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## SASBMB member wins TWAS Young Scientist Award

Professor Esta Van Heerden, manager of *BioPAD Metagenomics Platform*, has been awarded the *TWAS Young Scientist of the year award*. The award was handed to her by Minister Naledi Pandor in October 2009. This award is given jointly by the Academy of Sciences for the Developing World (TWAS), the Department of Science and Technology and the Academy of Science of South Africa (ASSAf).

Prof Esta van Heerden is Associate Professor in the Department of Microbial, Biochemical and Food Biotechnology at the University of Free State. She specialises in Extremophile Biochemistry. As BioPAD's Metagenomics Platform Manager, she is driving bioprospecting for novel bio-material

from extreme environments. Esta's research concentrates on metagenomics, novel gene product discovery, proteomics, and applications to improve polluted environments. Her group has attracted international recognition and the popular themes have invited documentaries made by BBC, Discovery Channel and National Geographic.

She serves on the International Astrobiology Society and has addressed the National Astrobiology Executive Council Meeting (NASA) and the National Science Foundation (NSF-USA) to ensure their participation in developing Astrobiology in South Africa. This research inspires our ideas about life on other planets.



*Minister Naledi Pandor, Prof Esta Van Heerden and Prof Robin Crewe (President ASSAf)*



## Letter from the President

2010 has been an exciting year for our country and the continent. South Africa has just successfully hosted Africa's first ever FIFA Soccer World Cup. More than ever, we find ourselves and our discipline at a pivotal and exciting point in our history. An example of this was the announcement by the J. Craig Venter Institute in the USA that they had succeeded in synthesizing the genome of *Mycoplasma mycoides*, sparking debate about the first "synthetic cell".

Our gratitude is extended to Professors Derek Litthauer and Esta van Heerden and their team at the University of the Free State for hosting a successful and productive conference in Bloemfontein.

This conference held on the 18 – 20th of January 2010, was the 22nd conference of SASBMB, approximately 35 years after the 1st SASBMB conference was held in Hermanus in 1975. We look forward to the next SASBMB conference (23rd) which will be hosted by the University of Witwatersrand in 2012. This will be a combined SASBMB/FASBMB conference.

Congratulations to our recipients of the Beckman Gold and Silver Awards for 2010, Professor Stephanie Burton from the Cape Peninsula University of Technology, and Professor Erick Strauss from the University of Stellenbosch, on their fine achievements. Professor Burton is internationally recognised for her research in oxidative biotransformations. Her areas of expertise include chemical and biochemical analysis, and applied enzymology. Prof Strauss has made an impact through his research in the field of biocatalyst/protein structure and function. He is currently directing his research into the area of drug target characterisa-



**Prof Brett Pletschke**

tion, based on his strong background in chemistry and biochemistry. Both recipients will be accepting their medals at a special Awards Ceremony to be announced soon and will showcase their research endeavors at the next SASBMB/FASBMB Conference in 2012.

A hearty welcome to our newest four life-long Honorary Members – Professors Clive Dennison, John Duncan, Abraham Louw and Albert Neitz. This award recognises their outstanding contributions over the years to biochemistry in South Africa, and to the Society in particular. Their contributions to biochemistry and molecular biology has provided a source of inspiration to

numerous young students ensuring the development of the next generation of biochemists and molecular biologists within South Africa and abroad. We do hope they will continue to participate in the Society's activities through its meetings, conferences and symposia.

The next IUBMB conference (*OzBio2010 – The Molecules of Life – From Discovery to Biotechnology*) will be held at the Melbourne Convention and Exhibition Centre on 26th September to 1 October 2010. This premier international scientific meeting brings together the *12th IUBMB Conference*, the *21st FAOBMB Conference* and the *ComBio2010 conferences*.

Finally I would like to acknowledge and thank the Editor of our Newsletter, Dr Laura Roden, for her professional and valuable contribution to ensuring our newsletter is something to be proud of as a society.

