

# **2011/12 Annual Report of Stellenbosch University Central Analytical Facilities (CAF)**

## **1. Overview**

The purpose of the Central Analytical Facility (CAF) at Stellenbosch University is to cost-effectively manage the large, multi-user equipment base to best advantage of the research community of the university. Thus, CAF functions on income from the provision of analytical services, with minimal subsidy from Stellenbosch University (typically 6 to 8% in recent years). The economy within which CAF operates is highly abnormal, as no other South African university has managed to successfully apply such a financially constrained model to the management of expensive analytical equipment. Internal clients pay for services via a finite pool of research grant money and it is in financial interest of Stellenbosch University that this money support as many subsidy earning outputs as possible. To facilitate this, CAF prices to internal clients need to be as low as possible. Additionally, CAF prices to internal and external clients are also constrained by those of our competitor institutions in the region and nationally, who commonly run heavily subsidised facilities that are able to charge well below cost for services. Consequently, CAF is always financially stressed. In 2011 it was clear that the large number of NEP funded new ventures CAF had undertaken and had planned for 2012 were very likely going to require additional institutional financial support for CAF. As a result, a motivation was submitted to the VR(R) that annual financial support for CAF be included as a recurrent item within the University budget for several years starting from 2011. The motivation is included as Appendix 1 and made a case for stimulating research at Stellenbosch by providing funds to enable lower prices within CAF to internal clients. This funding was initially partially granted and then lost again as the institution cut budgets in response to lower than expected DOE subsidy yields. As a consequence of this, CAF is predictably in a very difficult financial position at the moment. This annual report reviews CAF performance over the period and concludes with recommendations for regaining financial stability within CAF.

## **2. CAF service to research at Stellenbosch**

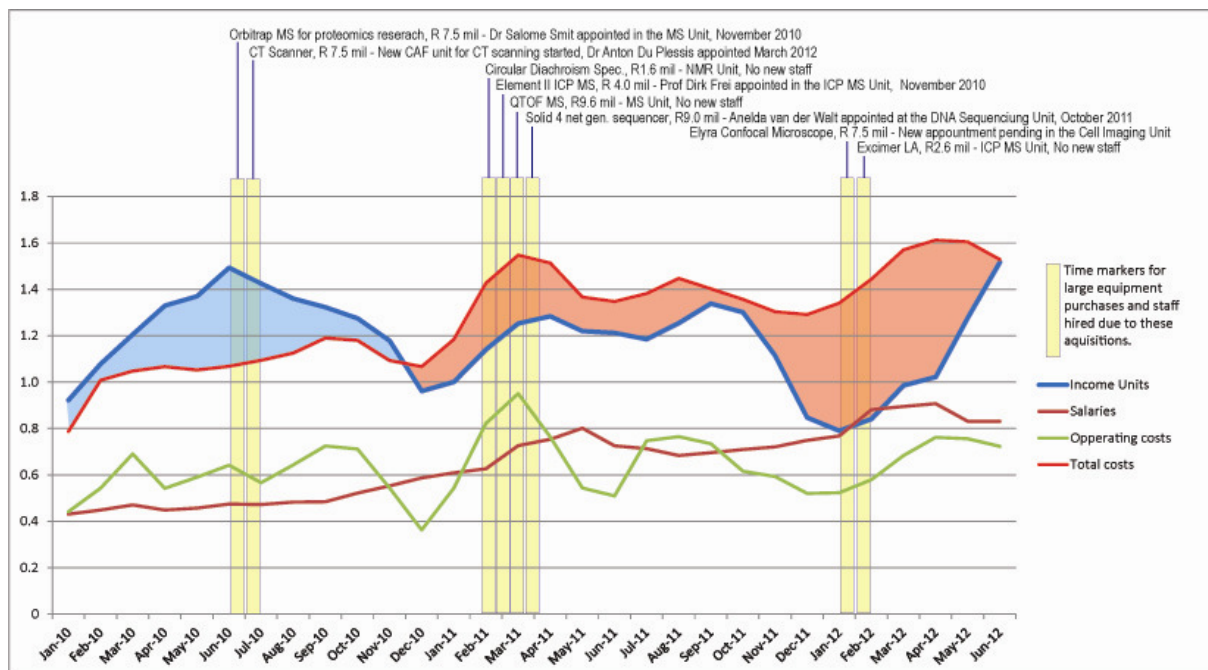
CAF is providing an excellent service to the Stellenbosch research community, both through providing access to high quality analytical facilities and services, through training provided to post-graduate students and researchers, and through active participation in research projects. Data on the number of publications produced by Stellenbosch University that utilised CAF services indicates that in excess of 100 of the publications submitted by the institution for DOE subsidy in 2010 (Appendix 1) have relied on CAF analyses. The admin division is currently collating a list of the post graduate students the University has produced in recent years who used CAF facilities in the course of their projects. In many departments this list will include almost all the M and D students graduated.

