

**ELECTRON MICROSCOPE UNIT  
ANNUAL REPORT  
1994**

<b>Director</b>	<b>B.T. Sewell</b>
<b>Principal Technical Officer</b>	<b>D.A. Gerneke</b>
<b>Chief Technical Officer (Part Time)</b>	<b>J. Duncan</b>
<b>Senior Technical Officer</b>	<b>M.A. Jaffer</b>
<b>Technical Officer</b>	<b>C. Bruintjies</b>
<b>Photographic Assistant</b>	<b>W. Williams</b>

*April 1995*

## **TERMS OF REFERENCE**

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

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

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

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

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

## **HIGHLIGHTS OF 1994**

### **THE NEW SCANNING ELECTRON MICROSCOPE**

The Leica S440i system was delivered on 7th April 1994 and installed during the following two weeks by Mr Mike Palmer of Leica Cambridge and Mr Bruce Middleton of SMM (Johannesburg). The system is equipped with a large range of attachments including:

- Secondary electron detector,
- Solid state four quadrant backscattered electron detector,
- Solid state transmitted electron detector,
- Cathodoluminescence detector,
- Oxford MonoCL cathodoluminescence spectrometer
- Specimen current amplifier
- Fisons cryo-transfer system
- Video printer
- 120 format monochrome camera
- Colour slide printer
- S-VHS video recorder
- Integrated Kevex Sigma energy dispersive X-ray analysis system

The instrument is the largest system ever manufactured by Leica and they are justly proud of their achievement. It is certainly the most versatile SEM in South Africa and indeed experiments can be done with the system which cannot easily be done elsewhere in the world at present.

After installation members of the Unit spent two months familiarising themselves with the system and refining the installation. The first serious use of the microscope was made on 20 June 1994. Considerable and varied use has been made of the system since then. Mr Dane Gerneke has been kept extremely busy by pilot projects from users seeking to test the capability of the machine.

Ms Galen Sapp of Kevex (San Francisco) visited the Unit from 14-20 November in order to complete the installation of the Kevex Sigma system and instruct Unit staff in its use.

### **THE NEW MICROTOME**

The Leica Ultracut FS microscope was installed by Mr Dieter Geppert of Premier Technology on the 2nd May. This instrument is the best available and is capable of cutting sections of frozen material in addition to normal embedded material. It is the first substantial enhancement of TEM preparative facilities in the Unit for two decades. It made a substantial and immediate difference to all work involving thin sections. The cryomicrotomy facilities will add an important new technique to the resources available to biological researchers at UCT.

**STAFF**

Two new staff members joined the Unit during 1994

Mr Mohamed Jaffer joined the Unit as Senior Technical Officer from January. He is responsible for all Transmission Electron Microscope applications and user training. As a result of his activities 6 new TEM users have been trained.

Mr James Duncan joined the Unit as part-time Chief Technical Officer in April. He is responsible for the maintenance of all equipment in the Unit. As a result of his efforts the considerable maintenance backlog is being cleared and the reliability of equipment has been substantially improved.

**INTRODUCTION OF A CHARGING STRUCTURE**

The EMU steering committee resolved to introduce a charging structure for all services of the Unit that were previously free. The funds raised in this way are being used to maintain the equipment. Having these funds available has improved the ability of the Unit to respond to user needs.

**MEETINGS OF THE EM UNIT STEERING COMMITTEE**

Meetings of the EM Unit Steering Committee were held on 20 May 1994 and 19 September 1994. At the first meeting the installation of the S440 was discussed and the details of the charging system were tabled. At the second meeting the Director reported on the status of the Unit. The Committee approved the proposed applications for equipment to be funded by ITEC and by the Equipment Committee. Progress made in bringing the new equipment into service was reviewed.

**USE OF THE UNIT**

Services provided by the Unit during 1994 are listed in Table 1.