**Best regards**  
**Brett**

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## Molecular Plant – Pathogen Interactions Lab highlights

The SSHscreen and SSHdb software for gene discovery (Coetzer et al., 2010) was developed through collaboration between the MPPI group, Department of Plant Science, Forestry and Agricultural Biotechnology Institute (FABI), the Bioinformatics and Computational Biology Unit in the Department of Biochemistry at UP, and the Department of Statistics, University of Oxford, UK. SSHdb was developed by Nanette Coetzer as part of her MSc (Bioinformatics) degree at UP, awarded *cum laude* in 2010. The SSHscreen software

is particularly useful for studies of non-model organisms when the aim is to discover genes differentially expressed between two or more treatments using suppression subtractive hybridization (<http://microarray.up.ac.za/SSHscreen/>).

The SSHdb software was developed to manage and annotate the EST sequences from SSH and other gene libraries. SSHdb provides a web-based inter-

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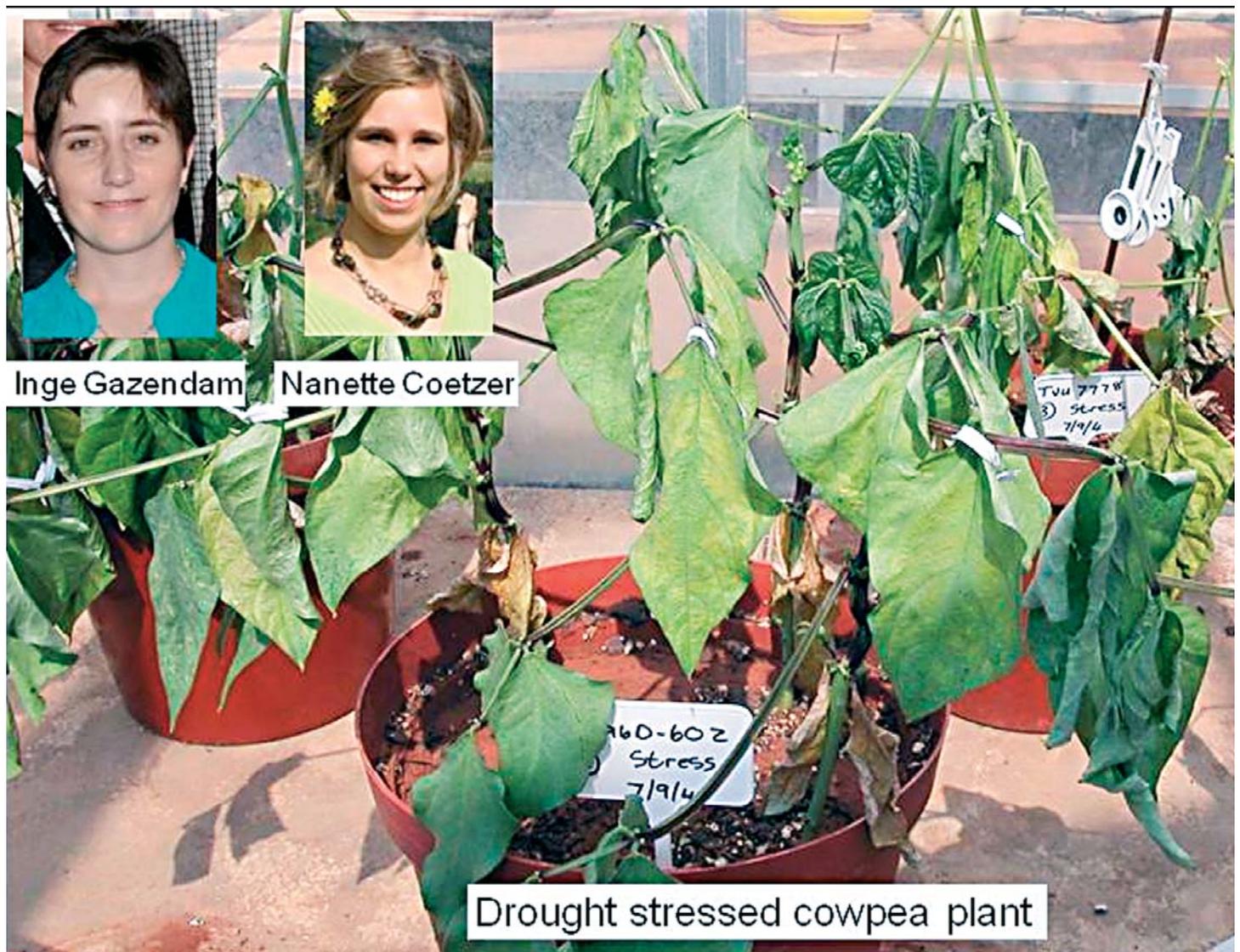
face for users to upload EST sequences to a personal database, where the sequences are automatically clipped of vector sequences, clustered, and annotated using BLASTX, BLASTN and Blast2GO (Coetzer et al., 2010). The results are provided in a series of user-friendly tables, which can be accessed by collaborators from different sites, and edited and downloaded in different formats. SSHdb can be used for any set of DNA sequences, and users can register their own project at <http://sshdb.bi.up.ac.za/>. Currently there are pearl millet, tomato, Arabidopsis, cowpea and Eucalyptus datasets on SSHdb.