CAF again run its very successful mid-year training exercise in 2012 (see <http://www.sun.ac.za/saf/training.html> for details. This year SASOL support enabled us to host 150 participants, with representation from most South African universities. Industry

participants paid to attend the course, but training was free of charge to university staff and students. A summary is provided in Appendix 2.

### 3. CAF financial performance over the period under review

In 2011 CAF record a deficit of R1.4 million. This was the first year in CAFs existence that income failed to exceed costs once subsidization by the University had been taken into account. CAF invoicing over the past four years was as follows: 2009 = R 9.9 million; 2010 = R15.8 million; 2011 = R14.2 million, with income in 2012 projected to be R14.9 million. Thus, CAF income dipped in 2011, with probable partial recovery in 2012. The dip was due to a very substantial decrease in demand for one of the key commercial services CAF was providing to the wine industry through the MS Unit. Over this period of decreased income, several very important new ventures built around NEP and ALT funded equipment were initiated within CAF (Figure 1). As a consequence of these new initiatives within CAF it has been impossible to scale costs proportionately with sales and as a result CAF is likely to produce a deficit of R2.7 million in 2012. It is likely that CAF will also record a deficit in 2013, but that this will be less than was the case in 2012.



**Figure 1:** CAF income vs. costs graph for the period January 2010 to June 2012. The blue shaded area represents CAF profitability, whilst the red shaded area represents times when CAF is losing money. The values plotted represent three month rolling averages, with December 2009 and July 2012 values assumed to be equivalent to those of the adjacent month. The yellow bars represent the dates on which large equipment items were ordered, with details provided above on the cost of equipment, where within CAF the equipment was hosted and the staff hired to operate the equipment. The substantial time gap between ordering some equipment (e.g. CT scanner) and appointing the relevant staff member is a consequence of both long manufacturing time for the equipment and the time needed to find the right person to fill the post. CAF predictably dips at year end. However at the end of 2011, the dip was much deeper and more sustained than predicted, due to a marked decrease in the demand for Natamycin analyses by the wine industry. Consequently, since October 2011, CAF has been working very hard to grow our new ventures to the point where we are again profitable. The results for the past 3 months are encouraging and indicate that we are making progress.

During 2011, operating costs excluding salaries were 48.2% of turnover, essentially unchanged from the 2010 figure of 47.6%, maintaining the improvement over previous years (59% in 2009; 56% in 2008). This is particularly important as the 2010 improvement primarily reflected the substantial amount of external work being conducted within the MS unit and the high profit margin related to this work. To consolidate this improvement through 2011 with decreasing demand for commercial services demonstrates that the Units worked hard to keep costs in check. In several CAF units, costs including salaries have always exceeded invoicing, requiring cross-subsidization from other units. An evaluation of the flows of funding within CAF over the past 3 years yields the following patterns: The DNA Sequencing Unit and the MS Unit have produced a profit by using excess capacity to serve external clients; The ICP MS and SEM units have typically operated at a near break-event point, realising a small profit or loss; and, the NMR, EA and Cell Imaging units operate at a loss. These patterns have changed dramatically during 2011 and 2012, as the following important developments have taken place: 1. The ICP unit has expanded equipment and staff and has required significant cross subsidization in 2011; 2. The CT Scanning unit has been created will began providing services in the 2<sup>nd</sup> half of 2011. This unit will require substantial subsidization during 2012; 3. The next-generation DNA sequencing platform (DNA Sequencing unit) has been commissioned and new staff appointed (Anelda van der Walt), but the equipment is not yet fully productive. The consequence of this is that the Sequencing unit realised a significant deficit in 2011 and may do so again in 2012; 4. The MS unit has acquired the Orbitrap mass spectrometer for proteomics research and has appointed new staff to manage this instrument (Dr Salome Smit). Additionally, the unit has seen reduced demand for commercial services. Consequently, although the unit realised a profit in 2011 (R1647398) and will do so again in 2012 (R559330), the amount of money made will be substantially less than in previous years.

