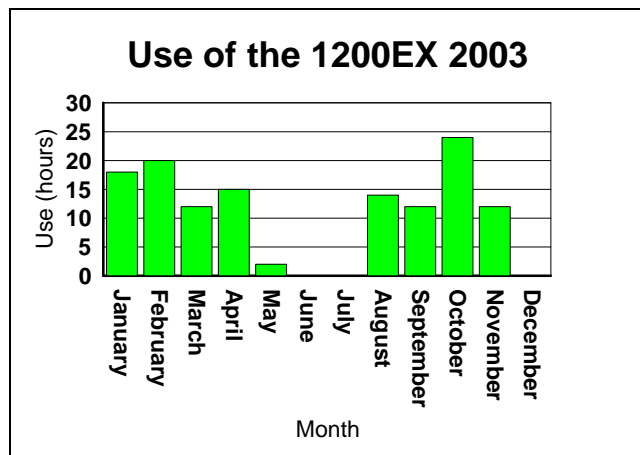


Figure 8: Use of the Jeol 1200EX TEM.

The Jeol 1200EX was fully operational all year and was used for a total of 129 hours, by 5 users from UCT. At the present time, this instrument is being used primarily for the Director's research. It is the only instrument with a functioning cryo-capability.

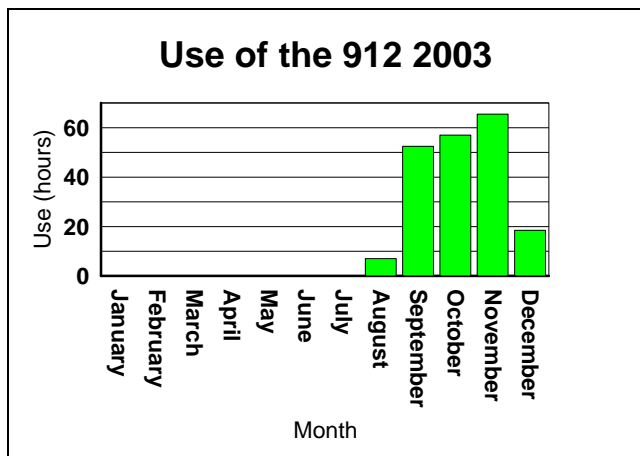


Figure 9: Use of the LEO 912 TEM.

This instrument was used for training purposes in July and available to users from August. It was used for a total of 83 hours by 20 people from UCT and 2 outside users. It is already proving to be a popular instrument.

OTHER MAJOR EQUIPMENT

ULTRAMICROTOME

Use of the ultramicrotome was 203.5 hours, virtually the same as the usage during 2002.

LIGHT MICROSCOPY

All the light microscopes were used during the year, although the usage dropped off when the Zeiss Axiocam digital was returned to the manufacturer to have the scratched lens replaced. This took longer than anticipated due to the agent’s apathy and a mix-up between the agent and the manufacturer. The Axiocam was not returned to us until March 2004.

IMAGING CENTRE

The imaging centre continued to be popular for printing although the demand for scanning slides and negatives has dropped slightly, probably due to the fact that most cameras are now digital. The HP2000C printer had a high usage and was used for printing several theses and plates for publications. Furthermore considerable unlogged use was made of the Leafscan 45 acquired by the director for his research.

PROBLEM AREAS

- 1) The digital infrastructure of Electron Microscope Unit is approaching 10 years old. Most of it urgently needs replacement in order to meet the objectives described in operational plan.
- 2) The substantial increase in the use of liquid nitrogen requires appropriate safety equipment. No budget has been allocated to this to date.
- 3) The substantial increase in research activity has created problems, the most noticeable of which is the complete absence of laboratory space for the preparation of protein material for structural studies. It should be noted that although the Director has the obligation to perform research, no personal laboratory space has been made available to him by the University.

MSSA 2003

MSSA annual conference was held at UCT this year, run by the Centre for Materials Engineering. Miranda Waldron was also on the organising committee. The conference attracted 160 delegates and was strongly biased towards materials science. Prof. Sewell, Brendon Price and Mohammed Jaffer attended the conference.

TEACHING AND EXTENSION

INDIVIDUAL TRAINING

200CX: Seven users from the departments of Chemistry, Chemical Engineering, Molecular and Cell Biology and Polymer Science (University of Stellenbosch).

EM109: Three users from the department of Molecular and Cell Biology.

S440: Three students from Archaeology, Materials Engineering, and Chemical Engineering.

S200: One new user Chemical Engineering.

1200EX: Seven users from the Structural Biology MSc and EMU.