In a recent collaboration, between the MPPI group at UP and ARC-Roodeplaat Vegetable and Ornamental Plant Institute, the pipeline was applied to discovery of drought response genes in cowpea plants (BMC

open access: Coetzer et al., 2010). Cowpea (*Vigna unguiculata*) is an important crop for food security in Africa, and thus a high priority in the ARC's research portfolio. The results indicated that cowpea plants protect themselves against drought by detoxification of unwanted compounds, stabilisation of useful proteins, and down-regulation of photosynthesis. This work forms part of the PhD project of Inge Gazendam, and her current work entails functional studies of a candidate gene using transgenic plants.

Coetzer N, Gazendam I, Oelofse D, Berger DK (2010) SSH-screen and SSHdb, generic software for microarray based gene discovery: application to the stress response in cowpea. *Plant Methods* 6: 10. <http://www.plantmethods.com/content/6/1/10>

**By Prof Dave Berger**  
University of Pretoria



*The results indicated that cowpea plants protect themselves against drought by detoxification of unwanted compounds, stabilisation of useful proteins, and down-regulation of photosynthesis.*



## Biochemistry at University of Johannesburg

Internationally competitive research, growing international collaboration and excellent teaching have become hallmarks of UJ's Biochemistry Department.

The new 'University of Johannesburg' is now five years old and the name not only reflects the university's geographical locality, but the new identity provides the institution with the necessary national and international recognition, and the name serves as a binding factor for all stakeholders in the new university, one of the biggest residential universities in South Africa.

The staff of Biochemistry at UJ consists of Prof. Ian Dubery (Research Professor and current HoD), Prof. Liza Bornman (Associate Professor), Dr. Marianne Cronje and Dr. Lizelle Piater (Senior Lecturers), Dr. Gerrit Koorsen, Dr. Emmanuel Mukwevho, Ms. Lindy Esterhuizen, Mr. Godfrey Tlou (Lecturers), Ms. Jacinda James and Ms. Heather Byth (Technical Lecturers) and Mr. Mosotho George (Instrumental Scientist). In addition two of our postgraduate students, Ntakadzeni Madala and Londiwe McGina are recipients of UJ's

'New Generation Scholarships' and will join the staff after completion of their studies. There are also two postdoctoral fellows in the department, Dr. Ju-Chi Huang and Dr. Natasha Sanabria.

Teaching Biochemistry to undergraduate students continues to be a major component of the department's activities. In addition to its normal spectrum of Biochemistry modules, the department also offers Introductory Biochemistry and Molecular and Cellular Biology on first year level to 300 students. The 150 first year, 60 second year, 45 third year and 14 honours students are the result of a steady growth over the last few years. The department is also actively involved in UJ's annual Open Day and programmes aimed at high school learners where the career prospects in Biochemistry and the research activities in the department are highlighted.