The six new ventures marked by the yellow blocks on Figure 1 have all clearly had very major cost implications for CAF, and although most are contributing to CAF income already, all have not yet approached their full potential. These new ventures have significantly increased costs, principally though increases to our salary costs and this has coincided with a period of decreased demand for the key commercial services that have helped keep CAF cost-effective. The result is the considerable gap that developed between CAF income and expenditure from the end of 2011, with possible recovery now underway (Figure 1). Very importantly, there is typically a gap of two years between planning a NEP application and delivery of the equipment. Thus, given the CAF pricing structure and the focus on research support, it is very difficult to certain that there will be sufficient profitability within CAF to carry the new equipment through the one to two years of method development and growing the client base before the equipment may become profitable. Figure 1 illustrates this well, as during 2010, we predicted quite confidently that CAF would be able to carry the costs associated with the 2011 and 2012 new equipment, when in reality declining demand for key external services has made this impossible to do. Financial data summarising CAF performance during 2011 are presented in Table 1, while a summary of 2012 performance for the first six months of the year is presented in Table 2.

| Units              | Production Costs             |               |              |           |           |           |              | Income           |                  |
|--------------------|------------------------------|---------------|--------------|-----------|-----------|-----------|--------------|------------------|------------------|
|                    | Maintenance and repair costs | Running Costs | Travel Costs | Infrastr. | 12% Levy  | Equipment | SAF Salaries | Amounts Invoiced |                  |
|                    |                              |               |              |           |           |           |              | Internal Clients | External Clients |
| MS                 | 287,645                      | 356,988       |              |           | 425,661   | 102,248   | 1,719,589    | 992,352          | 3,547,177        |
| SEM XRF            | 124,453                      | 33,552        |              | 9,131     | 8,877     | 8,292     | 276,184      | 383,923          | 73,975           |
| ICP MS             | 218,024                      | 310,810       |              | 9,836     | 96,909    | 138,541   | 1,048,453    | 291,747          | 807,579          |
| DNA                | 151,089                      | 3,699,187     |              |           | 372,166   | 198,753   | 1,763,945    | 2,831,442        | 3,101,384        |
| NMR                | 83,911                       | 368,599       |              |           | 27,941    | 36,735    | 1,024,679    | 528,155          | 232,838          |
| XRD                | 66,965                       | 29,940        |              |           | 3,250     |           | 287,428      | 304,879          | 27,080           |
| LCI                | 28,714                       | 49,755        |              |           | 960       | 20,405    | 474,073      | 222,630          | 8,000            |
| EA                 |                              | 476,054       |              |           | 66,615    | 13,917    | 1,091,549    | 281,729          | 555,128          |
|                    |                              |               |              |           |           |           |              |                  |                  |
| CAF 16             |                              | 182,336       | 96,195       | 41,036    |           | 588,420   | 957,401      |                  |                  |
| Interest Paid      |                              | 37,294        |              |           |           |           |              |                  |                  |
| SUBTOTALS          | 960,801                      | 5,544,515     | 96,195       | 60,003    | 1,002,379 | 1,107,311 | 8,643,302    | 5,836,857        | 8,353,160        |
|                    | 17,414,506                   |               |              |           |           |           |              | 14,190,016       |                  |
| Interest Received  |                              |               |              |           |           |           |              | 946,435          |                  |
| Sci. Fac. contrib. |                              |               |              |           |           |           |              | 853,374          |                  |
| TOTALS             | 17,414,506                   |               |              |           |           |           |              | 15,989,825       |                  |