LEO 912: Eighteen users from the Departments of Agriculture, Chemical Engineering, EMU, Human Biology, Medical Virology, Molecular and Cell Biology and Structural Biology MSc

Ultramicrotome: Eight new users from the Departments of Agriculture, Chemical Engineering, iThemba Labs, Polymer Science (University of Stellenbosch) and Molecular and Cell Biology.

SCHOOL VISITS

Three A level Students from The Hebrew Academy visited in March 2003. Eight A level students from the International School visited in August 2003.

MICROSCOPY FOR BIOLOGISTS

The Microscopy for Biologists course was held in March and attended by 24 MCB honours students.

STRUCTURAL BIOLOGY MSC STUDENTS

Six students from the Structural Biology taught Masters programme spent 2 weeks in the Unit. They were taught cryo TEM on the Jeol 1200EX and how to operate the Leo 912 TEM

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

The study on juvenile anchovy caught between 1998 and 2000 is still ongoing. Mr. Elliott Weni is continuing his MSc on sardine otoliths, Ms Margit Wilhelm graduated with her MSc.

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. The paper describing this work has been submitted and the grant under which it was done has terminated.

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

B.T. Sewell, B Price and P Chang

The cyanide degrading enzymes are of potential industrial significance. We have now solved six structures at varying resolutions by single particle techniques. Two papers resulted from this work during 2003.

PUBLICATIONS

Publications, for 2003, that resulted from research in which the EM Unit staff have been directly involved are listed:-

Kirsch, R., Clarkson, V., Shephard, E.G., Marais, D. A., Jaffer, M.A., Woodburne, V.E., Kirsch, R.E. and Hall, P.M.(2003) A rodent nutritional model of non-alcoholic steatohepatitis: Species, strain and

gender difference studies. *Journal of Gastroenterology and Hepatology*.

Matiru V. N., Jaffer M.A., Waldron M.E. and Dakora F.D. (2003) Desiccation and Damage. *Desiccation and Plant Survival*. (Eds M. Black and H. Pritchard). CAB International, London.

Schroeder, D.C., Jaffer, M.A. and Coyne, V.E. (2003) Investigation of the Role of a b(1-4) Agarase produced by *Pseudoalteromonas gracilis* B9 in Eliciting Disease Symptoms in the Red Alga, *Gracilaria gracilis*. *Microbiology*. **149**, 2919-2929.

Vander Willigen C, C., Pammenter, N.M, Jaffer, M.A., Mundree, S.G. and Farrant J.M. (2003) An ultrastructural study using anhydrous fixation of *Eragrostis nindensis*, a resurrection grass with both desiccation-tolerant and -sensitive tissues. *Functional Plant Biology* **30**, 281-290.

Varsani, A., Williamson, A. L., Rose, R. C., Jaffer, M., and Rybicki, E.P. (2003). Expression of Human papillomavirus type 16 major capsid protein in transgenic *Nicotiana tabacum* cv. Xanthi. *Arch.Virol.* **148**,1771-1786.

Jandhyala, D., Berman, M., Meyers, P.R., Sewell, B.T., Willson, R.T., and Benedik, M.J. (2003). CynD, the Cyanide Dihydratase from *Bacillus pumilus*: gene cloning and structural studies. *Appl. Environ. Microbiol.* **69**, 4794-4805.

Sewell, B.T., Berman, M., Meyers, P.R., Jandhyala, D., and Benedik, M.J. (2003). The Cyanide Degrading Nitrilase from *Pseudomonas stutzeri* AK61 Is a Two-Fold Symmetric, 14-Subunit Spiral, Structure, **11**, 1413-1422.

Published Conference Proceedings

Basson, I.J. and Viola, G. Passive kimberlitic fluid emplacement into dilating dyke-fracture arrays in South Africa. *Lithos - Proceedings of the 8th International Kimberlite Conference*.

V. N. Matiru, M.A. Jaffer, M.E. Waldron and F.D. Dakora, Rhizobial colonization of roots of African landraces of sorghum and millet. *Proceedings of the Microscopy Society of Southern Africa, Volume 33*.

W.C. Michaels and M.E. Waldron. SEM as an investigative tool for analysis of combustible casing failure. *Proceedings of the Microscopy Society of Southern Africa, Volume 33*.

B.T.Sewell and P.R. Meyers. Structural bioinformatics and the interpretation of low resolution, 3D maps from negative stain EM. *Proceedings of the Microscopy Society of Southern Africa, Volume 33*.