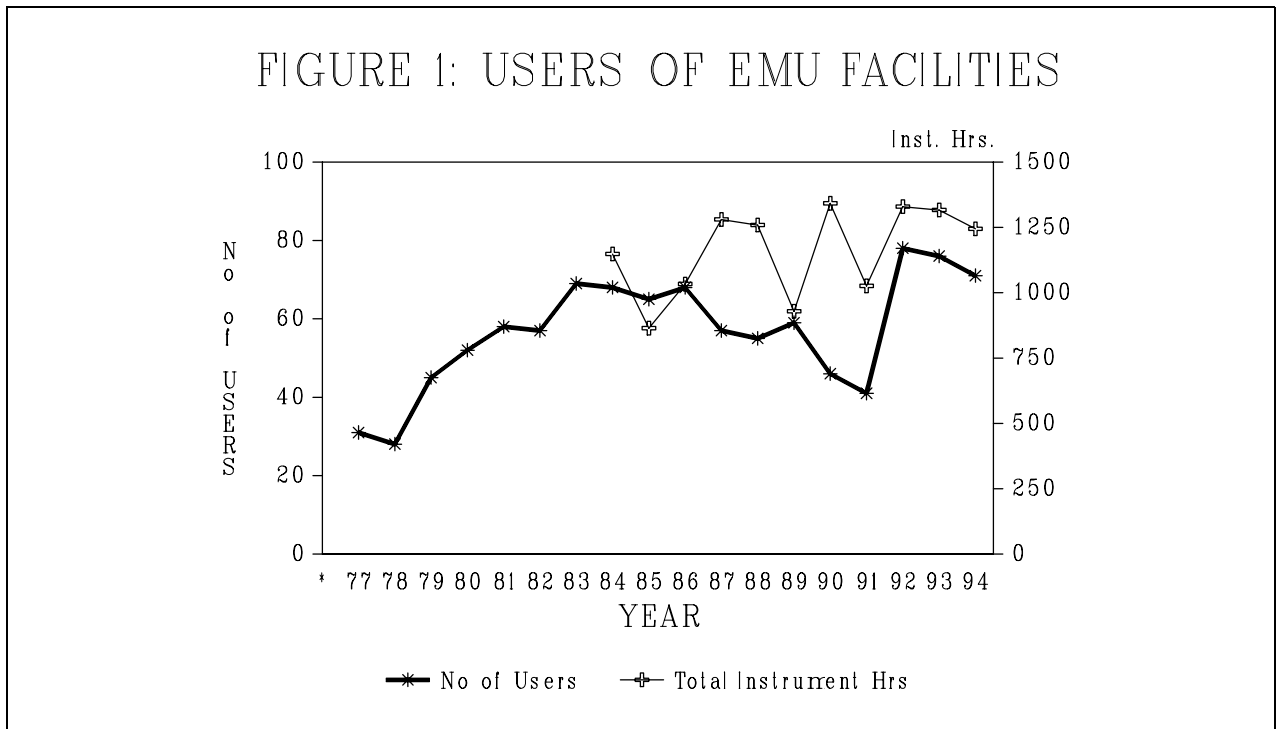
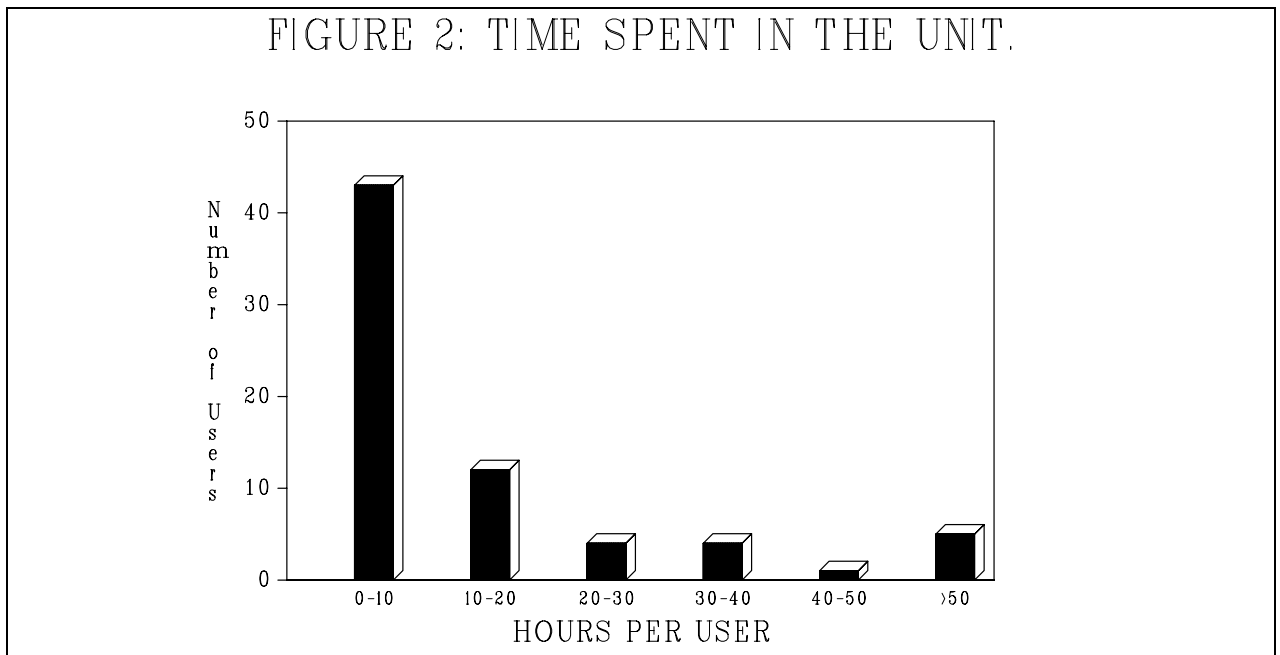


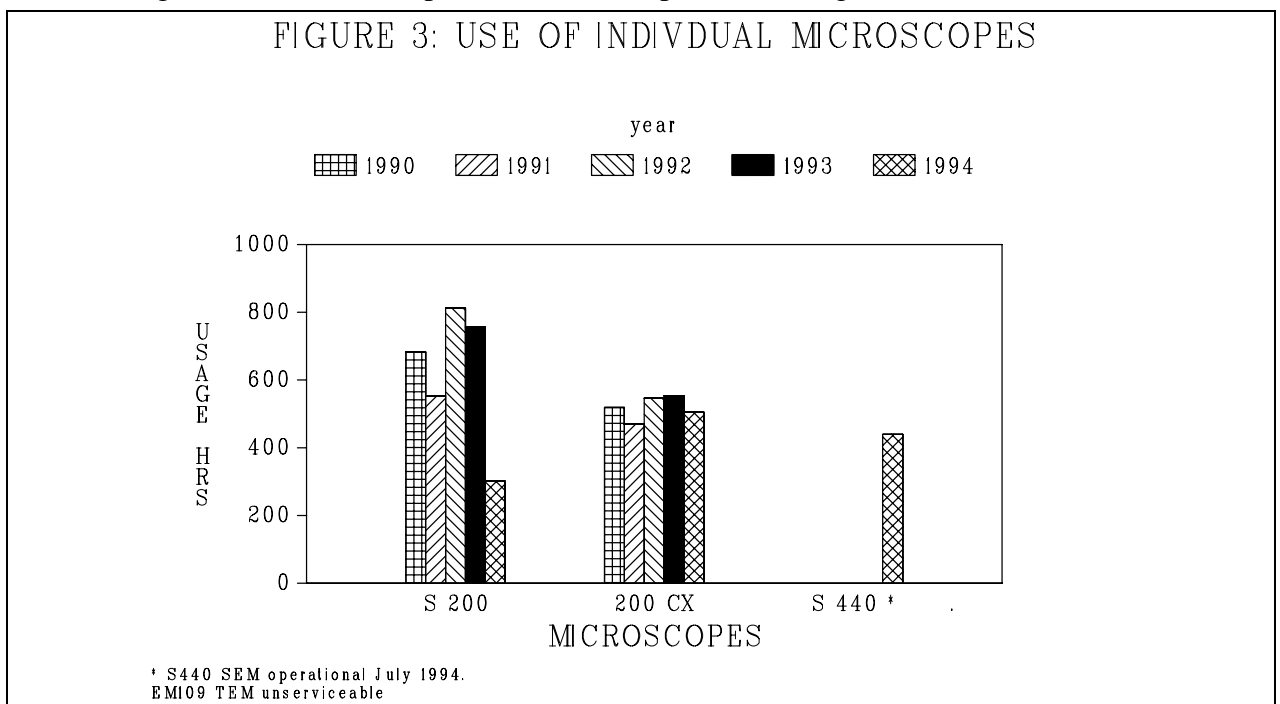
Figure 1 shows that the number of users continued to be high. The total usage of the EM facilities and instruments also remained high. There were slight decreases in both of these figures compared to the previous year. The reason for this is that at times during the year the

Unit was offering curtailed services while the staff were involved with the installation of the new equipment