**Table 1:** CAF income and production related expenditure for 2011. Blank entries indicate 0 values. All new analytical equipment associated with NEP and ALT grants is purchased from CAF 16. The equipment entry for CAF 16 represents the CAF funded portion of such purchases, i.e. what CAF added to ALT and NEP funds from income earned. The equipment expenditure listed under the units relates to smaller items of equipment or upgrades that the units purchased.

| Units                     | Production Costs             |               |              |          |                               |              | Income           |                  |  |
|---------------------------|------------------------------|---------------|--------------|----------|-------------------------------|--------------|------------------|------------------|--|
|                           | Maintenance and repair costs | Running Costs | Travel Costs | 12% Levy | Infrastr. and equipment costs | CAF Salaries | Invoicing        |                  |  |
|                           |                              |               |              |          |                               |              | Internal Clients | External Clients |  |
| MS                        | 123,400                      | 305,316       | 24,797       | 125,807  | 55,557                        | 1,246,788    | 913,435          | 1,048,395        |  |
| Imaging                   | 39,153                       | 35,310        |              | 586      | 13,148                        | 167,172      | 159,370          | 4,880            |  |
| SEM                       |                              | 87,137        |              | 4,283    |                               | 150,444      | 175,835          | 35,695           |  |
| ICP MS                    | 62,982                       | 143,579       | 49,269       | 48,347   | 10,242                        | 572,515      | 191,840          | 402,893          |  |
| DNA                       | 343,104                      | 1,405,063     | 14,386       | 201,784  | 5,607                         | 1,296,913    | 879,128          | 1,681,535        |  |
| NMR                       | 3,162                        | 158,832       | 345          | 23,043   | 6,697                         | 596,444      | 196,320          | 192,026          |  |
| EA                        | 73,949                       | 105,900       |              | 31,628   | 22,855                        | 362,853      | 111,008          | 263,569          |  |
| CT                        | 151                          | 40,194        | 5,236        | 2,922    | 14,147                        | 208,365      | 76,500           | 24,350           |  |
|                           |                              |               |              |          |                               |              |                  |                  |  |
| CAF 16                    | 167,245                      | 91,445        | 16,418       |          | 124,987                       | 537,158      |                  |                  |  |
| Interest Paid             |                              | 19,255        |              |          |                               |              |                  |                  |  |
| SUBTOTALS                 | 813,146                      | 2,392,031     | 110,451      | 438,401  | 253,240                       | 5,138,652    | 2,703,436        | 3,653,343        |  |
|                           | 9,145,921                    |               |              |          |                               |              | 6,356,779        |                  |  |
| Interest Received         |                              |               |              |          |                               |              | 62,977           |                  |  |
| SET Faculty Contributions |                              |               |              |          |                               |              | 895,993          |                  |  |
| TOTALS                    | 9,145,921                    |               |              |          |                               |              | 7,315,749        |                  |  |

**Table 2:** CAF income and production related expenditure for the six months January to June of 2012.

#### **4. New CAF equipment and staff during the review period**

During the period under review, two new items of large equipment were purchased with NEP and Stellenbosch University support. In summary:

1. An Excimer Laser Ablation system (NEP grant to Prof. Dirk Frei). This equipment has been ordered and will be delivered during September and will form part of the CAF ICP MS Unit;
2. A Super-resolution Confocal Microscope Imaging System, (NEP grant to Prof. Bert Klumperman and Dr Ben Loos). This equipment was commissioned during July and forms part of the Cell Imaging Unit.

The 2012 NEP call has yet to open. However, given the state of Central Analytical finances, expanding institutional support to CAF should be prioritised above buying new equipment. Further to this, if Stellenbosch University does submit NEP applications in 2012, these should mainly be focussed on replacing aging equipment within CAF rather than costly new ventures. Any applications aimed at new services within CAF should have the full cost of developing the equipment into a cost-effective service incorporated into the proposal. This should include infrastructure costs, staff costs and operating costs for the development

period. Ideally, CAF would only be required to fund the operating cost portion of these development costs.