Seewoo, S., van Hille, R. and Lewis, A.E., 2003. Control of the morphology of gypsum in the desupersaturation reactor used in the SPARRO process, 5th WISA-MTD Workshop: Membrane Developments in Waste Minimisation, Water Treatment and the Process Industry, Vereeniging, 30 March – 2 April 2003.

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.

Collett, H., Butowt, R., Smith, J., Farrant, J. and Illing, N. (2003). Photosynthetic genes are differentially transcribed during the dehydration-rehydration cycle in the resurrection plant, *Xerophyta*

humilis. Journal of Experimental Botany, **54**, 2593-2595.

Farrant, J.M., Bartsch, S., Loffell, D., Dander Willigen, C. and Whittaker, A. (2003). An investigation into the effects of light on the desiccation of three resurrection plants species. Plant Cell and Environment **26**, 1275-1286.

Kurzweil, H. and Chesselet, P. (2003) Studies in the genus *Machairophyllum* (Mesembryanthemaceae), with notes on some related genera. Bothalia **33**,1:13-39.

Lewis, A.E., and Roberts, M., (2003). Using fractal structure and flow properties to describe morphology of nickel crystals, Journal of the Minerals, Metals and Materials Society **55**, no.2:59-61.

Roberts, M. and Lewis, A.E. (2003). Three phase mixing studies for nickel precipitation, Minerals Engineering, **16**, no.9: 881-883.

Solomon, M.S. and Petersen, F.W. (2003). Membrane Bioreactor production of Lignin and Manganese Peroxidase. An International Newsletter: Membrane Technology. Elsevier Advanced Technology. **144**: pp 6-8.

Webber, D. Rodgers, A.L. Sturrock E. D. (2003) Selective inclusion of proteins into urinary calcium oxalate crystals: Comparison between stone-prone and stone-free population groups. Urology Research **39**:83-88.

Vicre M., Farrant, J.M., Gibouin, D and Driouich, A. (2003) Resurrection plants: how to cope with desiccation? Recent Research Developments in Plant Biology, **3**, 69-93.

Walford, S.A., Thomson, J.A., Farrant, J.M. and Mundree, S.G. (2003). The HSP90 family of chaperones: a look at the structure function and mode of action. Trends in Plant Biology **4**, 1-25.

M.Sc Theses

Koen, Louis (Chemical Engineering, University of Stellenbosch) The micronisation of synthetic waxes.

Kumwenda, M (Botany, University of Stellenbosch) A palynological study of *Heliophila* (Brassicaceae) in southern Africa.

Lamaiguere, Valerie (Chemical Engineering) Effects of hydrodynamic stress on growing *Saccharomyces cerevisiae* in a slurry reactor .

Midleton, Xavier, (Geological Sciences): Petrographic and geochemical evidence for the origin of phosphorites and phosphate rocks from the West Coast of South Africa.

Ncanana, Sandile (Botany) Biolistic-mediated transformation of *Eragrostis Curvula* with the HSP 12 gene.

Petrik, Leslie (Chemistry, UWC) Nanophase composite catalysts for electrosynthesis.

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

Phala, Noko (Chemical Engineering): A density functional theory study of methanol synthesis catalysed by gold.

Sello, Maitse (Centre for Materials Engineering) A comparative evaluation of manufacturing technologies and their effect on morphology and mechanical properties of poly-(propylene-ethylene) copolymers.

Seewoo, Shilpa (Chemical Engineering). Control of the desupersaturation reactor used in the SPARRO process.

Simpson Keryn (Geological Sciences). Foraminiferal species distributions and sedimentological dynamics of the Knysna Estuary, South Africa.

Solomon, M.S.(Cape Technikon) Membrane bioreactor production of Lignin and Manganese Peroxidase.

Wilhelm, Margit (Zoology), Hatchdate distributions and growth rates of anchovy (*Engraulis encrasicolus*) in the Southern Benguela ecosystem

PhD Theses

De Vries, E (Chemistry). Inclusion of alkylparabens in cyclodextrins.

Franceschini, Giuliana (Geological Sciences) Geology of aeolian and marine deposits in the Saldanha Bay region, Western Cape, South Africa.

Moon, Gillian (Chemical Engineering). Alkylation of phenol with methanol over H-ZSM-5, H-Beta, H-Mordenite, H-USY and H-MCM-22 .

Li, Jianxin (Institute of Polymer Science) Real-time investigation of fouling phenomena in membrane filtrations by a non-invasive ultrasonic technique.

Rau Amanda (Geological Sciences). A late quaternary history of Agulhas-Benguela interactions from two sediment cores on the western continental slope of South Africa.

Van Zyl, Andre (Institute of Polymer Science). Synthesis, characterization and testing of nano-structured particles for effective impact modification of glassy amorphous polymers.