In striving for academic excellence, top achievers in Biochemistry are annually awarded prizes at a formal ceremony hosted by the Dean of the Faculty of Sci-



### Department Biochemistry, University of Johannesburg 2010

**Back:** Dr Lizelle Piater, Prof Liza Bornman, Dr Marianne Cronje, Mr Godfrey Tlou, Dr Gerrit Koorsen, Mr. Mosotho George, Mrs. Lindy Esterhuizen

**Front:** Dr Natasha Sanabria, Dr Carol Huang, Ms Jacinda James, Dr Emmanuel Mukwevho, Prof Ian Dubery (HOD), Ms Heather-Ann Byth



ence, Prof. Kinta Burger. Honours for 2009 went to Siohban Jenkins (best 2nd year student sponsored by Becton-Dickenson), Cameron Meyer (best 3rd year student sponsored by Merck SA) and Dewaldt Engelbrecht (best Hons student sponsored by Labhouse). Melissa Vetten was awarded best departmental MSc (*cum laude*) sponsored by Associated Chemical Enterprises.

The research activities of the department are varied and include aspects of plant, mammalian and microbial biochemistry. Our students are thus exposed to a wide range of topics and different approaches in modern Life Sciences research.

#### **Some of the current research topics include:**

- The biochemistry and molecular biology of inducible defense responses and innate immunity in plants, including metabolomics (Prof. Ian Dubery),
- Methylation patterns in the promoter of the human vit. D receptor gene and its link to disease susceptibility (Prof. Liza Bornman), Mechanisms of modulating apoptosis and how heat shock proteins affect the outcomes of induced cell death (Dr. Marianne Cronje),
- Control of defense gene expression in *Arabidopsis thaliana* in response to ergosterol, a fungal-derived pathogen-associated molecular pattern (PAMP) molecule (Dr. Lizelle Piater),
- Structure of the amino- and carboxy terminal domains of linker histone isoforms and their role in chromatin compaction and other cellular processes (Dr. Gerrit Koorsen),
- The role of Calcium/calmodulin dependent protein kinase (CaMK) II in mitochondrial and GLUT4 expression (Dr. Emmanuel Mukwevho),
- The study of secondary metabolites of the medicinal herb *Centella asiatica* focusing on the production of triterpenoids (Jacinda James),
- Biodiversity studies on South African Begomoviruses as well as their whitefly vectors (*Bemisia tabaci*), viral resistance in *Solanum lycopersicon* and genetics of viral resistance (Lindy Esterhuizen),

- The influence of heat shock protein induction on programmed cell death in tobacco (*Nicotiana tabacum*) cells during a challenge with *Ralstonia solanacearum* (Heather Byth),
- Lipolytic enzymes from the plant pathogen *Pseudomonas syringae* – role(s) in the bacterium's pathogenesis (Godfrey Tlou).

The academic staff regularly attend international meetings and visit overseas laboratories to present their research results. Prof. Ian Dubery was fortunate to attend the International Conference on Plant Pathogenic Bacteria in tropical Reunion Island in June 2010 where he presented a talk on molecular pattern motifs found within bacterial lipopolysaccharides. In 2009, the department was the official host of the International Cell Death Society meeting with Dr. Marianne Cronje acting as organiser. She is also currently organizing the first inaugural SA Cell Death Society symposium that will be held in Cape Town on the 10th – 12th January 2011 (for more information, e-mail the secretary at [saicds@gmail.com](mailto:saicds@gmail.com)).

Official collaborations exist with several overseas universities and this has contributed to exchange visits of staff and students. Collaboration with the Centre for Plant Molecular Biology at the University of Tuebingen has resulted in an exchange agreement and two of our Masters students will be starting with their research in Germany. The strong research focus has also contributed to an excellent record of postgraduate student training, with 5 Masters and Doctoral students graduating in 2009 and a further 20 registered for 2010.

The quality of our BScHons and MSc graduates is excellent and several have moved on to PhD studies in Europe. The department is very proud of Nicola Skerman who was the co-recipient of the SASBMB prize for the best Honours student in 2008 and of Milena Roux who is completing her PhD at the John Innes Centre for Plant Research in the UK.

