

# **ELECTRON MICROSCOPE UNIT**

## **ANNUAL REPORT**

### **2010/11**

#### **Permanent Staff**

**Director**

**B.T. Sewell**

**Principal Technical Officer (Part Time)**

**J. Duncan**

**Principal Technical Officer**

**M. A. Jaffer**

**Principal Scientific Officer**

**B.W. Weber**

**Chief Scientific Officer**

**F. Cummings**

**Chief Scientific Officer**

**M.E. Waldron**

**Technical Assistant**

**S. Karriem**

## Formal 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 EM Unit Steering Committee.

### 1. General

The Electron Microscope Unit is a resource centre which enables researchers and their students to visualise and analyse microscopic entities arising from diverse fields. The resources it provides are microscopes, preparative equipment, analytical equipment, an infrastructure for image data visualisation, analysis, management and presentation as well as knowledge and experience in a variety of areas of microscopy. The Unit also exists for the promotion of electron microscopy and other forms of microscopic visualisation in research and for the education of users in various aspects of the technology.

A key resource of the Unit are the staff who act as research partners advising on possible microscopy strategies for achieving the required insights and guiding students and researchers in the use of the technology.

The primary areas served are research and postgraduate teaching in Engineering, Health Sciences and Science. The Unit is not structured as a routine diagnostic or quality control facility.

The primary users served by the Unit are from UCT, the neighbouring academic institutions and local industry. Occasional use of the Unit is made by academics from African states and from further afield. Recently the Unit has acquired the status of the National Centre for cryo-Electron Microscopy.

### Governance and Management

#### *The operational model for the Electron Microscope Unit*

The unit is supported by an annual grant by the University (approx R2.5m) which covers the cost of:

1. A 50% time Director

2. Three full-time principal scientific officers (responsible for SEM, TEM and biological sample preparation respectively)
3. A full-time chief scientific officer (responsible for material science applications and the T20)
4. A full time departmental assistant at the highest payclass (responsible for maintenance of the public working areas)
5. A 66% time principal technical officer (responsible for servicing the instruments)

The EMU is located within the Health Sciences for administrative purposes. The budget for the EMU resides within the Health Sciences, but decisions on replacement of equipment, etc. would fall within the ambit of the Steering Committee and CEF.

Income for capital equipment must be raised on the basis of "ad hoc" grants supported by funds raised through services to clients of the unit.

Income for maintenance, consumables and other running costs, courses, conferences and salary increases must be raised through services to clients.

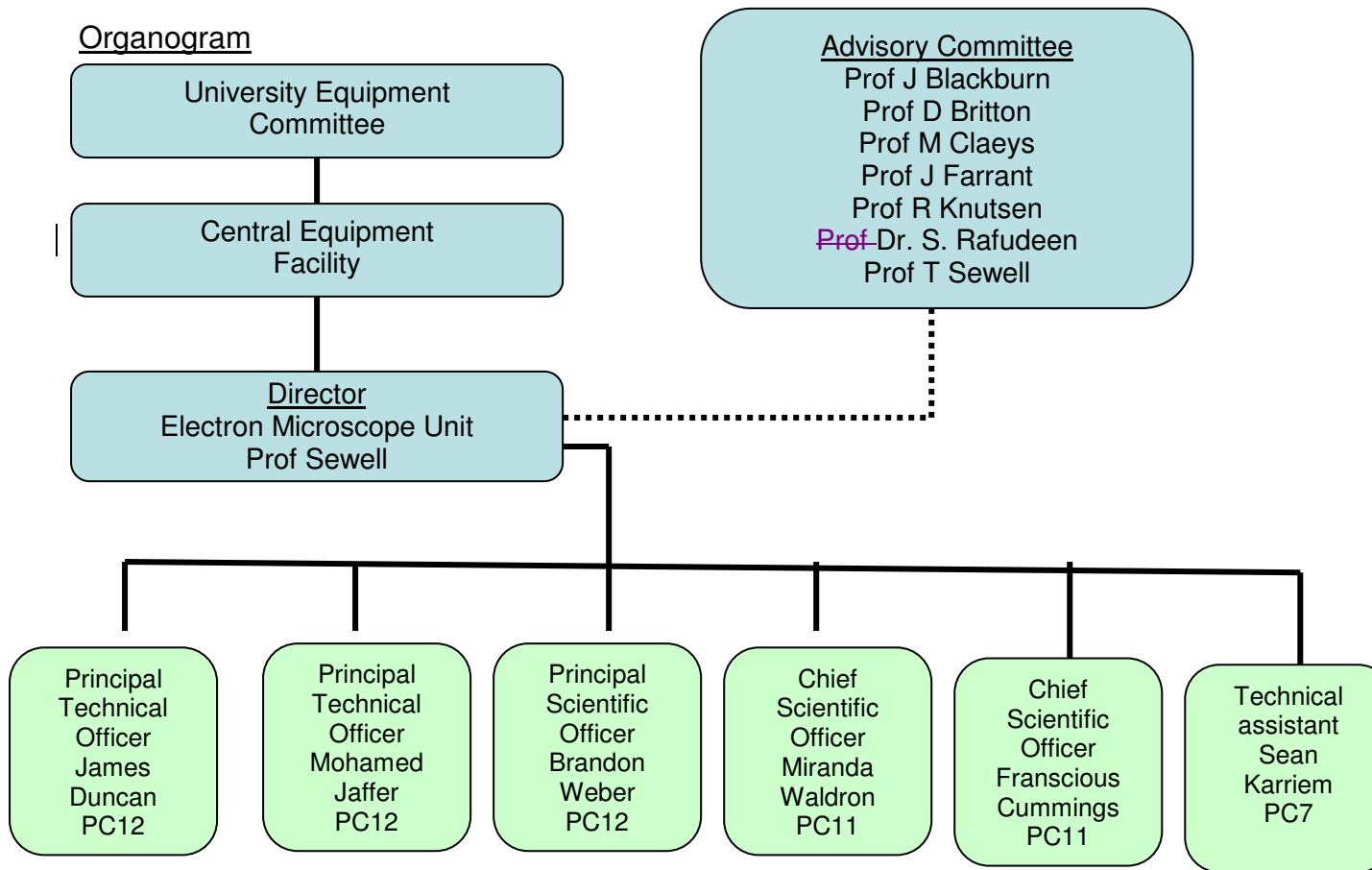
The rates for the use of the instruments assume 500 hours use per instrument per annum. Certain clients receive preferential pricing. Usage is logged by the clients themselves and is billed on a monthly basis. The charge structure should be approved annually through the CEF and UEC

Most clients are students whose usage is funded by their supervisors. The money comes largely from research grants.