Varsani, Arvind (MCB) Development of candidate Human papillomavirus vaccines.

FINANCE

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

OTHER MATTERS

LEAVE BY THE DIRECTOR

The director took three weeks leave in May to attend a Biophysical society meeting in California and meet with Professor Benedik in Houston. He also spent five days on acceptance testing of our new Leo 912 at the Zeiss factory in Oberkochen.

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 2003 were: De Beers, Fine Chemical Corporation, Henkel Technologies, iThemba Labs, National Botanical Institute, Namakwa Sands, One Eighty Degrees, Patterson and Cooke and Plascon. These clients almost exclusively use the S440 SEM and together accounted for 112 hours instrument time.

VISITORS TO THE UNIT

Professors Helen Saibil, Sir Tom Blundell, Edward Egelman and Dr. Mike Lawrence all visited in connection with the Structural Biology programme.

SUMMARY

The Unit is undoubtedly the most successful in the country. The range of equipment and expertise available to users is considerable. Indeed there are probably only a small number (< 100) of units in the world which can offer the range of services and quality which we do and they certainly cost a great deal more money to run. Having said this it must also be stated that we have a significant hardware disadvantage. We have been able to catch up in terms of expertise through the judicious acquisition of second hand instruments but we are certainly not yet able to satisfy a number of our clients and our infrastructure remains fragile. Much of our computer system is almost ten years old and we have been unable to afford all the safety equipment we require for the use of liquid nitrogen.

Prepared by: Associate Professor B.T. Sewell

Director

23 July 2004

TABLE 1
Services Offered by the Unit during 2003

Service	Comment
Access to 200CX TEM	Used by 21 people
Access to Leo 912 TEM	Used by 20 people
Access to 1200EXII TEM	Used by 5 people
Access to S440 SEM	Used by 84 people
Access to S200 SEM	Used by 17 people
Access to the EM109 TEM	Used by 12 people
Training on 200CX	5 users were trained
Training on the Leo 912	18 New users were trained
Training on S440 SEM	4 new users were trained
Training on S200	1 new user was trained
Training on the EM109 TEM	Used in courses. 7 users individually trained
Access to Ultracut S Ultramicrotome	Used by 21 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	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
Access to optical microscopy facilities	Used
Access to Image Analysis (GENIAS)	Not used.
Access to Image Processing and Analysis (SiS)	Used
Element analysis by EDS	Well used.
Cryo SEM	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, Instrument is broken pending the availability of a budget for its repair.
Production of CD ROMS	Well Used
Digitization of transparent media on LS4500	Used
Dye sublimation printer	Not used, this technology is now too expensive and has been replaced by ink jets.
High quality ink-jet printer	Very popular
Flat bed scanner	Well Used

Table 2

Electron Microscope Unit

**Actual Income and Expenditure,
2003**

	Total	Operating Fund 000516	Ext Services Fund 1258	Equipment Fund 170025	Consumables Fund 0933	Maintenance Fund 0995
Opening Balance	78289	22878	174977	-201529	31618	50345
Surplus/(defecit) for the year	64202		56927		17457	-10182
Income	562350	103335	77427	227829	55746	98013
Direct expenditure	-108680	80457	-20500	-315121	38289	108195
Closing balance	408434	0	231904	87292	49075	40163
Income	562350	103335	77427	227829	55746	98013
Budget allocation	103335	103335				
Fees: Facilities internal	152304		14550		41741	96013
Fees: Facilities external	78882		62877		14005	2000
Expenditure	562562	80457	20500	315121	38289	108195
Staffing: Total	1082285					
Staffing: Permanent	19					19
Staffing: Ad Hoc	9483					9483
Admin/operating						
Telephone, postage, fax	19963	17998	1965			
Catering	718	718				
Marketing						
PC Cons and software	16708	1931			6235	8542
Lab Supplies						
Photocopying/printing	1108	1108				
Stationery	4627	2128			2499	
Subscriptions						
Travel	1832		1832			
Conferneces						
Cleaning etc						
Utilities	22791	10033			12758	
Operating	39537	8493	2803		15793	12448
Repairs and Maint	87858	9701	400	12358		65399
Floats	3203	3203				
Equipment: Fixed Assets	15064			15064		
Equipment: teaching/research	104400	10580	13500	74936	1004	4380
Equipment: Support	564108			282054		
Equipment non cap	28136	14564		5648		7924