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

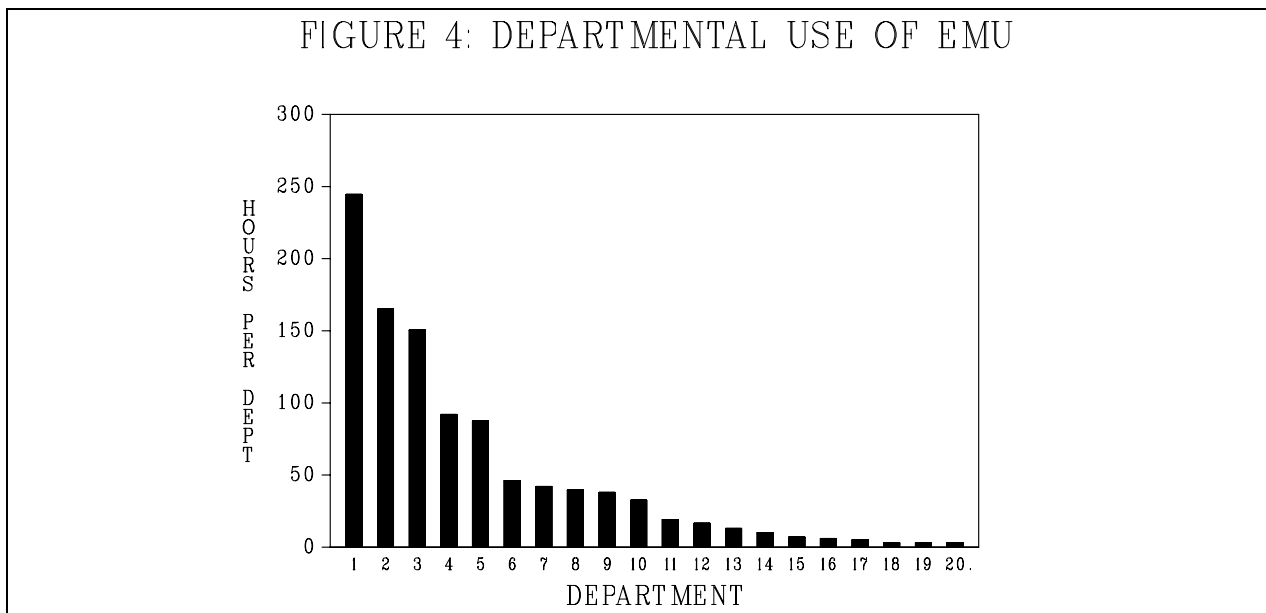


The usage pattern shows that the largest number of users made use of the Unit facilities for a comparatively short time. There is very little point in investing time in training these people and therefore they make considerable demands on the Unit staff. This graph illustrates the continued high demand for a samples in-results out pattern of usage.



Use of the S440 climbed rapidly after it was brought into service at the end of June. Many users transferred their work to the new microscope from the S200 because of the improved facilities it offered and because the S200 was performing poorly. Although the total time spent using the 200CX was similar to that in previous years, it was used by more than twice as many people as in 1993.

FIGURE 4: DEPARTMENTAL USE OF EMU



- |                          |                                     |                         |
|--------------------------|-------------------------------------|-------------------------|
| 1 Microbiology           | 8 Botany                            | 15 Anatomy              |
| 2 Materials Engineering  | 9 Chemical Engineering              | 16 Physics              |
| 3 EMU - User training    | 10 Commercial Users                 | 17 Civil Engineering    |
| 4 Geological Sciences    | 11 Medicine                         | 18 Red Cross Hospital   |
| 5 Zoology                | 12 UWC                              | 19 Medical Biochemistry |
| 6 Chemistry              | 13 Sea Fisheries Research Institute | 20 Surveying            |
| 7 Mechanical Engineering | 14 National Botanical Institute     |                         |

Use of the microscopes by members of various departments is shown in figure 4.

- 1 Microbiology remained the largest user. They use the TEM almost exclusively.
- 2 EM Unit training was the third largest user. Much of this time was spent instructing users in the use of the new equipment. The cost of this was charged to the Departmental Grant.
- 3 The total number of user departments has remained constant since 1993.

## TEACHING

### USER COURSES

A SEM training course was held in August, introducing a total of 5 new SEM users. The four day intensive course aimed at honours and post graduate students, "Introduction to Microscopy for Biologists", was held three times and attended by a total of 36 students:

28/2/94-3/3/94      12 Microbiology students

7/3/94-10/3/94      14 students from Botany, Medical Microbiology,  
SFRI and UWC

22/3/94-24/3/94      10 Zoology students

A course of 8 lectures and demonstrations was held between 20/7/94 and 6/9/94 to introduce users to capabilities of the S440. It was necessary to restrict the number attending to about eight people per lecture.

### SCHOOL VISIT

Pupils of St Joseph's College attended a lecture and microscope demonstration in the unit on 3 February.

### LECTURES

Special introductory lectures on the S440 were held at the request of the departments of Chemical Engineering and Mechanical Engineering. A lecture on the "EMU and its Services" was given to the Biochemistry Department..

Mr Jaffer delivered three lectures and a practical on "Virus Structure and Electron Microscopy" as a component of Microbiology 303S.