#### *Weaknesses in the system*

Money is granted to users who then have free choice in how to deploy it. If they choose not to do EM at UCT then no revenue is generated for the maintenance of the instruments. If the Unit does not generate sufficient revenue to maintain an instrument and it fails then no further revenue can be generated and funds must be raised from non-service related income streams in order to restore the instrument. The minimum cash required to maintain the instruments may not be raised leading to a catastrophe.

Organogram



University Equipment Committee

Central Equipment Facility

Director  
Electron Microscope Unit  
Prof Sewell

Advisory Committee

Prof J Blackburn  
Prof D Britton  
Prof M Claeys  
Prof J Farrant  
Prof R Knutsen  
~~Prof~~ Dr. S. Rafudeen  
Prof T Sewell

Principal Technical Officer  
James Duncan  
PC12

Principal Technical Officer  
Mohamed Jaffer  
PC12

Principal Scientific Officer  
Brandon Weber  
PC12

Chief Scientific Officer  
Miranda Waldron  
PC11

Chief Scientific Officer  
Franscious Cummings  
PC11

Technical assistant  
Sean Karriem  
PC7

## 2. Users

Actual use by hour/ Students name, University or Company, department.

The table below gives a list of people who used the various instruments in the Electron Microscope Unit in 2010 and 2011. The users are listed by name, University or Company and department and the hours logged by each individual on each electron microscope are noted.

Name	University/ Company	Department	S440 SEM	912 TEM	Nano SEM	F20 TEM	T20 TEM
Cotton, J	180		78.5		36		
Fungai	180		0.5				16.5
Ruppert, M	Adv Mat Sci				0.5		
Ruppert, M	AMS		0.5		4.5		
Bandama, F	UCT	Archaeol	13		1		
Ahmed, S	UCT	BISRU			29.5		
Gebregzigaben, A	UCT	Botany	11		75		
Hedderson, T	UCT	Botany	1				
Musaya, M	UCT	Botany			2		
Sievers, C	UCT	Botany			18		
Viljoen, J	UCT	Botany	3				
Welsford, M	UCT	Botany			3.5		
Steyn, L	UCT	Cape Heart		1.5	4.5		
Amed, M	UCT	Chem Eng		3			
Amod, A	UCT	Chem Eng		13	4	4	
van Hille, R	UCT	Chem Eng			13		
Makhubela, B	UCT	Chem Eng	1				2
Brosius, R	UCT	Chem Eng		2	1		
Bulelwa	UCT	Chem Eng			8		
Chonco, Z	UCT	Chem Eng		11.5	6		3
Clapham, B	UCT	Chem Eng		9		2	4.5
Claeys, M	UCT	Chem Eng		2			
Cotton, J	UCT	Chem Eng	6		9		
Craig, T	UCT	Chem Eng			5.5		
Cupido, R	UCT	Chem Eng			0.5		
Doreen	UCT	Chem Eng		4			
Emmanuel	UCT	Chem Eng			2		
Feltes, T	UCT	Chem Eng		6		63.5	18
Fisher, N	UCT	Chem Eng		6.5		11	3.5
Ghorbani, Y	UCT	Chem Eng	0.5		21.5		
Hsu, P	UCT	Chem Eng		54.5			
Voegeli, J	UCT	Chem Eng			4		
Jones, G	UCT	Chem Eng			5.5		
Julies, M	UCT	Chem Eng		21.5	11.5		5.5
Kekana, L	UCT	Chem Eng		3.5	1.5	30.5	5
Khonthu, T	UCT	Chem Eng			10.5		
Ledwasa, L	UCT	Chem Eng				3.5	
Levecque, P	UCT	Chem Eng		1.5		1	
Lindani	UCT	Chem Eng			8		
Magorosi, P	UCT	Chem Eng			7.5		
Mariam,	UCT	Chem Eng		1	1.5		
Mooruth, N	UCT	Chem Eng	1.5		8.5		
Mungwe, N	UCT	Chem Eng	3	71.5	9	90	6.5

Musil, E	UCT	Chem Eng	1	14		
Nagooroo, S	UCT	Chem Eng	1	8.5		
Naido, S	UCT	Chem Eng		3		
Naidoo, Q	UCT	Chem Eng			3.5	3
Norbert	UCT	Chem Eng		3		
Nzonke	UCT	Chem Eng		2		9.5
Petersen, A	UCT	Chem Eng			1	
Pietersen, A	UCT	Chem Eng				1.5
Royker, M	UCT	Chem Eng				2
Rukaya S	UCT	Chem Eng		2.5	6	1.5
Swannel, W	UCT	Chem Eng		1		
Toma, N	UCT	Chem Eng		8		
van Heerden, T	UCT	Chem Eng		9.5	6	3.5
van Zyl, W	UCT	Chem Eng			1.5	
Vogel, J	UCT	Chem Eng		2		
Wing	UCT	Chem Eng		0.5		
Wright, C	UCT	Chem Eng	7.5	25		
Yorath, G	UCT	Chem Eng	0.5	1		
Kubethu	UCT	Chem Eng	0.5			
	Chem Invest					
Norton, S	Serv			1		
Ambele, M	UCT	Chemistry	21.5		48	22
Botha S	UCT	Chemistry	21.5	3	4.5	
Makubela, B	UCT	Chemistry	5	2.5		
Combrik J	UCT	Chemistry	1.5			2
Jardine, A	UCT	Chemistry	5			
Khanyile	UCT	Chemistry	5.5			
Omar, A	UCT	Chemistry	3.5	7		
Ronica	UCT	Chemistry	6			
Sayed, S	UCT	Chemistry		24	7.5	
Wicht, K	UCT	Chemistry			6	
Webber, D	UCT	Chemistry	1.5		0.5	
Burmeister, N	UCT	Civ Eng			13	
Gillmor, M	UCT	Civ Eng	8			
Gropinath, R	UCT	Civ Eng			8	
Nganga, G	UCT	Civ Eng			0.5	
Santharam, M	UCT	Civ Eng			12.5	
Akleker, G	UCT	CME	3		0.5	
Allies, S	UCT	CME	0.5		9.5	37.5
Chiba, C	UCT	CME			10.5	
Chetty, S	UCT	CME			1.5	
Chumani	UCT	CME				28.5
Clinning, N	UCT	CME			8	
Dauids, R	UCT	CME			2	
Edward	UCT	CME		2.5		
Finkelstien, L	UCT	CME			5.5	
George, S	UCT	CME	2.5		30	9
Hons	UCT	CME	24.5		5.5	
Morrison, G	UCT	CME				4.5
Kariniza, I	UCT	CME		0.5	1	1.5
Khanyisa,	UCT	CME	1		5.5	1.5
Kloppers, N	UCT	CME			1	
Knutsen, R	UCT	CME		4	340.5	6
Letaba, G	UCT	CME		61.5		114
						34