2003 User list

*indicates Microscope users

Agricultural Research Council

Disease Management

Howell, Carolyn Staff*

Wood, Alan Staff*

Weed Pathology *Lennox, Cheryl* Staff*

Anatomical Pathology

Kirsch, Richard Staff*

Archaeology *Miller, Duncan* Staff*

Newton, Ian MSc*

Rosenstien, Dana PhD*

Botany *Archibald, S* Staff

Aguilar, Gonzalo Staff

Al-Farsi, Amina PhD*

Anderson, B MSc

Chiphane, S Staff

Griffin, N Hons

Gwynne-Evans, D Hons*

Hedderson, T Staff

Kumwenda, A MSc*

Pauw, Anton PhD

Trinder-Smith, T Staff

Verboom, T PhD

Vetter, S Hons

Whitehouse, C MSc

Cape Technikon,

Dept Chem Eng

Soloman, Marshal Staff*

Small, Hanneli Staff*

Wallen Mtech*

Cape Heart Centre *Higham, Lawrence* MSc*

Mathews, Martin Staff*

Moulde, M Staff

Samodien, Nazlia Staff

Centre for Materials Engineering

Carelse, Muneeba Hons*

Keraan, Tauriq MSc*

Klaas, Nkosana MSc*

Knutsen, Rob Staff*

Lang, Candy Staff*

Lehobye, Mali Hons*

Marekwa, M Msc*

Marcus, Kashif Staff*

Meletse, Thabo MSc*

Moumakwa, Donald MSc*

Netangaheni, Phumudzo MSc*

Parker, Sa-adat Msc*

Park-Ross, Penny Staff*

Sandile, John MSc*

Stando, E Msc*

Silethelwe, Nxumalo MSc*

Topic, Mira. Staff*

Chemistry	<i>Benson, Sally</i>	<i>MSc*</i>
	<i>Deppa, Ntsapo</i>	<i>PhD*</i>
	<i>Linder, Peter</i>	<i>Staff*</i>
	<i>Mavindle, Siph</i>	<i>Hons*</i>
	<i>Oliver, Clive</i>	<i>PhD*</i>
	<i>Siele, Tewolde</i>	<i>Msc*</i>
	<i>Welcome</i>	<i>PhD*</i>
	<i>Wagie, F</i>	<i>MSc*</i>
Chemical Engineering		
	<i>Balasundaram</i>	<i>PhD*</i>
	<i>Callaann, L</i>	
	<i>Claeys, Michael</i>	<i>Staff*</i>
	<i>Johnston-Robertson, M</i>	<i>Msc*</i>
	<i>Kleinschmidt Jaques</i>	<i>MSc*</i>
	<i>Mabaso, Itai</i>	<i>PhD*</i>
	<i>Martinovic, Jasmina</i>	<i>MSc*</i>
	<i>Modutwane, Angel</i>	<i>MSc*</i>
	<i>Moon, Gillian</i>	<i>Phd*</i>
	<i>Msimang, Velaphi</i>	<i>PhD*</i>
	<i>Newell, Andrew</i>	<i>Staff*</i>
	<i>Parolis, Lesley</i>	<i>Staff*</i>
	<i>Roberts, Mandy</i>	<i>MSc*</i>
	<i>Ryan, Dan</i>	<i>PhD*</i>
	<i>Raja, Sashnee</i>	<i>PhD*</i>
	<i>Seawoo, Shilpa</i>	<i>MSc*</i>
	<i>Swart, Jurie</i>	<i>MSc*</i>
	<i>Viljoen, Elvera</i>	<i>PhD*</i>
	<i>Vittam, Priyo</i>	<i>PhD*</i>
	<i>Zwane, Seneliso</i>	<i>MSc*</i>
Civil Engineering	<i>Fourie, Clyde</i>	<i>PhD*</i>
De Beers	<i>Vietti, Andrew</i>	<i>PhD*</i>
Department of Agriculture		
	<i>Lamberts, Clyde</i>	<i>MSc*</i>
Fine Chemical Corporation		
	<i>E Munsch</i>	<i>Staff*</i>
Geological Sciences	<i>Basson, Ian</i>	<i>Staff*</i>
	<i>Bisnath, Avi</i>	<i>PhD*</i>
	<i>Compton, John</i>	<i>Staff*</i>
	<i>De Villiers, Sue</i>	<i>Staff*</i>
	<i>Garden, Ben</i>	<i>PhD*</i>
	<i>Grosch, Eugene</i>	<i>MSc*</i>
	<i>Haltis, D</i>	<i>Staff</i>
	<i>Smith, Meris</i>	<i>PhD*</i>
	<i>Rau, Amanada</i>	<i>MSc*</i>
	<i>Tonclin, E</i>	<i>MSc</i>
	<i>Tredoux, M</i>	<i>Staff*</i>
	<i>Viola, G</i>	<i>Staff</i>
	<i>Wrigley, Rochelle</i>	<i>PhD*</i>
Henkel technologies	<i>Massyn, Werner</i>	<i>Staff*</i>
Human and Cell Biology		
	<i>Mgweba, Thandi</i>	<i>PhD*</i>
	<i>Nikitina, Natalya</i>	<i>PhD*</i>
iThemba Labs	<i>Budka, Dobrusca</i>	<i>Staff*</i>
	<i>Pryzbilowycz J</i>	<i>Staff*</i>