**The department is located in C2 Laboratory building on the Auckland Park campus of UJ. Contact detail: Prof. Ian Dubery, Department of Biochemistry, University of Johannesburg, P.O. Box 524, Auckland Park, 2006. Tel. +27-11-559-2370 / 2401, Fax: +27-11-559-2605**

## **ADVERTISEMENT PhD and MSc positions: Bioinformatics**

NRF-funded PhD and MSc positions are available in the MPPI lab at UP to study pathogenesis in the maize pathogen *Cercospora zeina* that causes the economically important Grey Leaf Spot disease (see our paper: European J Plant Pathology

(2009), 124 (4) 577-583). The project entails assembly and annotation of the genome sequence with the aim to address hypotheses about pathogenicity mechanisms, in collaboration with US researchers sequencing related species. Please apply by

sending a covering letter and complete CV with contact details of three referees (including phone numbers and email addresses) to:

**Prof Dave Berger**  
[dave.berger@fabi.up.ac.za](mailto:dave.berger@fabi.up.ac.za)



# Biochemistry UKZN: awards in Pietermaritzburg and a Knight in Durban

## New building

On our Westville site we now have new offices, teaching and research laboratories for Biochemistry and Microbiology. Rob Slotto (Deputy Vice Chancellor and Head of College, UKZN) cut the tape and Prof Gansen Pillay (Deputy Vice President, NRF) was our guest speaker at an opening ceremony held in May.

## Graduating students

Dr Bridgette Cumming, PhD and Ramona Hurdaya, MSc graduated from Prof Goldring's lab. Dr Celia Snyman, PhD, Candice Crouch, MSc and Derek Van Rooyen, MSc graduated from Dr Elliott's lab. Fikelane Ngubane, MSc, was co-supervised by Dr Masola. Sheilagh Halstead, MSc and Anita Campbell, MSc were supervised by Prof Anderson. Kyle Goetch obtained his MSc *cum laude* and continues the work for his PhD in Dr Niessler's lab. Cara Bartlett, MSc, Perrina Vather, MSc and Hlumani Ndlovu, MSc *cum laude* were supervised by Prof Coetzer.

## Conferences and sabbaticals

Phyllia Vukea (Leap lecturer and PhD student in the Coetzer lab) and David Choveaux (PhD with Goldring) presented talks at the SASBMB Bloemfontein conference. Dr Shahidul Islam presented his work at the 53rd annual meeting of the Japanese Diabetics Society and the 2nd Scientific Meeting of the Asian Society for the Study of Diabetes held in Japan in May. Dr Edith Elliott was on sabbatical when she attended the Gordon Conference on Proteases and their inhibitors II in Italy. She also visited Prof Philippe Bastiaen's Cell biology Group at the Max Planck (Dortmund) and Prof Harald Tschesche at the University of Bielefeld. Prof

Anderson presented two talks at the Conceptual Assessment in Biology III meeting in San Diego in May and was invited by Prof Nancy Paelez from Purdue to consult as part of the HHMI programme in July. He is a participant on two USA IBP mini-grants and is on the Steering Committee to develop a BioHUB for Conceptual Assessments in Biology (funded by a USA NSF RCN-UBE grant) with Kathleen Fisher and Kathy Williams from San Diego. Trevor is co-author and co-editor of "The Encyclopedia of Molecular Life Sciences" volume 11. Dr Carola Niessler with Prof Michael Pepper (U. Pretoria) organised the "Stem cells in South Africa" session of the Transplant Indaba, held in Cape Town in August this year. Carola will be presenting a talk at the joint BSCR-SASCAR cardiovascular workshop in London this December. The workshop aims to highlight common research interests in cardiovascular science in the UK and SA.