Miller, D	UCT	CME			3.5		4
Morrison, G	UCT	CME				5	13.5
Mpufumeni	UCT	CME		1.5			
Mukadam, L	UCT	CME	2		1.5		15.5
Nasheeta	UCT	CME			23.5	2	
Oliver	UCT	CME			4		
Park-Ross, P	UCT	CME			2		
Royker, M	UCT	CME		3			
Ngwenya, S	UCT	CME	0.5		2.5		
Tembo, B	UCT	CME	2		3		
Tobile	UCT	CME	1		7	6.5	
Vellie	UCT	CME			3		
Willimas, R	UCT	CME	3				
Mokhetso W	UCT	CME	2		21.5		
Kirby, B	CPUT	Biotechnology	4				
Reza	CPUT	Biotechnology	1				
Fahaad	CPUT	Chemistry			0.5		9
Halemat, A	CPUT	Chemistry			0.5		4
Mardhall, A	CPUT	Civil Eng			1		
Verster, V	CPUT	Civil Eng			1	3	3
		Clothing and					
Greyling, C	CPUT	Textiles			12.5		
Leiman, T	UCT	Economics			2.5		
Eze, P	UCT	EGS			4		
Cummings, F	UCT	EMU				20	34
Jaffer, M	UCT	EMU		15		53.5	72.5
Waldron M	UCT	EMU	28		27.5		
Weber, B	UCT	EMU		3		6	
Buffler, F	UCT	Fine Art			2.5		
White, M	Fine Chem		4.5		3.5		
Zimper, U	Fine Chem				0.5		
Klatzow, D	Forensics		1		3		
Tichagwa, L	Fort Hare	Chemistry		1.5			
Berry, C	Frika Wigs		1				
Busakwe, A	Frika Wigs		3		0.5		
Muller, B	Frika Wigs				1		
Mackay A	UCT	Geol Sci			1.5		
Carly	UCT	Geol Sci	0.5				
Bumfrett, I	UCT	Geol Sci	1.5		2		
Cooper, S	UCT	Human Biol		9			
Tiamyu, A	UCT	Human Biol			3		
Cass, J	UCT	IMBM		2.5			
Lukasa, L	UCT	IMBM		7.5			
Barnabas A	lthemba labs			16			
Enoch	lthemba labs				4		
Simmo, A	lthemba labs			2	3.5		1
Dompreh	lthemba labs				2.5		
Samain, F	lthemba labs			1.5			
Hanief, N	lthemba labs				0.5		
Khamalich, S	lthemba labs		2		2		
Khenfouch, M	lthemba labs				3		
Khumalo, Z	lthemba labs				19		
Kotsedi L	lthemba labs				4		
Jo	lthemba labs		3				

Edominonyi-Out, L	lthemba labs		3.5		1.5	6
Lebogang	lthemba labs			1.5		1
Nechaev, A	lthemba labs	5				
Maaza, M	lthemba labs	3	6.5	10	3	
Mohammed	lthemba labs			4		
Osofi, R	lthemba labs			7.5		
Mongwaketsi P	lthemba labs	1.5	2	8.5		
Sone, B	lthemba labs	5	2.5	6.5		
Topic, M	lthemba labs	7.5		2.5		
Quwdele, K	lthemba labs	2				
van Den Berg,C	lthemba labs	1				
Zebib	lthemba labs			8		
Herbert, W	Malutsa				1	
3rd yrs and Hons	UCT	MCB	6	9		
Alta, D	UCT	MCB		2		
Burger, M	UCT	MCB		25	1	
Cooper, K	UCT	MCB		72		
David M	UCT	MCB		1		
Gareth	UCT	MCB			2	
Gingbot, Z	UCT	MCB		41.5		
Hattingh A	UCT	MCB		1		
Lexi	UCT	MCB		16.5		1
Meyers, A	UCT	MCB		3.5		
Meyers, P	UCT	MCB			3.5	
Mutepfa, D	UCT	MCB		8		
Mulelu, A	UCT	MCB				8
Pineo, C	UCT	MCB		13		
Reddy, A	UCT	MCB		39		
Rholand, J	UCT	MCB	5			
Rybicki E	UCT	MCB		8		
Mbweana, S	UCT	MCB		3.5		
Lee, S	UCT	Mec Eng			2.5	
McCormick, D	UCT	Mec Eng	16			
Kuppuswammy, R	UCT	Mech Eng	9.5		5.5	
Rosie, K	UCT	Mech Eng	17.5			
Tamutswa, L	UCT	Mech Eng	6			
Cotton, J	UCT	Med Biochem		6.5		
van Wyk, C	Metsep		1		0.5	
Fredericks, N	Mintek			3		
Greyling, C	NanoNCI		21		16.5	
Hattingh, B	NWU	Chemical Sciences				22
Odeh	NWU	Chemical Sciences				3
Roberts, M	NWU	Chemical Sciences				4
Jansen, L	Oceans & Coasts		117.5		1	
van Rensberg, B	OHE		6.5		4	
Keet, G	OHMS		0.5			
Soley, J	Univ Pretoria	Ondesterpoort				8
Fitton, J	ONFO		0.5		3.5	
Jones, J	Origen				1.5	