	<i>Pryzbilowycz W</i>	<i>Staff*</i>
Mechanical Engineering		
	<i>Mudd, Richard</i>	<i>MSc*</i>
Medical Virology	<i>De Campos, Walter</i>	<i>Staff*</i>
	<i>Tiedt, Fritz</i>	<i>Staff*</i>
Molecular and Cell Biology		
	<i>Bierman, Lauren</i>	<i>Hons*</i>
	<i>Cross, Brent</i>	<i>Staff*</i>
	<i>Cooper, Keren</i>	<i>Staff*</i>
	<i>Coyne, V</i>	<i>Staff</i>
	<i>De Klerk, C</i>	<i>PhD*</i>
	<i>Edward Lin</i>	<i>MSc*</i>
	<i>Farrant, Jill.</i>	<i>Staff*</i>
	<i>Govender, Kershni</i>	<i>MSc*</i>
	<i>Hunt, B</i>	<i>Staff*</i>
	<i>Jaffray, Anne</i>	<i>Staff*</i>
	<i>Kohl, Thomas</i>	<i>PhD*</i>
	<i>Koekemoer, M</i>	
	<i>Lee Mung-Yi</i>	
	<i>Lindsay, G</i>	<i>Staff</i>
	<i>Livio, Heath</i>	<i>MSc*</i>
	<i>Matiru, Vivienne</i>	<i>MSc*</i>
	<i>Meyers, Paul</i>	<i>Staff*</i>
	<i>Mowla, Shaheen</i>	<i>PhD*</i>
	<i>Moore, John</i>	<i>MSc*</i>
	<i>Ncanana, Sandile</i>	<i>MSc*</i>
	<i>Shepherd, D</i>	<i>Hons</i>
	<i>Van der Walt, Eric</i>	<i>PhD*</i>
NBI	<i>Kurzweil, Hubert</i>	<i>Staff*</i>
Namakwa Sands	<i>Philander, Carlo</i>	<i>Staff*</i>
Oceanography	<i>Bernard, Stuart</i>	<i>PhD</i>
	<i>Waldron, Howard</i>	<i>Staff</i>
	<i>Wedinge, S</i>	<i>MSc</i>
One Eighty Degrees	<i>Basson, Janet</i>	<i>Staff*</i>
Patterson and Cooke		
	<i>Van Sittert, Fritz</i>	<i>Staff*</i>
	<i>Clinton</i>	<i>Staff*</i>
	<i>Thabiso</i>	<i>Staff*</i>
Pharmacology	<i>Webber, B</i>	<i>MSc*</i>
Physics	<i>Driver, Steve</i>	<i>Staff</i>
	<i>Thovhogi, Tshilidzi</i>	<i>PhD*</i>
Plascon	<i>Koen, Yolande</i>	<i>MSc*</i>
Private	<i>Klatzow, D</i>	<i>Staff*</i>
Saldanha Steel	<i>Schlettwein, Natasha</i>	<i>Staff*</i>
University of Stellenbosch		
Chemistry	<i>Mwatse, W</i>	<i>MSc*</i>
Chemical Engineering		
	<i>Banda, Wezi</i>	<i>MSc*</i>
	<i>Greef, Freddy</i>	<i>Staff*</i>
Dentistry	<i>Cara, Sharath</i>	<i>PhD*</i>
	<i>Pillay, Pat</i>	<i>MSc*</i>
Inst. Polymer Science		
	<i>Abraham, Teclesenbet</i>	<i>MSc*</i>
	<i>Cloete Valeska</i>	<i>PhD*</i>