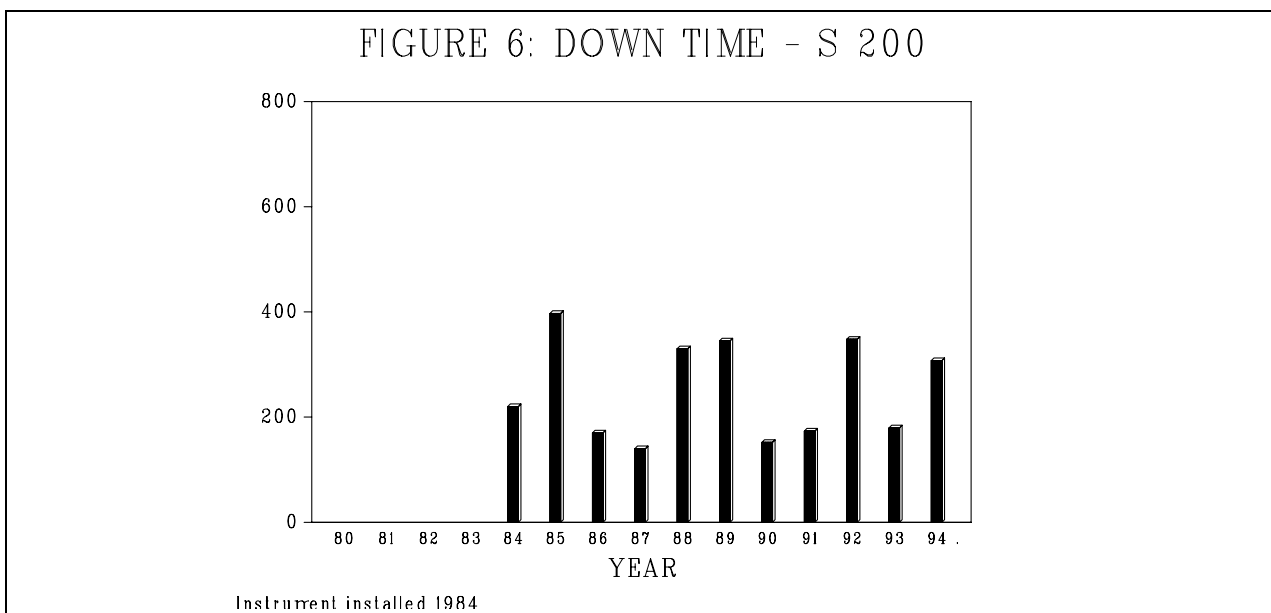
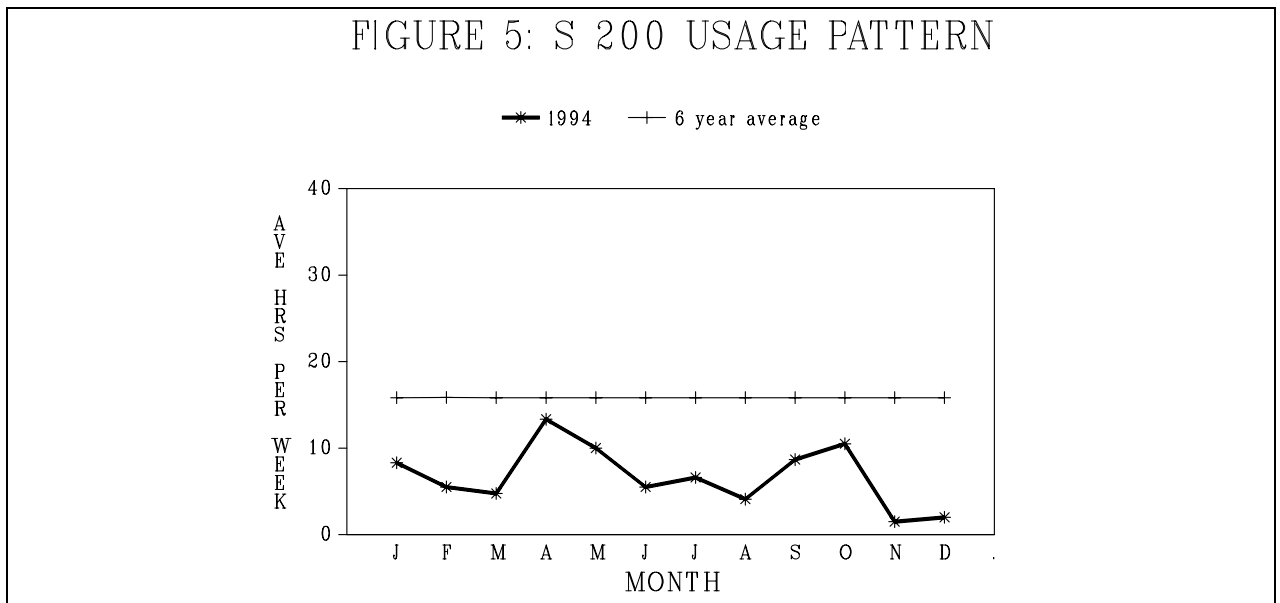
## EQUIPMENT

### CAMBRIDGE S200 SEM AND KEVEX 7000 EDX

The S200 was used at well below its normal rate for most of the year. It suffered from an accumulation of minor intermittent faults which were extremely difficult to locate and in August the instrument was taken partially out of service while the faults were diagnosed. It ultimately proved necessary to rebuild the power supplies and replace most of the internal connectors. The screen was also replaced. After these repairs, which took several weeks, the machine worked extremely well and it was brought back into service in November. The cost of the repairs was covered by money raised by user fees and it was not necessary to call on the emergency repair fund.

The microscope was upgraded by the addition of a backscatter detector.