Henk	Origen		2					
Sergey	Origen					4.5		
Malloch, R	P&C					4		
van der Walt, M	P&C		2					
Wickens, J	P&C		2.5					
Zeelie, P	P&C					0.5		
Zengeni, B	P&C		10.5			8		
Buffler, A	UCT	Physics				1		
Oguh, J	UCT	Physics	3			12		
Jonah, E	UCT	Physics				13		
Jones, S	UCT	Physics	6.5	9		1.5		17
Lehlo	UCT	Physics	22.5			25		
Unigibe, D	UCT	Physics	8.5			5		
Uli	UCT	Physics				3		
Ahmed, A	U Stellenbosch	Poly Sci			9	1		
Fozi A	U Stellenbosch	Poly Sci			4			
Basson, T	U Stellenbosch	Poly Sci				1		
Bayley, G	U Stellenbosch	Poly Sci			10			
Bayley, N	U Stellenbosch	Poly Sci			5			
Cloete, W	U Stellenbosch	Poly Sci			1.5			1.5
Chirowadza H	U Stellenbosch	Poly Sci			2			
Du Toit, M	U Stellenbosch	Poly Sci				2.5	1.5	16.5
Etmimi, H	U Stellenbosch	Poly Sci			20.5		2	
Gerike, A	U Stellenbosch	Poly Sci				5		
Hendricks, K	U Stellenbosch	Poly Sci			5			
Jacobs, J	U Stellenbosch	Poly Sci					2.5	2
Keulder, L	U Stellenbosch	Poly Sci				2		5
Khotso	U Stellenbosch	Poly Sci			3.5	7	6	7
Kotze, I	U Stellenbosch	Poly Sci			5			
Koen, M	U Stellenbosch	Poly Sci			6			
Kriel, H	U Stellenbosch	Poly Sci	2.5			1		
Oliver, L	U Stellenbosch	Poly Sci				1		
Meyer, T-M	U Stellenbosch	Poly Sci			1.5			
Mpitso, K	U Stellenbosch	Poly Sci			12		13	
Pound, G	U Stellenbosch	Poly Sci			2			
Pfukwa, R	U Stellenbosch	Poly Sci			4			
Reuben,	U Stellenbosch	Poly Sci			0.5			
Simpson, J	U Stellenbosch	Poly Sci			0.5			
van Dungen, E	U Stellenbosch	Poly Sci			4.5		25	
Walid	U Stellenbosch	Poly Sci			1.5	6.5		6
Zengeni, E	U Stellenbosch	Poly Sci			13.5			15.5
Ledgerwood, T	Precision Press						1	
van Dyk, S	Rhodes	Biochemistry				16		
Bergh, I	Roediger					3		
Mtembu, X	SAB		9					
Manning, J	SANBI		1					
Roux, K	SANBI					1.5		
Snjiman, D	SANBI		0.5					
Burger, V	SASOL					5		
Gertenbach, R	SASOL		2	21.5		3.5	3	
Andani,	UCT	SBIO			6		9	22
Kimani, S	UCT	SBIO			9.5		5	
Fredericks, J	UCT	SBIO			4.5		2.5	9
Patel, S	UCT	SBIO			30.5		54.5	4

Thuku, N	UCT	SBIO		56.5		52.5	
van Rooyen, J	UCT	SBIO				9	
Varsani, A	UCT	SBIO				22.5	1
Watermeyer, J	UCT	SBIO		13.5		42.5	2
Woodward, J	UCT	SBIO				70	
Van Rooyen, J	UCT	SBIO		2			
Swart, H	Shimoda			1.5			
Du Plessis, L	Shimoda			9.5			
Matthews, G	St Gorban					2	
Van Heerden, J	Synexa					5	
Halimer, G	TF Design		11			13	
Geesh, N	UFS	Physics				2.5	
Luyt	UFS	Agriculture		15.5			6
Pasi, Vio Sarah	Univ Helsinki	Centre of virus research				98.5	
Gitari, M	Univ Venda	Biochemistry	2			1	
le Roux, C	U Stellenbosch	Biochemistry		1.5		5	
Bagialli	U Stellenbosch	Chem				4.5	1.5
de Villiers, K	U Stellenbosch	Chem				1.5	
Gerhaeuser, C	U Stellenbosch	Chem		20			
saban W	U Stellenbosch	Chem				1.5	
Lakay, E	U Stellenbosch	Chem		9.5	13.5	7.5	24
Gauthier	U Stellenbosch	Engineering					2
Boshoff, I	U Stellenbosch	Physics				2	0.5
Cass, J	UWC	Biotech		5			
Gitau, G	UWC	Biotech				1	1
Kuklik, N	UWC	Biotech		35		10	
Adeniyi, B	UWC	Chemistry		2			
Abbo, H	UWC	Chemistry				1	
Alegbe, J	UWC	Chemistry	1		11.5		2
Ayanda	UWC	Chemistry			8.5		4.5
Bulelwa, N	UWC	Chemistry			4		
Boke, N	UWC	Chemistry			1		
Eze, P	UWC	Chemistry			7		
Fanapi, N	UWC	Chemistry			1		
Fatoba	UWC	Chemistry			6.5		
Fadipe	UWC	Chemistry				10.5	
Hsu	UWC	Chemistry			2.5		
Ilcher, A	UWC	Chemistry				2	
Izak	UWC	Chemistry			1		
Jonas, N	UWC	Chemistry	1		3.5		
Meyer, F	UWC	Chemistry			8.5		
Molopo, K	UWC	Chemistry			1		
Mothoa, S	UWC	Chemistry			1.5		
Muriithii, G	UWC	Chemistry			2		
Musyoka, N	UWC	Chemistry	2		3.5		
Noluntu	UWC	Chemistry					1.5
Ntlameana, A	UWC	Chemistry			2		
Nomsa	UWC	Chemistry			10.5		
Nyale, S	UWC	Chemistry			2		
Godonwana, Z	UWC	Chemistry		2		2	
Galithana, O	UWC	Chemistry			22		
Olushola	UWC	Chemistry		2	7		
Saban, W	UWC	Chemistry	1	3	3		