	<i>Crouch</i>	<i>Staff*</i>
	<i>Ganeva, Dessi</i>	<i>PhD*</i>
	<i>Greyling, Corinne</i>	<i>PhD*</i>
	<i>Hartmann, Patrice</i>	<i>Staff*</i>
	<i>McLeary, James</i>	<i>PhD*</i>
	<i>Mosidi</i>	<i>PhD*</i>
	<i>Smit, E</i>	<i>MSc*</i>
	<i>Swanepoel, Francois</i>	<i>Staff*</i>
	<i>Tichikawa Lilian</i>	<i>PhD*</i>
	<i>Van Zyl, Andre</i>	<i>PhD*</i>
Institute of Wine Biotechnology		
	<i>Sharath</i>	<i>PhD*</i>
Orthodontics	<i>Cara, Sharath</i>	<i>PhD*</i>
	<i>Pillay, P</i>	<i>PhD*</i>
UWC		
BCB	<i>Lewis, Ceri</i>	<i>Staff*</i>
Chemistry	<i>Ahmed, Samina</i>	<i>Staff*</i>
	<i>Botha, Subelia</i>	<i>MSc*</i>
	<i>Masters, Gerry</i>	<i>PhD*</i>
	<i>Maxakato, Wendy</i>	<i>MSc*</i>
	<i>Morrani, Touhami</i>	<i>PhD*</i>
	<i>Mwase, Webster</i>	<i>MSc*</i>
	<i>Petrik, Lesley</i>	<i>Staff*</i>
Virology	<i>Kohl, Thomas</i>	<i>PhD*</i>
	<i>Versani, Arvind</i>	<i>PhD*</i>
WITS	<i>Weber, Stephen</i>	<i>MSc*</i>
Zoology	<i>Branch Margo</i>	<i>Staff*</i>
	<i>Weni, Elliot</i>	<i>MSc*</i>

* Microscopy Users (148)

21 non EM users

Appendix A

Table of current users projects at the E.M.Unit

	Name	Dept	Project Title	Supervisor	Fund source
S440	Ayodele, Odo	Physics	Device application of amorphous and nanocrystalline semiconductor materials	D. Britton	
S440	Baard, Annalize	Saldanha Steel	Chemical analysis of fracture zones in rolled steel		Saldanha Steel
S440	Branch, Margo	Zoology	Bryozoans of Marion Island		NRF
Leo912 200CX	Callanan, L	Catalysis research unit	Synthesis of nano-sized alpha-bismuth-molybdate particles using water in oil micro-emulsion		
Leo 912 200CX	Cloete, Valeska	Polymer Science	The development of coatings with minimal moisture transmission rate	R. Sanderson	
S440	Custoides, Taty	Chemical Engineering	Aggregation of metal in precipitation	A Lewis	Industry
Leo912	De Campos, Walter	Virology	Isolation, purification and characterization of a novel antiviral substance from a plant extract: potential uses in HIV chemotherapy	G Kotwal	
Leo 912 1200CX	De Klerck, Carin	MCB	Ultrstructure evaluation and colloidal gold immunolabeling of a bacterial pathogen of the red algae <i>Gracilaria gracilis</i>	V Coyen, K Denby	
S440	Dorchin, Netta	Zoology	Identification and description of biocontrol agents against Australian myrtle	J. Hoffman	
200CX	Govender, Kershini	MCB	Molecular characterization of a perpxiredoxin type 2 isolated from the ressurection plant <i>Xerophyta viscosa</i>	S. Mundree J. Thomson	
Leo912	Governor Godongwana, Ziboneni	Chemistry UWC	Characterisation of nanomaterials and nanocomposites for homogeneity and reproducibility		
S440 Leo912	Greyling, Corinne	Polymer Science, US	High Voltage polymer insulators studied by positron annihilation spectroscopy	R Sanderson	
Leo 912	Hartmann, Patrice	Polymer Science US	Targeted directing of chemotherapeutic agents	R. Sanderson	
Leo912	Heath, Livio	MCB	The production of beak and feather disease pseudo-virions	E. Rybicki	
S440	Herbert Caren	Geological Science	Sediments of the Holocene mudbelt	J. Compton	
Leo 912	Hermant, Marie-Claire	Polymer Science, US	Purpose built block copolymers by emulsion polymerization	R Sanderson, J McLeary	
Leo 912 200CX	Higham, Lawrence	Polymer Science, US	Templated synthesis of functionalised nanoparticles	R Sanderson	
Leo912	Hunt, Brian	MCB	Production of Gag VLPs in plants	A Jaffray	
Leo912	Hunt, Brian	MCB	Production of Gag VLPs in baculovirus	A Jaffray	
Leo 912	Kleimsmidt, Jacques	Chemical Engineering	Carbon nanotube supported iron Fischer Tropsch Synthesis	E. Van Steen, M. Claeys	
Leo912 200CX	Kohl, Thomas	MCB	Expression of human papillomavirus type 11L1NLS gene in transgenic <i>Arabidopsis thaliana</i> .	E. Rybicki	
S200 200CX	Lamberts, Clyde	Department of Agriculture	An investigation into the occurrence of a novel protozoan parasite in the gut of abalone <i>Haliotis midae</i>	A. Mouton, L. Basson	
Leo 912	Lin, Edward	MCB	Structure of 3-way junction DNA	H. Klump	
Leo912 S440 200Cx	Mabaso Itai	Chemical Engineering	A novel preparation method for nano-sized monodispersed Fe ₂ O ₃ crystallites.	M. Claeys E. van Steen	
Leo 912	Matahwa, Howard	Polymer Science, US	Surfimer synthesis for miniemulsion latex formation by RAFT Mediated polymerization	R Sanderson	
S440	Meyer, Anel	Agriculture, US	The incidence and extent of pitting on ostrich skins in the South African ostrich leather industry	P. Cloete	NOPSA
S440	Mgubani, Thembi	Chemical Engineering	Investigating the effect of gypsum crystal morphology on membrane damage in the Saipro process	A Lewis	Water Research