## Awards

Many of you will remember Rob Pike who obtained his BSc in 1987 and his PhD in 1991 from Pietermaritzburg. Rob was awarded the 2010 Convocation award by the University of KwaZulu-Natal for his outstanding contributions to Agriculture Engineering and Science. He did a postdoc at the University of Georgia, USA, and then Cambridge, UK. He was recruited to the Department of Biochemistry and Molecular Biology at Monash University in Australia in 1997. He has a prolific research group with over 118 research papers. They work on serine proteases and their inhibitors, the serpins, protease activated receptors and their involvement in inflammation, as well as the initiating



**CONVOCATION PRESIDENT, Mr André Young; NOMINATOR, Prof. Theresa Coetzer; PREMIER OF KWAZULU-NATAL AND UKZN CHANCELLOR, Dr Zwelini Mkhize; CONVOCATION AWARDEE, Prof. Rob Pike; PRESIDENT AND CHAIR OF CONVOCATION, Mr Sandile Ngcobo and EXECUTIVE DIRECTOR OF UKZN CORPORATE RELATIONS, Ms Nomonde Mbadi**



serine proteases of the complement system. In 2007 he was appointed Head of his Department, which is the largest and most successful of its kind in Australia. He has four patents and five chapters in books. His work is highly cited and he enjoys a h-index of 29. He has been Chair of the International Proteolysis Society and is a principal investigator on some of the largest research grants awarded in Australia. He was nominated by Prof Theresa Coetzer who read the citation at the Convocations Awards dinner in March. Theresa and Rob continue to collaborate.

### **Knight of the Order of the Star of Italian Solidarity**

Professor Mario Ariatti is now an Emeritus Professor. His contributions to Biochemistry have been recognized and he has been Knighted by the Italian Government. He is a “*Cavaliere dell’Ordine della Stella della Solidarieta Italiana*” which translates as Knight of the Order of the Star of Italian Solidarity.

*We congratulate Mario and Rob on their achievements and awards.*

**Prof Dean Goldring**

## **Centre for Human Metabonomics, NWU Potchefstroom**

The North-West University Division of Biochemistry, now also houses the Centre for Human Metabonomics, both of which have undergone several changes in recent months. Not only have there been numerous upgrades made to the infrastructure, but new personnel and laboratories further improve the research capability at the Division.

After many years of faithful service to the NWU, Prof. Carools Reynecke has stepped down as Head of the Centre for Human Metabonomics. The newly appointed Head of the Centre is Prof Chris Vorster, formerly associated with AMPATH pathologists.

The newly rejuvenated Biochemistry Division is divided into five different research groups, each housed within their own renovated laboratories.

The first group focuses specifically on diagnosis of human inborn errors of metabolism. The group is under supervision of Prof. Japie Mienie, a pioneer of the newborn screening concept in South Africa.

Mr. Lardus Erasmus’ group focuses on cellular biotransformation. Specific challenge probes are used to determine Phase I and II liver biotransformation function while antioxidant status and oxidative stress levels of patients are also monitored. The results obtained can then be used by the patient’s physician to prescribe specific supplements to help improve the liver detoxification capacity, and in so doing, improve the wellbeing of the patient. Tuberculosis (TB) metabolomics is focus of the third group, supervised by Prof. Du Toit Loots. The recent acquisition of a LECO GC-GCxTOFMS system by this group has significantly increased the accuracy and capacity of their research projects.



**New toys at NWU, Potchefstroom: Agilent 5975C GCMS, equipped with a 7890A GC and 7693 Autosampler.**

The fourth group focuses on mitochondrial energy metabolism deficiencies and cellular responses, including oxidative stress responses. This group is supervised by Prof. Francois van der Westhuizen.

The fifth group dealing with molecular biology is sub-divided into two groups: Prof. Piet Pretorius’ group focuses on DNA damage and repair, epigenetics studies, and free-DNA research; Prof Albie van Dijk’s group focuses on recombinant enzyme development, molecular characterisation of key detoxification enzymes and inborn errors of metabolism. Molecular virology, specifically rotavirus vaccine development, is a further area of focus of this group.

Apart from the new allocation of laboratories, there is now also a second tissue culture facility. The first is coordinated by Dr. Oksana Levanets, and houses various mammalian cell lines used by the different research groups. The second tissue culture lab is coordinated by Mrs. Rencia van der Sluis and is mainly used for molecular virology work.