Tatindi, S	UWC	Chemistry				3
Toca, O	UWC	Chemistry			2	
Segun	UWC	Chemistry			3	
Qi-Ling	UWC	Chemistry		2.5	4	
Xolelwa	UWC	Chemistry	2		4.5	
Hons	UWC	SBIO		27		12
Freemenatle, C	WITS	Chem Eng			15.5	6
Amaka	UCT	Zoology			2.5	
Chinsamy, A	UCT	Zoology			1	
Lucas M	UCT	Zoology			1.5	
Uys, C	UCT	Zoology			0.5	
Reed, C	UCT	Zoology	3			
Nico, C	UCT	Zoology			1	
Warinus, G	Private			1		
Schroeder, D	Private					4

The table below gives a list of UCT users projects,

Students	PI	Project	Technique
<b>Botany</b>			
	Hedderson, T	<i>Picobryum</i> , a new genus of Pottiaceae (Bryophyta) from South Africa, and an erratum for <i>Acaulonopsis</i>	SEM
Sievers, C	Musaya, M	<i>Isolepis namaquana</i> (Cypereae, Cyperaceae), a new endemic species from the winter rainfall area of South Africa.	SEM
<b>Chemical Engineering</b>			
Amod, M	Prof. van Steen	Potassium promotion on nano-sized iron crystallites in the Fischer-tropsch process	TEM
Ahmed, M			
Clapham, B			
Jones, G	Prof. van Steen	An Investigation of ion exchange as a method for preparation of gold catalysts for use in ethylene glycol oxidation.	TEM/SEM
Julies, M			
Van Heerden, T			
Chonco, Z	Prof. van Steen	Promotion of Fe-based FT-catalysts by group II metals.	TEM/SEM
Fisher, N	Prof M Claeys	Nanometre and Angstrom sized cobalt ensembles and their performance in the Fischer-Tropsch synthesis.	TEM
Musil, E	Prof A Lewis	Developing methods to measure the precipitation kinetics of sparingly soluble systems	SEM
Ghorbani, Y	Dr Petersen	Charaterization of bioleaching in large particle in the heap leach process	SEM
Kekana, L	Prof M Claeys	Synthesis of cobalt nanoparticles from organometallic precatuers as model catalyst for Fischer Tropsch	TEM/SEM
Naidoo, S	Prof. A Lewis	Control, of particle characteristics in precipitation process	SEM
Magarosi, P			TEM
Mungwe, N	Prof. M Claeys	Fischer-Tropsch Synthesis based on Rhodium crystallites and clusters of different sizes.	TEM
Rendani, R	Prof. A Lewis	Phosphate removal from waste water.	SEM
Toma, N	Prof van Steen	The inveastiagtion of a novel cobalt catalyst	TEM

Wright, C	Prof Fletcher	preparation of cobalt based Fischer-Tropsch synthesis Synthesis of medium pore zeolites for the alkylation of M-cresol with isopropanol.	SEM
<b>Civil Engineering</b>			
Burmeister, N	Dr H Beuhausen	Evaluation of concrete coatings under artificial weathering regimes	SEM
Gilmor, M	Prof M Santharam,	Performance of banded overlays with the addition of SAP	SEM
<b>CME</b>			
Finkelstein, L Miller, D	Prof C Lang	Novel ordering of platinum alloys	SEM
George, S	Prof Knutsen	EBSD	SEM
Leteba, G	Prof C Lang	Catalytic properties of pt-based near surface alloys	TEM
<b>Geological Sciences</b>			
Brumfrett, I	Prof J Compton	The diagnosis of bone related to sediment composition for pain pit, E Quarry, West Coast Fossil park	SEM
Faber, C	Dr Rowe	Deformation textures in ther Naukluft thrust – dolocalaclasites to calcmylonites	SEM
<b>Human Biology</b>			
	Cooper, S	Meklanocyte-hyperisin UV project	TEM
<b>Molecular and Cell Biology</b>			
K Cooper, M Burger, Pineo, C	Prof Farrant	Biochemical, genetic, physiological and cellular research in dessication plants.	SEM, TEM
Mutepfa, D	Dr V Coyne	The investigation of pathogenesis-related proteins produced by <i>G. gracilis</i> in response to infection.	TEM
Rholand, J	Dr P Meyers	Identification of novel antibiotics.	SEM
Mulelu, S	Prof E Rybicki	Vaccine development against avian influenza.	TEM
<b>Mechanical Engineering</b>			
Lee, S	Prof Kuppuswamy	Micro-grinding of PCD insert chamfers with precision depth setting device.	SEM
McCormick	Prof R Tait	Concrete at sustained high temperatures	SEM
Rosie, K	Prof R tait	Microstructural crack behaviour studies of nuclear graphite using an in situ double torsion rig inside a scanning electron microscope	SEM
<b>Medical Biochemistry</b>			
Cotton, J	Dr M Parker	Fluorescent ajoenes as a mechanistic probe for cancer	TEM
<b>Physics</b>			
Mongalo, L Oguh, J	Prof Britton	Investigation of copper metal matrix nano composite	SEM
Monfal, L	Prof D. Britton, Prof M. Harting	Plasma-sprayed ceramic coatings.	SEM
Unigibe, D	Prof D. Britton, Prof M. Harting	Application of Ni-Si semiconductor material.	SEM, TEM,
<b>Structural Biology</b>			