Staff change within CAF during the review period is summarised in Table 3 below.

| <b>Date</b>   | <b>New Appointments</b>   | <b>Staff Resigned</b>                                    |
|---------------|---|--|
| <b>Jan-11</b> | Fundisile Nkumenge - ICP MS Unit  |  |
| <b>Mar-11</b> | Dr. Susanna Causemann - NMR Unit  |  |
| <b>Jun-11</b> |   | Dr Jan Gertenbach - XRD Unit<br>Elsabe Cloete - XRD Unit |
| <b>Oct-11</b> | Anelda van der Walt - DNA Sequencing Unit<br>Lize Engelbrecht - Cell Imaging Unit |  |
| <b>Nov-11</b> |   | Dr Esme Spicer - EA Unit                                 |
| <b>Jan-12</b> | Nadine Pretorius - MS Unit  |  |
| <b>Feb-12</b> |   | Dr Ben Loos - Cell Imaging Unit                          |
| <b>Mar-12</b> | Dr Anton du Plessis - CT Scanning Unit<br>Dr Cynthia Sanchez-Garrido - EA Unit    |  |
| <b>Jul-12</b> | Rozanne Adams - Cell Imaging Unit   |  |

**Table 3:** A summary of new staff appointed within CAF and staff that left CAF during the review period. All the new appointments are related to new equipment acquisitions with the exception of Cynthia Sanchez-Garrido, who was hired as a replacement for Esme Spicer (Staff Scientist at the EA Unit). Of the staff that left CAF, Jan Gertenbach and Elsabe Cloete, both employed at the XRD Unit left of their own accord and the CAF Unit was closed; Esme Spicer left to take up employment at Richards Bay Minerals; and, Ben Loos left for an academic position in the Department of Physiology at SU.

## **5. Prioritization of initiatives for 2012/13**

The following actions need to be prioritised to ensure that CAF meets its potential in 2012/14 (not listed in order of priority as many are equally important):

- CAF needs to develop a diverse array of commercial services that utilise extra equipment capacity. Several important initiatives are underway that have the potential to generate substantially to CAF income e.g.:
  - An integrated database of beverage characteristics against which fruit juices and wines can be tested for validity of ingredients and origin.
  - An XRF service for rock chemistry directed at the substantial number of foreign research teams doing geological research in Southern Africa.
  - An internationally competitive laser ablation geochronology service.
  - An internationally competitive next generation sequencing service.
- Of the 2010/11 new ventures, both the CT Scanning and next generation DNA sequencing initiatives are significantly behind the targets set for development in 2012. These initiatives need to develop rapidly to the point where they approach cost effectiveness and then advance to become profitable.
- Stellenbosch University needs to find a mechanism for providing financial support to CAF at times when CAF cannot be cost-effective, particularly when this is due to substantial investment in new expensive equipment for the university.

## Appendix 1: A compilation of the 2010 publications submitted for DOE subsidy by Stellenbosch University that utilise data generated with CAF facilities

**Note on the generation of the publication data:** Stellenbosch University publication claim information was supplied by DRD and was filtered against the CAF client list. All entries that did not match with the CAF client list were discarded. Where there was a match, the title of the article was examined, along with the abstract, if necessary, and a decision taken as to whether or not the research was likely to have included data generated within CAF.