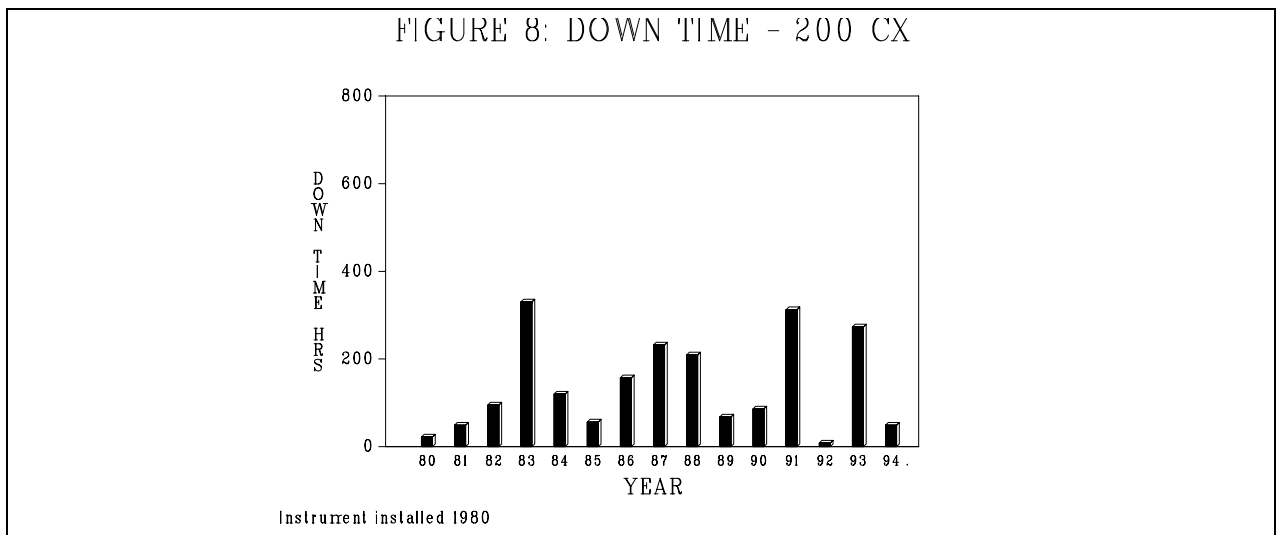
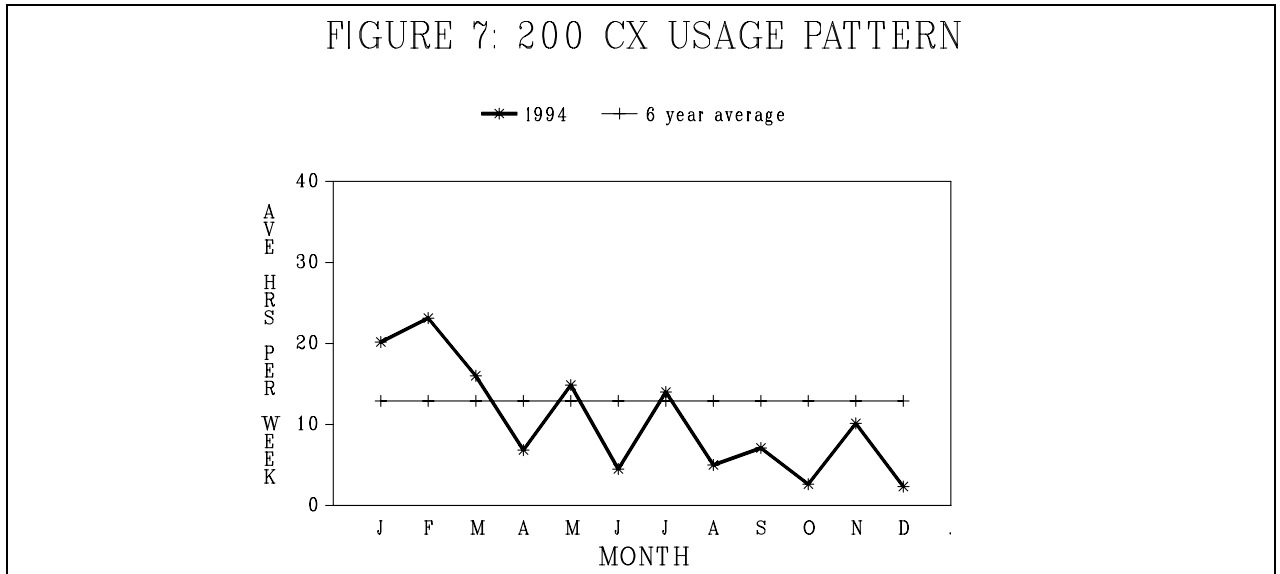
The Kevex detector was used successfully in the early part of the year. An identical Kevex system was donated to the University by NAMPAK. This will be stored and used as a source of spares for our instrument.



### JEOL 200CX TEM

Use of the TEM fell during the year and the year average use was below normal. This was in spite of the training of 6 new users by Mr Jaffer and two new Materials Engineering users. Five projects were also done for users by Mr Jaffer.

No serious breakdowns were recorded on this instrument during the year.



**ZEISS EM109**

The departments of Biochemistry and Microbiology have agreed to allow this instrument to be moved to the Unit.

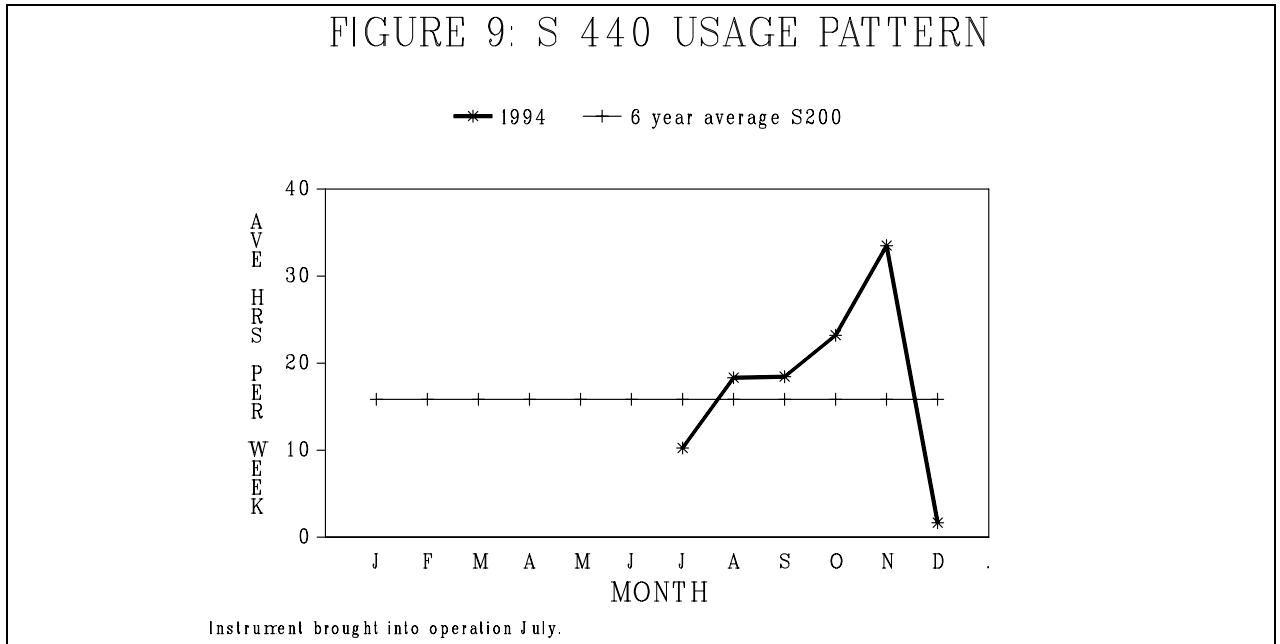
Funds (approximately R80 000) were raised from the Equipment Committee for the parts necessary to restore this instrument. Zeiss has scheduled the parts for delivery in June 1995.

The move will take place during June 1995 after space has been made for the instrument in the Unit. It will be used for training and student projects.