Broadley, S	Dr B.T.Sewell	Purification and co-crystallisation of Plasmodium falciparum HGXPRT with a chalcone inhibitor	TEM
Kimani, S	Dr B.T.Sewell	Structural characterization of the active sites of amidases from the nitrilase superfamily; with emphasis on the amidase domain from the Mycobacterium tuberculosis NAD <sup>+</sup> synthetase	TEM
Thuku, N	Dr B.T.Sewell	Structure of the nitrilase <i>Rhodococcus rhodochrous</i> J1: Homology modelling and three-dimensional reconstruction.	TEM
Van Wyk, J	Dr B.T.Sewell	The basis of thermostability in the Co containing nitrile hydratases.	X-ray
Van Rooyen, J	Dr V Abratt Dr B.T.Sewell	The structure of the type III Glutamine Synthetase from <i>Bacterioides fragilis</i> determined by combining electron microscopic and X-ray data.	TEM
Watermeyer, J	Dr B.T.Sewell	Investigating the mechanism of helix formation in microbial nitrilases by three-dimensional negative stain and cryo-electron microscopy	TEM
Woodward, J	Dr B.T.Sewell	The feasibility of high resolution, three-dimensional reconstruction of metal-coated surfaces in structural biology.	TEM/SEM
<b>Zoology</b>			
	Reed, C	Paralena identification of Bapydrid isopod infecting <i>Upagebia capensis</i> in Langebaan lagoon	SEM

The tables below give the top ten users of the Electron Microscope Unit in 2010 and 2011

<b>Department or company</b>	<b>Total Hours 2010</b>
Chemical Engineering	490
Centre for Materials Engineering	402.5
EMU/ Structural Biology	223.5
Molecular and Cell Biology	208
U Stellenbosch, Polymer Science	135
Oceans and Coasts	117.5
Chemistry	112.5
180 Engineering solutions	110
UWC Chemistry	106
University of Helsinki	98.5

<b>Department or company</b>	<b>Total Hours 2011</b>
Centre for Materials Engineering	486
EMU/ Structural Biology	348.5
Chemical Engineering	347.5
U Stellenbosch, Polymer Science	107
Molecular and Cell Biology	106
Chemistry	103
Botany	90.5
Itemba	89.5
UWC Chemistry	74.5
UWC Biotechnology	52

Extent of under or over utilization of the instruments:

Instrument usage is budgeted at 500 hours per year, the table below gives the total hours each instrument was used in 2010 and the number of hours the instrument was under or over utilized.

Instrument	S440 SEM	Leo 912 TEM	F20 TEM	T20 TEM	Nova NanoSEM
<b>Total Hours 2010</b>	<b>410</b>	<b>696.5</b>	<b>409</b>	<b>50</b>	<b>780.5</b>
Hours under utilized	90		91	450	
Hours over utilized		196.5			280.5
<b>Total hours 2011</b>	<b>108.5</b>	<b>393.5</b>	<b>566</b>	<b>464</b>	<b>762.5</b>
Hours under utilized	391.5	106.5		36	
Hours over utilized			66		262.5

### 3.Outputs

Publications over the last two years.

**Publications for 2011 that resulted from research in which the EM Unit staff have been directly involved:**

Nel AJ, Tuffin IM, Sewell BT, Cowan DA. 2011. Unique aliphatic amidase from a psychrotrophic and haloalkaliphilic nesterenkonia isolate. Appl Environ Microbiol. 2011 Jun;77(11):3696-702

van Rooyen J, Belrhali H, Abratt V, Sewell BT. 2011. Proteolysis of the type III glutamine synthetase from *Bacteroides fragilis* causes expedient crystal-packing rearrangements. Acta Crystallogr Sect F Struct Biol Cryst Commun. 2011 Mar 1;67(Pt 3):358-63

#### **Publications by users of the Unit in 2011**

Chinsamy-Turan, Anusuya and Thomas, Daniel Chemometric analysis of EDXRF measurements from fossil bone Journal of X-Ray Spectrometry 40(6) 41-445.

Fischer, N, Van Steen, E and Claeys, M (2011) Preparation of supported nano-sized cobalt oxide and fcc cobalt crystallites Catalysis Today 171 174-179

George, S and Knutsen, R Solidification of an Al-Zn alloy during semi-solid processing. Journal of the South African Institute of Mining and Metallurgy 111:138-186

Ghorbani, Y, Becker, M, Mainza, A, Frandiz, J-P and Pertersen, J. Large particle effects in chemical/biochemical heap leach processes - A review. Minerals Engineering 24: 1172-1184

Hedderson, T and Zander, R *Picobryum*, a new genus of Pottiaceae (Bryophyta) from South Africa, and an erratum for *Acaulonopsis*. J of Bryology, 33 130-133

Jones, G, Corin, K, van Hille, R and Harrison, S. The generation of toxic reactive oxygen species (ROS) from mechanically activated sulphide concentrates and its effect on thermophilic bioleaching Minerals Engineering. 24:1198-1208

Khamilch, S., Manikandan, E., Ngom, B.D., Sithole, J., Nemraoui, O., Zorkani, I., McCrindle, R., Cingo, N. and Maaza, M. (2011). Synthesis, characterization and growth mechanism of  $\alpha$ -Cr<sub>2</sub>O<sub>3</sub> monodispersed particles. *J. Phys. Chem. Solids*, doi:10.1016/j.jpcs.2011.02.015.

Mohomane SM, Djokovic V, Thomas S & Luyt AS, "Polychloroprene nanocomposites filled with different organically modified clays: Morphology, thermal degradation and stress relaxation behaviour", *Polymer Testing*, **30**, 585-593 (2011)

Motaung TE, Luyt AS & Thomas S, "Morphology and properties of NR/EPDM rubber blends filled with small amounts of titania nanoparticles", *Polymer Composites*, **32**, 1289-1296 (2011)

Matthews, L and Knutsen, R. Microstructure evolution in Ti-6Al-4V alloy during hydrogen dosing at elevated temperature. *Journal of the South African Institute of Mining and Metallurgy* 111:155-158

Muasya, A., Viljoen, J. and Stirton, C. (2011). *Isolepis namaquana* (Cypereae, Cyperaceae), a new endemic species from the winter rainfall area of South Africa. *South African journal of Botany*. 77:55-58.