A further new addition to the Biochemistry Division is the Newborn Screening Laboratory under the supervision of Mrs. Brenda Klopper. The lab routinely screens for more than 27 different inborn errors of metabolism. They are working towards SANAS ISO15189 accreditation which they intend to obtain by March 2011. A metabolomics platform has also been established. This platform falls under the supervision of Mr. Peet Jansen van Rensburg who assists various researchers with sample analysis and method development.

**By Zelmarié de Villiers, Reinart Meissner-Roloff, Etresia van Dyk**



## HIV: Structure-function and Viral Fitness Molecular and Cell Biology at UCT

We welcomed new academic Dr Zenda Woodman to the department this year. Her research investigates the role of HIV envelope in viral fitness.

The very first viral contact with host cells is mediated by the envelope protein that occurs as spikes on the viral surface. Envelope comprising of gp120 and gp41 binds to CD4 and CCR5 receptors on T lymphocytes and DC-SIGN on dendritic cells. Binding to these receptors on T cells is essential for HIV replication and attaching to DC-SIGN is important in HIV transmission. The focus of her research is thus on the function of envelope and its impact on the ability of HIV to replicate within a given environment and thus influence disease progression. The two major research thrusts are:

1. identifying Envelope functional determinates that impact HIV fitness and
2. the impact of Envelope N-glycosylation on HIV transmission.

### **HIV-1 subtype C Envelope functional determinants as targets for drug and vaccine design**

This study will identify determinants essential for viral propagation by focusing on dual infected individuals (infected with two HIV phylogenetically distinct variants) as a model system. Moreover, this study will also investigate the mechanistic relationship between the function of structurally constrained sites and their impact on viral replication. Given the limited research focus on the structure and function of subtype C Env, this project will advance current knowledge on subtype C infections.



*Dr Zenda Woodman*

### **N-glycosylation patterns of gp120 involved in HIV transmission**

As vaccines and microbicides are designed to target transmitted variants, this study aims to elucidate the mechanism whereby HIV variants are able to cross the genital epithelium and infect CD4 T lymphocytes. A genetic bottleneck occurs during HIV transmission resulting in the transmission of a single HIV infectious unit. However, the presence of sexually transmitted infections when the genital mucosa is likely to be disrupted is associated with increased risk of HIV infection and the transmission

of multiple variants suggesting that an intact genital epithelium is highly protective against HIV infection and that variants able to overcome this barrier are selectively transmitted. Transmitted variants are enriched for *env* sequences with shorter variable loops and fewer N-glycan sites than variants from chronically infected individuals. This suggests that transmission might be dependent on the presence or absence of specific N-glycan sites that bind to DC-SIGN on dendritic cells. DC-SIGN binds to gp120 and mediates HIV *trans*-infection of CD4+ T cells. Therefore, DC-SIGN might selectively bind to variants depending on the presence or absence of specific N-glycan sites on gp120. However, the glycosylation patterns and carbohydrate structures at the N-glycan sites of transmitted variants have not been identified. This study aims to identify the N-glycan sites essential for DC-SIGN binding of subtype C viruses and the impact of this interaction on trans-infection of T lymphocytes.

*By Zenda Woodman*

## UCT annual MCB indoor soccer tournament

This is always a highlight in our academic year, with postgraduate students and academics taking part. Players and fans were greeted by the sound of a blaring vuvuzela as they turned out for the start of the MCB indoor soccer league. In honour of the first Fifa World Cup to be held in Africa, our teams were named after African countries. We were fortunate to once more have sponsorship from Inqaba Biotec, and this stretched to team T-shirts, decorated by our very talented MSc student, Delroy



Guzha. We had some controversial goals confirmed by video footage – FIFA might not be able to get it right, but MCB can! The final ended in dramatic fashion as Ghana fended off a challenge from Nigeria to clinch the MCB title in what was a memorable tournament. A total of 15 games were played, with only two draws and 45 goals in total. A Jabulani (replica) ball was used for the tournament and none of the players experienced any difficulties with it.

*By Vai Bhardwaj and Mariette Smart*