|   |  |
|---|--|
| <i>Phytophthora</i> taxa associated with cultivated <i>Agathosma</i> , with emphasis on the <i>P. citricola</i> complex and <i>P. capensis</i> sp. nov.                                       | Bezuidenhout CM, Denman S, Kirk SA, Botha WJ, Mostert L, McLeod A                |
| <i>Phytophthora capsici</i> on vegetable hosts in South Africa: distribution, host range and genetic diversity  | Meitz JC, Linde CC, Thompson A, Langenhoven S, McLeod A                          |
| <i>Penicillium</i> species associated with pre-harvest wet core rot in South Africa and their virulence towards apple fruits.   | Van der Walt L, Spotts RA, Visagie CM, Jacobs K, Smit FJ, McLeod A               |
| Characterisation of South African isolates of <i>Fusarium oxysporum</i> f.sp. <i>cupense</i> from Cavendish bananas   | Visser M, Gordon TR, Fourie G, Viljoen A   |
| New primers for single-copy nuclear-encoded chloroplast-expressed Glutamine Synthetase (ncpGS) in Oxalidaceae   | Oberlander KC, Dreyer LL, Roets F  |
| Reduced neutral invertase activity in the culm tissues of transgenic sugarcane plants results in a decrease in respiration and sucrose cycling and an increase in the sucrose to hexose ratio | Rossouw D, Kossmann J, Botha FC, Groenewald JH                                   |
| <i>Coniochaeta</i> ( <i>Lecythophora</i> ), <i>Collophora</i> gen. nov. and <i>Phaeomoniella</i> species associated with wood necroses of <i>Prunus</i> trees                                 | Damm U, Fourie PH, Crous PW  |
| In vitro hepatic biotransformation of aspalathin and nothofagin, dihydrochalcones of rooibos ( <i>Aspalathus linearis</i> ), and assessment of metabolite antioxidant activity                | Van der Merwe JD, Joubert E, Manley M, De Beer D, Malherbe CJ, Gelderblom WCA    |
| Isolation and segregation of 44 microsatellite loci in the South African abalone <i>Haliotis midae</i> L.   | Slabbert R, Hepple J, Venter A, Nel S, Swart L, van den Berg NC, Roodt-Wilding R |
| Genetically distinct Dutch-domesticated <i>Clarias gariepinus</i> used in aquaculture in southern Africa  | Roodt-Wilding R, Swart BL, Impson ND   |
| Parentage assignment in <i>Haliotis midae</i> L.: a precursor to future genetic enhancement programmes for South African abalone  | van den Berg NC, Roodt-Wilding R   |
| Karyotype and genome size estimation of <i>Haliotis midae</i> : Estimators to assist future studies on the evolutionary history of haliotidae   | Franchini P, Slabbert R, van der Merwe M, Roux A, Roodt-Wilding R                |

|  |   |
|--|---|
| Mapping of the 5' terminal nucleotides of <i>Grapevine leafroll-associated virus 3</i> sgRNAs  | Maree HJ , Gardner HJF, Freeborough MJ, Burger JT                   |
| Deep sequencing analysis of viruses infecting grapevines: Virome of a vineyard   | Coetzee B, Freeborough MJ, Maree HJ , Celton J, Rees DJG, Burger JT |
| The first complete nucleotide sequence of a <i>grapevine virus E</i> variant   | Coetzee B, Maree HJ , Stephan D, Freeborough MJ, Burger JT          |
| A microsatellite panel for triploid verification in the abalone <i>Haliotis midae</i>  | Slabbert R, Prins N, Brink D  |
| The development of a method for the extraction of carotenoids and chlorophylls from grapevine leaves and berries for HPLC profiling.               | Lashbrooke JG, Young PR, Strever AE, Stander C, Vivier MA           |
| Carnitine supplementation has protective and detrimental effects in <i>Saccharomyces cerevisiae</i> that are genetically mediated.                 | Franken CJ, Bauer FF  |
| Allosyndetic recombinants of the <i>Aegilops peregrina</i> -derived <i>Lr 59</i> translocation in common wheat                                     | Marais GF, Kotze L, Eksteen A                                       |
| Reduction of <i>Aegilops sharonensis</i> chromatin associated with resistance genes <i>Lr 56</i> and <i>Yr 38</i> in wheat                         | Marais GF, Badenhorst PE, Eksteen A, Pretorius ZA                   |
| Attempts to remove gametocidal genes co-transferred to common wheat with rust resistance from <i>Aegilops speltoides</i>                           | Marais GF, Bekker TA, Eksteen A, McCallum B, Fetch T, Marais AS     |
| A rapid HPLC method for the extraction and quantification of vitamin B 2 in dairy products and cultures of <i>Propionibacterium freudenreichii</i> | Van Wyk J, Britz TJ   |
| Comparative transcriptomic and proteomic profiling of industrial wine yeast strains.   | Rossouw D, van den Dool AH, Jacobson D, Bauer FF                    |
| Occurrence and Control of Plant-parasitic Nematodes in Irrigation Water - A Review   | Hugo HJ, Malan AP   |
| Regulation of endo-polygalacturonase activity in <i>Saccharomyces cerevisiae</i> .   | Louw CT, Young PR, Van Rensburg P, Divol B                          |
| Epigenetic regulation of <i>PGU1</i> transcription in <i>Saccharomyces cerevisiae</i> .  | Louw CT, Young PR, Van Rensburg P, Divol B                          |
| PCR and DGGE detection limits for wine spoilage microbes.  | Bester L, Cameron M, Du Toit M, Witthuhn RC                         |
| Malolactic Fermentation: The ABC's of MLF.   | Lerm E, Engelbrecht L, Du Toit M                                    |
| Genetic screening of wine-related enzymes in <i>Lactobacillus</i> species isolated from South African wines.                                       | Mtshali PS, Divol BT, Van Rensburg P, Du Toit M                     |
| Physical properties of burnt timber, with special focus on the drying performance  | Meincken M, Smit NH, Steinmann DE                                   |
| Population genetic structure of economically important Tortricidae (Lepidoptera) in South Africa: a comparative analysis                           | Timm AE, GEERTSEMA H, Warnich L                                     |