**LEICA STEREOCAN S440**

This instrument is currently the flagship of the Unit. It has generated considerable interest both inside and outside the University. Mr Gerneke was in Cambridge from 5-25 March to be present during the final stages of assembly and testing and to receive instruction from the

various manufacturers. The S440 was shipped to us on 28 March and was installed by 22 April. It would be unreasonable to expect an installation of this magnitude to be entirely uneventful, however all the problems we encountered were addressed and overcome by those responsible. Usage climbed to around 100 hours during November. It should be noted that very few, if any, users were independent and thus it was necessary for Mr Gerneke to operate the instrument most of the time.



## **OTHER EQUIPMENT**

### **CD RECORDER**

The Unit purchased a CD recorder with funds granted by ITEC and a 1Gb hard disc using money raised by performing work for commercial users. CD is an extremely cheap (R90-00 for 640Mb) method of recording data and will be used to store images generated by the new microscope. It will also be offered as one of the Unit's services. Over a dozen CD's were made for users, mostly of radar images containing 200Mb each generated by the Electrical Engineering department.

### **OPTICAL MICROSCOPE**

A Leica Diaplan optical microscope equipped with Hoffmann Modulation Contrast Optics was purchased for the Unit with funds from the Equipment Committee. It is the only microscope in South Africa equipped with this optical system. Researchers from several departments have used the instrument. The Unit has also used the microscope to instruct students and staff in the use and care of optical microscopes.

## **FINANCE**

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

## **RESEARCH ACTIVITY**

The internal research component carried out within the EMU remained low as almost the entire year was spent installing and learning the new equipment. The research was generally carried out in close collaboration with other departments and laboratories.

The Director devoted time to the three research projects described below and to the supervision of two PhD students (Mr Jaffer and Mr Reavis) and one MSc student (Mr Nicolls).



*Electron Tomographic studies of the chromatin fibre:*

B.T. Sewell, M.A. Jaffer and S. Schwager.

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

*Computer analysis of gel electrophoretograms:*

B.T. Sewell, S.C. Reavis (Provincial Laboratory for Tissue Immunology).

This project involves the development of a computer system for the analysis of gel electrophoretograms. Although many of the algorithms are of general application the primary objective is the development of a system for the automatic analysis of the tandem repeat VNTR DNA polymorphism for paternity testing.

*Autofocus Algorithms in the Scanning Electron Microscope*

B.T. Sewell, G de Jager and F.C. Nicolls (Department of Electrical Engineering)

Accurate and rapid automatic focusing of the scanning electron microscope would simplify the operation of the microscope for novice users and enable an experienced user to achieve more. The only published work in the area makes use of a large number of scans of the same area and chooses the one which has the best focus. The goal of this project is to design and implement an algorithm which will be able to predict focus from a small number of scans.

The project is being undertaken as part of our partnership agreement with Leica, Cambridge

**PUBLICATIONS**

Publications, for 1994, that resulted from research in which the EM Unit staff have been directly involved are listed:-

**Published Conference Proceedings**

Sewell, B.T. and Gerneke D.A., "SEM and the Digital Paradigm - Blessing or Curse?" Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 12.

Wittridge, N.J., Knutsen, R.D., Sewell, B.T. and Gerneke, D.A., "Electron Backscatter Diffraction Analysis for Microtexture Determination", Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 15.

Nicolls, F.C., de Jager, G. and Sewell, B.T., "Towards a Predictive Autofocus Algorithm for SEM", Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 11

von Wechmar, M.B., Jaffer, M.A., and Purves, M., "Association of Bacteria with Tobacco Necrosis Virus and Ciliates in Necrotic Plum and Apricot Leaves", Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 66.

von Wechmar, M.B., Jaffer, M.A., and Purves, M., "Detection of Tobacco Necrosis Virus in Bacteria Associated with Papaya Fruit Exhibiting Small Green Freckles", Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 67.

von Wechmar, M.B., Jaffer, M.A., and Purves, M., Gerneke, D. and Chauhan, M., "Pseudomonas-like Bacteria Yield Tobacco Necrosis Virus Causing Lesions in Plants", Proceedings of the Electron Microscopy Society of Southern Africa, 24 (1994) 72.

**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.

Linder, P.H. and Kurzweil, H., "The Phylogeny and Classification of the Disease (Orchidoideae:orchidaceae)", Annals of the Missouri Botanical Garden, 81(1994)687-713.

Moller, K.P., Kojima, M. and O'Connor, C.T., "Diffusion and adsorption in HY and HM deactivated by propene oligomerization and hexene cracking", *Chemical Engineering Journal*, 54(1994)115-123.

Nicolson, S.W., "Pollen Feeding in the Eucalypt Nectar Fly, *Drosophila flavohirta*", *Physiological Entomology*, 19 (1994) 58-60.

Rodgers, A.L., Ball, D., Harper, W., "Effect of Urinary Macromolecules and Chondroitin Sulphate on Calcium Oxalate Crystallisation in Urine", *Scanning Microscopy*, 8 (1994) 71-77.

Vaughn, J.S., Fletcher, J.C.Q., and O'Connor, C.T. "High pressure oligomerization of propene over heteropoly acids", *Journal of Catalysis*, 147(1994)441-454.

Webb, S.C., and Korrûbel J.L. "Shell Weakening in Marine Mytilids Attributable to Blue-Green Alga *Mastigocoleus* Sp. (*Nostochopsidaceae*)", *Journal of Shellfish Research*, 13 (1994) 11-17

## **OTHER MATTERS**

### **VISIT BY MEMBERS OF THE EXECUTIVE**

Dr Saunders and Professor Woods visited the Unit on 20 April .

### **FRD VISIT**

Dr Anton Botha of the FRD visited the Unit on 22 April

### **VISITOR TO THE UNIT**

Dr M.C. Lawrence, a former director of the Unit, now working at the CSIRO, Melbourne, visited the Unit in August. He delivered a lecture on his current work in the "Design of Biologically Active Compounds" and spent considerable time with Mr Jaffer, of whom he is co-supervisor. His trip was paid for by the Visiting Scholar's Fund.

### **FUNCTION**

A cheese and wine party was held to inaugurate the new equipment on 17 October. It was attended by about 100 people and was paid for by SMM Instruments.

### **LEICA MEETING**

SMM Instruments and Leica Cambridge hosted a meeting of the S400 series users in the Unit from 5-7 December. Technicians and scientists from Medunsa, Geological Survey, Hulett's Aluminium and the EM Unit attended. Mr Tim Sparrow represented Leica.

### **ELECTRONIC WORKSHOP**

Substantial funds were spent building up an electronics workshop in order to give the Unit the capability of maintaining the instruments in its care. It will be necessary to continue spending funds for this purpose in 1995.