S440	Miller Duncan	Archaeology	Iron age metal fabrication technology in Southern Africa	D. Miller	
S440	Minani Evariste	Physics	Production and characterization of a si/h for solar cell applications	D. Britton	
S440	Mlungisi, Nkoi	Chemistry, UWC	Electrochemical preparation of nickel structures on etched ion track membranes	V Linkov	NRF
S440 Leo912	Mokrani, Touhami	Chemistry UWC	Development of aninorganic direct methanol fuel cell	L Petrik	
S440	Moore, John	MCB	Localization of polyphenols in <i>Myrothamnus flabellifolus</i> Welw.	J. Farrant	
Leo912	Naidoo Gasen	Chemistry UWC	Preparation of catalytic ink composites for hydrogen production	V Linkov	
S440	Naidoo, Jeetan	Chemical Engineering	Investigating the effect of gypsum crystal morphology on membrane damage in the Saipro process	A Lewis	Water research comm
S440	Napier, Hugh	Human and Cell Biology	The role of proliferation and cell shape changes during ciliary body morphogenesis in the mouse	S. Kidson	
S440	Newel, Andrew	Chemical Engineering	Chemical and optical determinations of surface layers on base metal sulphide minerals and non-sulphide minerals.		
S440	Nxumalo, Lethu	CME	Investigation of the hardening behavior of novel platinum rich alloys	C. Lang	
S200	Parker, Sa-aadat	CME	Recrystallization of AISI 304 stainless steel in the Steckel Mill Rolling process	R. Knutsen	
Leo912	Phiri, Kelvin	MCB	The production, characterization and immunogenicity of HIV-1 subtype C Gag/Env VLPs via aBaculovirus expression system		
Leo912	Popp, Alexander	Chemical Engineering	Testing of a series of gold catalysts for methanol synthesis	E. van Steen	
S440	Rosenstien, Dana	Archaeology	Correlating change in the technology of ceramic production with the advent of 18th century Western Tswana towns.	S Hall.	
S440	Schlettwin Natasha	Saldanha Steel	Examination of stress and fracture zones in rolled steel		Saldanha Steel
Leo912	Thamahane, Tankiso	Chemistry UWC	Development of oxygen evolution electrocatalyst for proton exchange membrane in water electrolysis.	V Linkov L Petrik	
S440	Tshivhase, Mbonenei	Chemistry	Kinetics of malaria pigment formation in Benzoic acid	T Egan	NRF
Leo912	Valley-Omar, Ziyaad	MCB	A study of the neutralizing antibody (Nab) response to different V3-loop Nab epitopes of HIV-1 subtype-C fused to TMV coat proteins	A Jaffray	
Leo 912	Van Vuuren, Peter	Chemistry, US	Preparation of catalysts using reverse micelle technique	L Callanan	NRF
Leo 912	Van Zyl, AJ	Polymer Science, US	Synthesis of liquid c-filled polymeric nanocapsules	R Sanderson	
Leo 912	Vatta, Laura	Polymer Science US	Targeted directing of chemotherapeutic agents	R Sanderson	
Leo 912	Viljoen, Elvira	Chemical Engineering	Preparation of cubic unsupported crystallites as catalysts	E Van Steen, M. Claeys	
S440	Vries, Filicity	ARC-Infruitec	Biological control of post-harvest pathogens		Infruitec
Leo912 S440	Welker, Cathrin	Chemical Engineering	Synthesis of Ruthenium catalyst under Fischer-Tropsch conditions	M. Claeys E. Van Steen	
Leo912	Williams, Mario	Chemistry, UWC	Characterisation of nanomaterials		