Sievers, C and Muasya, A.M. (2011). Identification of the sedge *Cladium mariscus* subsp. *Jamaicense* and its possible use in the Middle Stone Age at Sibudu, KwaZulu-Natal. *Southern African Humanities* 23:77-86

Vogeli, J. Reid, D. Beckser, M. Broadhurst, J and Franzidis, J-P Investigation of the potential for mineral carbonation of PGM tailings in South Africa. *Minerals Engineering* 24:1348-1356.

**Publications for 2010 that resulted from research in which the EM Unit staff have been directly involved:**

Achinlonu, I.A., Gildenhuis, S. Fisher, L., Burke, J., Fanucchi, S., Sewell, B.T., Fernandes, M.A. and Dirr, H.W. (2010) The role of a topologically conserved isoleucine in glutathione transference structure – stability and function. *Acta Crystallographica Section F – Structural Biology and Crystalization Communications*, F66:776-780

Briddon, R.W., Martin, D.P., Owor, B.E., Donaldson, L., Markham, P.G., Greber, R.S. and Varsani, A. (2010) A novel species of mastrevirus (family Geminiviridae) isolated from *Digitaria didactyla* grass from Australia. *Archives of Virology*, 155(8), 1529-1534.

Briddon, R.W., Heydarnejad, J., Khosrowfar, F., Massumi, H., Martin, D.P. and Varsani, A. (2010) Turnip curly top virus, a highly divergent geminivirus infecting turnip in Iran. *Virus research*, 152(1-2), 169-175.

Erdmann, J.B., Shepherd, D.N., Martin, D.P., Varsani, A., Rybicki, E. and Jeske, H. (2010) Replicative intermediates of Maize streak virus found during leaf development. *Journal of General Virology*, 91, 1077-1084

Frouws, T., Patterson, H.G and Sewell, B.T. (2010) Histone Octamer Helical tubes suggest then an internucleosomal Four-Helix bundle stabilizes the chromatin fiber. *Biophysical Journal* 96(8):3363-3371

Joubert, M.K., Kinsley, N., Capovilla, A., Sewell, B.T., Jaffer, M.A. and Khatib, M. (2010) A modelled structure of an aptamer-gp120 complex provides insight into the mechanism of HIV-1 neutralization. *Biochemistry*, 49:5880-5890

Lefevre, P., Martin, D.P., Harkins, G., Lemey, P., Gray, A.J.A., Meredith, S., Lakay, F., Monjane, A., Lett, J.M., Varsani, A. and Heydarnejad, J. (2010) [The Spread of Tomato Yellow Leaf Curl Virus from the Middle East to the World](#) *PLoS Pathogens*, 6(10), e1001164.

Moore, J.P., Waldron, M., Lindsey, G.G., Farrant, J.M. and Brandt, W.F. (2010). An Ultrastructural investigation of the surface of the microbiota present on the leaves and reproductive structures of the resurrection plant *Myrothamnus flabellifolia*. South African journal of Botany

Ortiz-Catedral, L., Kurenbach, B., Massaro, M., McInnes, K., Brunton, D.H., Hauber, M.E., Martin, D.P. and Varsani, A. (2010) A new isolate of Beak and feather disease virus from endemic wild Red-fronted parakeets (*Cyanoramphus novaezelandiae*) in New Zealand. *Archives of Virology*, 155(4), 613-620.

Shepherd, D.N., Martin, D.P., van der Walt, E., Dent, K., Varsani, A. and Rybicki, E.P. (2010) Maize streak virus: an old and complex 'emerging' pathogen. *Molecular Plant Pathology*, 11(1), 1-12.

Tazehkand, A.S., Pour, A.H., Heydarnejad, J., Varsani, A. and Massumi, H. (2010) Identification of phytoplasmas associated with cultivated and ornamental plants in Kerman province, Iran. *Journal of phytopathology*, 158, 713-720.

Van Rooyen, J., Abratt, V., Berhali, H and Sewell, B.T (2010) Crystallization of recombinant *Bacteroides fragilis* glutamine synthetase(GlnN)isolated using a novel and rapid purification protocol. *Protein Expression and Purification* 74:211-216

Varsani, A., de Villiers, G.K., Regnard, G., Bragg, R.R., Kondiah, K.M., Hitzeroth, I. and Rybicki, E.P. (2010) A unique isolate of Beak and feather disease virus from budgerigars (*Melopsittacus undulates*) in South Africa. *Archives of Virology*, 155(3), 435-439.

Watermeyer, J., Kroger, W., O'Neill, H, Sewell, B.T. and Sturrock, E (2010) Characterization of domain-selective inhibitor binding in angiotensin-converting enzyme using a novel derivative of lisinopril. *Biochemical Journal*. 428:67-74.

Williamson DS, Dent KC, Weber BW, Varsani A, Frederick J, Thuku RN, Cameron RA, van Heerden JH, Cowan DA, Sewell BT. 2010. Structural and biochemical characterization of a nitrilase from the thermophilic bacterium, *Geobacillus pallidus* RAPc8. *Applied Microbiology and Biotechnology*, 88(1), 143-153.

Williamson, D.S., Dent, K.C., Weber, W.B., Varsani, A., Frederick, J., Cameron, R.A., van Heerden, J.H., Cowan, D.A. and Sewell, B.T. (2010) Structural and biochemical characterization of a nitrilase from the thermophilic bacterium, *Geobacillus pallidus* RAPc8. *Applied Microbiology and Biotechnology*, 88(1), 143-153.

Woodward, J. and Sewell, B.T (2010) Tomography of symmetric bulk specimens images by scanning electron microscopy. *Ultramicroscopy*, 110:170-175

#### **Publications by users of the unit in 2010**

Ah-Peng, C. Bardat, J. Ellis, L.T. Hedderson, T.A., Malombe, I., Matcham, H., Pocs, T., Porley, R., Seneca, A., Soderstrom, L and Wilbraham, J (2010) Additions to the bryoflora of Reunion Island 3: new and interesting records from the Tropical Bryology Group (British Byological Society) *Journal of Bryology*, 32:288-295

Archer, W. and Braun, D. (2010). Variability in bifacial technology at Elandsfontein, Western cape, South Africa: a geometric morphometric approach. *Journal of Archaeological Science*. 37 (1): 201-209

Becker, M., de Villiers, J and Bradshaw, D (2010). The mineralogy and crystallography of pyrrhotite from selected nickel and PGE ore deposits. *Economic Geology*. 105:1025-1037

Compton, J., Herbert, C., Hoffman, M., Schneider, R. And Stuut, J-B. (2010) A tenfold increase in the Orange River mean Holocene mud flux: implications for soil erosion in South Africa. *Holocene*:20 115-122.