### **SERVICE TO INDUSTRIAL AND OTHER EXTERNAL USERS**

The users offers its facilities on an ad hoc basis to external users. Clients exploiting these services during 1994 were SA Nylon Spinners, Unifruco, Somchem, Wella, the National Botanical Institute, and the Department of Environmental Affairs. Revenue from this source fell for the second year in succession.

### **ACCESS CONTROL**

Two corridors which connect the lecture theatres to the Physics undergraduate laboratories pass through the Unit. The substantial through traffic led to a high incidence of petty theft and an unacceptable working environment. Doors with electronic combination locks have been installed at the ends of the corridors and the Unit is contained within these doors. The improvement in the working environment has been substantial and no disadvantages have been brought to my attention.

## **SUMMARY**

1994 was a year dominated by the installation of new equipment. The Unit received considerable exposure in the University and national press and as a result we have had a large number of enquiries. The interest generated in many cases still needs to be converted into projects. The Unit is now on a firm footing with respect to equipment and there has been substantial improvement in our staff and financial position. The Unit is in an excellent position to fulfil its role at UCT.

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

**Prepared by: Associate Professor B.T. Sewell**

*Director*

**24 April 1995**

**TABLE 1****Services Offered by the Unit during 1993**

<b>Service</b>	<b>Comment</b>
Access to 200CX TEM	Used by an increasing number of staff and students.
Access to S440 SEM	Very heavily used after commissioning
Access to S200 SEM	Not as well used as usual. The instrument was performing poorly and work was transferred to the S440.
Training on 200CX	Eight users were trained in 1994
Training on S440 SEM	Was mostly done on an individual basis with experienced users.
Training on S200	One course was held in 1994
Access to Ultracut S Ultramicrotome	Usage increased rapidly after installation
Training on Ultracut S	Three people were trained
Sectioning of blocks supplied by the user	Well used
Embedding of biological specimens	Well used
Sputter Coating of specimens supplied by user	Very popular service
Critical point drying of specimens supplied by the user	Very popular service
Access to darkroom facilities	Well used by a small number of users. Many potential users would rather have their darkroom work done for them.
Printing of EM films	Service used to capacity
Preparation of slides of electron micrographs for lecture purposes	Well used
Access to optical microscopy facilities	Use is increasing
Access to Image Analysis (GENIAS)	Well used by a small number of users. Used for teaching image analysis.
Access to Image Processing and Analysis (SEMPER)	Not used.
Element analysis by EDS	There is considerable demand for this service on the new Kevex Sigma system.
"Introduction to EM for Biologists"	This course was held three times.
Access to specimen polisher	Well used
Access to high vacuum coating plant and accessories	Increasing use from some departments (e.g. Microbiology)
Store of EM consumables	Used by all our users
Access to prep lab	Used for the final stages of preparation only.
Collection of books and journals on microscopy	Substantial renewal of the collection took place during 1994. The books are well used during our courses.
Access to microdensitometry facilities	This was repaired but was not used during 1994.
Vacuum Leak Detection	Only used by EM Unit.
Production of CD ROMS	14 were produced

**TABLE 2**

**Equipment Expenditure**

**Funded by the Equipment Committee**

Scopemeter	R 8 800.00
Gas Soldering Equipment	R 2 400.00
Frequency Generator	R 4 500.00
Power Supply	R 3 900.00
Leica Diaplan Modulation Contrast Microscope	R 35 000.00
<b>TOTAL</b>	<b>R54 600.00</b>

**Funded by ITEC**

PC for Electronics Technician	R 5 700.00
CD Recorder	R 24 943.00
<b>TOTAL</b>	<b>R30 643.00</b>

**Funded by special Council grant (including R325 000 from FRD)**

Leica S440 and attachments	R 1 530 215.02
Leica Ultracut S ultramicrotome	R 214 110.00
Astromed slow scan CCD camera for TEM	R 293 981.08
<b>TOTAL</b>	<b>R 2 038 306.10</b>

**Donation from NAMPAK**

Kevex 7000 system	R 20 000.00
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**TABLE 3**

**External Services Entity**

Opening Balance of Funds	R 14 747.04
<b>Income</b>	
Miscellaneous	R 5 207.85
Sales and Services	R 1 329.82
Transfers (Other)	R 1 323.69
Entertainment	R 0.01
<b>TOTAL</b>	<b>R 7 861.37</b>
<b>Expenditure</b>	
Committee teas and Refreshments	R 258.15
Computer Supplies	R 111.40
Conference Fees	R 510.00
Minor Equipment Under R100	R 2 683.83
Films and Videotapes	R 90.80
Materials and Consumables	R 398.00
Petrol Purchases	R 146.55
Stationery	R 99.61
Sundry Expenses	R 181.30
Airfare	R 2 518.39
Travel and Subsistence	R 2 450.76
Equipment Registered Assets	R 301.72
<b>TOTAL</b>	<b>R 9 750.51</b>
Opening Balance	R 9 938.29
<b>INCOME</b>	<b>R 7 861.37</b>
<b>EXPENDITURE</b>	<b>R 9 750.51</b>
Closing Balance 1994	R 12 857.90

**TABLE 4**  
**Departmental Grant**

Opening Balance of Funds	R 2 617.17
<b>Income</b>	
Annual Grant	R 32 500.00
Ad Hoc Grants (ex Maintenance Provision)	R 7 620.00
<b>TOTAL</b>	<b>R 40 120.00</b>
<b>Expenditure</b>	
Books (Departmental Library)	R 352.44
Cleaning Materials	R 280.64
Computer Consumables	R 1 356.91
Minor Equipment under R100	R 246.24
Gas - General	R 6 600.37
General Expenses	R 655.50
Laundry	R 220.65
Maintenance Department Charges	R 1 417.51
Materials and Consumables	R 5 689.43
Printing / Photocopy	R 1 560.97
UCT Printing Department	R 451.00
Postage and Telegrams	R 495.74
Repairs and Maintenance General	R 10 647.76
Stationery	R 735.10
Subscription	R 50.00
Sundry Expenses	R 355.75
Telephone Calls	R 4 040.33
Telephone Installation Costs	R 349.98
Hire of Equipment	R 1 900.00
Equipment Registered Assets	R 3 167.49
<b>TOTAL</b>	<b>R 40 573.81</b>
Opening Balance	R 2 617.17
<b>INCOME</b>	<b>R 40 128.00</b>
<b>EXPENDITURE</b>	<b>R 40 573.81</b>
Closing Balance 1994	R 2 171.36