|   |  |
|---|--|
| Wheat and gluten in South African food products   | Cawthorn D, Steinmann HA, Witthuhn RC  |
| Starch: Its Metabolism, Evolution, and Biotechnological Modification in Plants  | Zeeman S, Kossmann J, Smith AM   |
| Regulation of starch metabolism: the age of enlightenment?  | Koetting O, Kossmann J, Zeeman S, Lloyd JR   |
| Repression of both isoforms of disproportionating enzyme leads to higher malto-oligosaccharide content and reduced growth in potato   | Luetken H, Lloyd JR, Glaring MA, Baunsgaard L, Laursen KH, Haldrup A, Kossmann J, Blennow A                                    |
| Limited Endosymbiont Variation in <i>Diuraphis noxia</i> (Hemiptera: Aphididae) Biotypes From the United States and South Africa  | Swanevelder ZH, Surrridge AKJ, Venter E, Botha-Oberholster AM  |
| Transcript Profiling of Wheat Genes Expressed During Feeding by Two Different Biotypes of <i>Diuraphis noxia</i>  | Botha-Oberholster AM, Swanevelder ZH, Lapitan NLV  |
| The effects of engineered nanoparticles on survival, reproduction, and behaviour of freshwater snail, <i>Physa acuta</i> (Draparnaud, 1805)   | Musee N, Oberholster PJ, Sikhwivhilu L, Botha A-M  |
| First report on the colony-forming freshwater ciliate <i>Ophrydium versatile</i> in an African river  | Oberholster PJ, Ashton PJ, Fritz GB, Botha A-M   |
| Virus-induced gene silencing of <i>WRKY53</i> and an inducible <i>phenylalanine ammonia-lyase</i> in wheat reduces aphid resistance   | Van Eck L, Schultz T, Leach JE, Scofield SR, Peairs FB, Botha A-M, Lapitan NLV   |
| Recovery of endo-polygalacturonase activity in wine yeast and its effect on wine aroma.   | van Wyk H, Divol B   |
| Three genetic grapevine leafroll-associated virus 3 variants identified from South African vineyards show high variability in their 5'UTR   | Jooste AEC, Maree HJ, Bellstedt DU, Goszczynski DE, Pietersen GJ, Burger JT  |
| Characterization of the genetic profile of CYP2C19 in two South African populations   | Drogemoller BI, Wright GEB, Niehaus DJH, Koen L, Malan S, Da Silva DM, Hillermann-Rebello R, La Grange AM, Venter M, Warnich L |
| Elucidation of CYP2D6 genetic diversity in a unique African population: Implications for the future application of pharmacogenetics in the Xhosa population   | Wright GEB, Niehaus DJH, Drogemoller BI, Koen L, Gaedigk A, Warnich L  |
| Use of green rooibos ( <i>Aspalathus linearis</i> ) extract and water-soluble nanomicelles of green rooibos extract encapsulated with ascorbic acid for enhanced aspalathin content in ready-to-drink iced teas | Joubert E, Viljoen M, de Beer D, Malherbe CJ, Brand DJ, Manley M   |