Farrant, J. (2010) Mechanisms of desiccation tolerance in resurrection plants: A review from the molecular to whole plant physiological level. *South African Journal of Botany*: 76 (2):389  
 Huang, A, Ncokazi, K., De Villiers, K., Wright, D and Egan, T (2010) Crystallization of synthetic haemozoin ( $\beta$ -haematin) nucleated at the surface of lipid particles. *Dalton Transactions*. 39: 1235-1244

Miller, D.E.(2010) Indigenous metal melting and casting in Southern Africa. *South African archaeological Bulletin* 65(191):45-57

Motaung TE & Luyt AS, "Effect of maleic anhydride grafting and the presence of oxidised wax on the thermal and mechanical behaviour of LDPE/silica nanocomposites", *Materials Science & Engineering A*, **527**, 761-768 (2010)

Muyasya, A.M., Musil, P.M. and Vrijdaghs, A (2010) *Kyllinga mbitheana* (cyperaceae) – description, floral ontogeny and pollen micromorphology of a new species from Kenya. *Kew Bulletin* 65:323-325

Olaofe, O., Burton, S., Cowan, D and Harrison, S (2010) Improving the production of a thermostable amidase through optimising IPTG induction in a highly dense culture of recombinant *Escherichia coli*. *Biochemical Engineering Journal*. 52: 19-24.

Oyekola, O., van Hille, R and Harrison, S (2010) Kinetic analysis of biological sulphate reduction using lactate as carbon source and electron donor: Effect of sulphate concentration. *Chemical Engineering Science*. 65: 4771-4781.

Petersen, S. and Knutsen, R.D. 2010 Deformation and recrystallisation of powder processed commercially pure titanium (publication submitted to *Materials Science and Technology*)

Ramesh, K and Siong, L (2010) Extraction of flank wear growth models that correlates cutting edge integrity of ball nose end mills while machining titanium. *International Journal of Advanced Manufacturing Technology*. 2010: 2753-2759.

Reddy, T., Lewis, A., Witkamp, G-J., Kramer, H. and van Spronsen, J. (2010) Recovery of  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  from reverse osmosis retentate by eutectic freeze crystallisation technology. *Chemical Engineering Research and Design*, 88: 1153-1157

Students who have graduated and who used the Unit for their research:

Name	Degree	University	Dept	Race	Gender
<b>2010</b>					
Abduallah, A	PhD	UWC	Chemistry	C	M
Alshuiref, A.	PhD	UWC	Chemistry	C	M
Basson, N	MSc	U Stell	Polymer Sci	W	M
Chiririwa, H	PhD	UWC	Chemistry	B	M
Floweday, G	PhD	UCT	Civ Eng	W	M
Galimberti, M	PhD	UCT	Archaeology	W	F
George, S	PhD	UCT	CME	W	F
Goro Gonfa, G	PhD	UCT	Physics	B	M
Greyling, C	PhD	U Stell	Polymer Sci	W	F
Khanye, S	PhD	UCT	Chemistry	B	M
Kriel, H.	MSc	U Stell	Polymer Sci	W	M
Mogorosi, M	PhD	UCT	Chem Eng	B	M
Mothoa, S	MSc	UWC	Chemistry	B	M
Muriithi, G	MSc	UWC	Chemistry	B	F
Rholand, J	PhD	UCT	MCB	W	M
Van Rooyen, J	PhD	UCT	MCB	W	M
<b>2011</b>					
Adenyi, O	PhD	UWC	Chemistry	B	M
Akinyemi, S	PhD	UWC	Chemistry	B	M

Beckett M	MSc	UCT	MCB	W	F
Bulelwa, N	MSc	UWC	Chemistry	B	F
Chetty, S	MSc	UCT	Mat Eng	C	M
Fischer, N	PhD	UCT	Chem Eng	W	M
Godongwana, Z	PhD	UWC	Chemistry	B	M
Kimani, S	PhD	UCT	MCB	B	F
Letaba, G	MSc	UCT	Mat Eng	B	M
McCormick, D	MSc	UCT	Mech Eng	W	M
Mongalo, L	MSc	UCT	Physics	B	M
Muller, T-L	MSc	UCT	Medical Virology	W	F
Musil, E	MSc	UCT	Chem Eng	W	F
Musonza, E	MSc	UCT	Physics	B	M
Mutepfa, D	MSc	UCT	MCB	B	M
Pineo, C	MSc	UCT	MCB	W	F
Rosie, K	MSc	UCT	Mech Eng	W	F
Saban, W	MSc	UWC	Chemistry	C	M
Woodward, J	PhD	UCT	MCB	W	M
Naidoo, Q-L	PhD	UWC	Chemistry	W	F

#### 4. Financial Report

Actual income and expenditure over the last three years

	<b>2009</b>	<b>2010</b>	<b>2011</b>
Opening Balance	1,013,955	1,305,423	1,077,229
Income	726,475	727,416	1,155,670
Expenditure	-442,375	-932,108	-793,018
<b>Closing balance</b>	<b>1,298,055</b>	<b>1,100,731</b>	<b>1,439,881</b>

Actual/projected income and expenditure

Current facility charges:

<b>Service</b>	<b>Unit</b>	<b>Price</b>
Electron Microscopy	Per hour	R 300.00
Ultramicrotome	Per hour	R 100.00
Operator Charges	Per hour	R 300.00
Critical Point Drying	Per run	R 50.00
Sputter coating	Per run	R 50.00
Carbon coating	Per run	R 50.00
Scanning negatives	Per hour	R 10.00
Scanning negatives with operator	Per hour	R 50.00