**TABLE 5**  
**Consumables Store**

<b>I</b>	
Opening Balance of Funds	R 10 011.64
<b>Income</b>	
Miscellaneous	R 641.49
Internal Recoveries	R 19 278.98
TOTAL	R 19 920.47
<b>Expenditure</b>	
Computer Consumables	R 45.60
Films & Video Tapes	R 3 104.66
Materials and Consumables	R 19 656.23
Repair & Maintenance	R 874.77
Stationery	R 89.60
Telephone Calls	R 3.03
TOTAL	R 24 732.27
Closing Balance of Funds 1994	R 5 199.84



**TABLE 6**  
**Maintenance**

<b>I</b>	
Opening Balance of Funds	R 18 424.90
<b>Income</b>	
Hire of Equipment	R 2 160.00
Miscellaneous Income	R 265.35
Stationery	R 110.88
Internal Recoveries	R 23 683.05
TOTAL	R 26 219.28
<b>Expenditure</b>	
Computer Supplies	R 2 609.17
Materials and Consumables	R 468.11
Postage and Telegrams	R 14.05
Repair & Maintenance	R 4385.96
Equipment (Registered Assets)	R 2 944.00
TOTAL	R 10 412.29
Closing Balance of Funds 1994	R 34 222.89

**TABLE 7**  
**User List**

<b>I</b>		
<b>Anatomy</b>	<b>Chou K</b>	<b>PhD</b>
	<b>Omlin F</b>	<b>Staff</b>
	<b>Richards P</b>	<b>Staff</b>
<b>Biochemistry</b>	<b>Chen W</b>	<b>PhD</b>
<b>Botany</b>	<b>Griffioen C</b>	<b>BSc</b>
	<b>Midgley J</b>	<b>Staff</b>
	<b>Smuts R</b>	<b>Hons</b>
<b>Chemical Engineering</b>	<b>Cohen B</b>	<b>MSc</b>
	<b>Johnson L</b>	<b>MSc</b>
	<b>M'Kombe C</b>	<b>MSc</b>
	<b>Moosa S</b>	<b>PhD</b>
	<b>Petrik L</b>	<b>Staff</b>
	<b>Scholtz N</b>	<b>MSc</b>
<b>Chemistry</b>	<b>Koch K</b>	<b>Staff</b>
	<b>Linder P</b>	<b>Staff</b>
	<b>Pocock F</b>	<b>Staff</b>
	<b>Rodgers A</b>	<b>Staff</b>
	<b>Seymour L</b>	<b>PhD</b>
<b>Civil Engineering</b>	<b>Gentz J</b>	<b>BSc</b>
	<b>Heckroodt R.O.</b>	<b>Staff</b>
<b>Geological Sciences</b>	<b>Rickard D.</b>	<b>Staff</b>
	<b>Davies T</b>	<b>PhD</b>
	<b>Horwood S</b>	<b>MSc</b>
	<b>Chinn I</b>	<b>PhD</b>
	<b>Gartz V</b>	<b>MSc</b>
	<b>Kopylova M</b>	<b>Post Doc</b>
	<b>Buntzen M</b>	<b>Hons</b>
<b>Medicine</b>	<b>Adams S</b>	<b>PhD</b>
<b>Lubilon</b>	<b>Fisher D</b>	<b>Cons</b>
<b>Materials Engineering</b>	<b>Ming V</b>	<b>PhD</b>
	<b>Coetzee A</b>	<b>Staff</b>
	<b>Howard R</b>	<b>PhD</b>
	<b>Jungbacke N</b>	<b>MSc</b>
	<b>Knutsen R</b>	<b>Staff</b>
	<b>Lang C</b>	<b>Staff</b>
	<b>Mills D</b>	<b>MSc</b>
	<b>Ming V</b>	<b>PhD</b>
	<b>Vismer S</b>	<b>MSc</b>
	<b>Williams G</b>	<b>MSc</b>
	<b>Wittridge N</b>	<b>MSc</b>

<b>Mathematics</b>	<b>Bruyns P</b>	<b>Staff</b>
<b>Mechanical Engineering</b>	<b>Leigh G</b>	<b>Hons</b>
	<b>Saunders T</b>	<b>Hons</b>
	<b>Berril A</b>	<b>Hons</b>
	<b>McKuur G</b>	<b>Hons</b>
	<b>Tait R</b>	<b>Staff</b>
<b>Medical Biochemistry</b>	<b>Rossouw J</b>	<b>Staff</b>
<b>Microbiology</b>	<b>Jaffray A</b>	<b>MSc</b>
	<b>Smith A</b>	<b>PhD</b>
	<b>von Wechmar B.</b>	<b>Staff</b>
<b>NAC</b>	<b>Pineda C</b>	<b>Staff</b>
	<b>Przybylowicz W.</b>	<b>Staff</b>
	<b>Przybylowicz J.</b>	<b>Staff</b>
<b>NBI</b>	<b>Kurzweil H</b>	<b>Staff</b>
<b>Physics</b>	<b>Comrie C</b>	<b>Staff</b>
	<b>Nemutudi R</b>	<b>BSc</b>
	<b>Schroeder B</b>	<b>MSc</b>
<b>Red Cross Hospital</b>	<b>Emms M</b>	<b>Staff</b>
<b>SANS</b>	<b>Austin R</b>	<b>Staff</b>
	<b>Steyn C</b>	<b>Staff</b>
<b>Serina</b>	<b>Butterworth J</b>	<b>Staff</b>
<b>SFRI</b>	<b>Matthews S</b>	<b>Staff</b>
<b>SOMCHEM</b>	<b>Rupert M</b>	<b>Staff</b>
<b>Surveying</b>	<b>Forsyth D</b>	<b>MSc</b>
<b>Unifruco</b>	<b>Crouch I</b>	<b>Staff</b>
<b>UWC</b>	<b>Akkers T</b>	<b>MSc</b>
<b>Wella</b>	<b>Noppe M</b>	<b>Cons</b>
<b>Zoology</b>	<b>Bloomer J</b>	<b>PhD</b>
	<b>Erasmus J</b>	<b>MSc</b>
	<b>Harris J</b>	<b>Staff</b>
	<b>Leeb A</b>	<b>MSc</b>
	<b>Ruck K</b>	<b>MSc</b>
	<b>Waldron M</b>	<b>Staff</b>