|  |   |
|--|---|
| Optimization of a method for the extraction and quantification of carotenoids and chlorophylls during ripening in grape berries ( <i>Vitis vinifera</i> cv. Merlot). | Kamffer Z, Bindon KA, Oberholster A   |
| Optimization of Automated Ribosomal Intergenic Spacer (ARISA) for the estimation of microbial diversity in fynbos soil.  | Slabbert E, Van Heerden CJ, Jacobs K  |
| Phenolic composition of Cabernet Sauvignon ( <i>Vitis vinifera</i> ) grapes during ripening in four South African winegrowing regions.                               | Oberholster A, Botes MP, Lambrechts MG  |
| Two new <i>Ophiostoma</i> species from <i>Protea caffra</i> in Zambia  | Roets F, Wingfield BD, De Beer ZW, Wingfield MJ, Dreyer LL  |
| Familial associations in medullary thyroid carcinoma with Hirschsprung disease: the role of the RET-C620 "Janus" genetic variation.                                  | Moore SW, Zaahl MG  |
| Chasing the ubiquitous RET proto-oncogene in South African MEN2 families: implications for the surgeon   | Moore SW, Zaahl MG  |
| <i>Toxicocladosporium protearum</i>  | Crous PW, Roets F   |
| Glutamate dehydrogenase and glutamine synthetase are regulated in response to nitrogen availability in <i>Mycobacterium smegmatis</i> .                              | Harper CJ, Hayward D, Kidd M, Wiid IJF, Van Helden PD   |
| Functional integrity of naturally occurring mutants of HIV-1 subtype C vpr   | Romani B, Glashoff RH, Engelbrecht S  |
| Analysis of exon dosage using MLPA in South African Parkinson's disease patients   | Keyser RJ, Lombard D, Veikondis R, Carr J, Bardien S  |
| Novel non-sense <i>GCH1</i> mutation in a South African family diagnosed with dopa-responsive dystonia   | Bardien S, Keyser RJ, Lombard D, Du Plessis M, Human H, Carr J  |
| Investigation of mitochondrial sequence variants associated with aminoglycoside-induced ototoxicity in South African TB patients on aminoglycosides.                 | Human H, Hagen CM, de Jong G, Harris T, Lombard D, Christiansen M, Bardien S  |
| Abrogation of Glucocorticoid Receptor Dimerization Correlates with Dissociated Glucocorticoid Behavior of Compound A   | Robertson S, Allie-Reid F, Vanden Berghe W, Visser K, Binder A, Africander D, Vismer M, De Bosscher K, Hapgood JP, Haegeman G, Louw A |
| Daily brief restraint stress alters signaling pathways and induces atrophy and apoptosis in rat skeletal muscle.   | Engelbrecht A-M, Smith C, Neethling IG, Thomas M, Ellis B, Mattheyse M, Myburgh KH  |
| Fractionation and analysis of an impact poly(propylene) copolymer by TREF and SEC-FTIR   | de Goede E, Mallon PE, Pasch H  |
| The osmotic stress tolerance of basidiomycetous yeasts.  | Tekolo OM, McKenzie JM, Botha A, Prior BA   |
| Heterologous production of NpCel6A from <i>Neocallimastix patriciarum</i> in <i>Saccharomyces cerevisiae</i> .   | van Wyk N, Den Haan R, Van Zyl WH   |
| Engineering cellulolytic ability into bioprocessing organisms.   | La Grange DC, Den Haan R, Van Zyl WH  |

|   |   |
|---|---|
| Heterologous co-production of <i>Thermobifida fusca</i> Cel9A with other cellulases in <i>Saccharomyces cerevisiae</i> .  | van Wyk N, Den Haan R, Van Zyl WH   |
| Continental growth and convergence-related arc plutonism in the Mesoarchaeon: Evidence from the Barberton granitoid-greenstone terrain, South Africa  | Kisters AFM, Belcher RW, Poujol M, Dziggel A  |
| The Heerenveen Batholith, Barberton Mountain Land, South Africa: Mesoarchaeon, Potassic, Felsic Magmas Formed by Melting of an Ancient Subduction Complex.  | Clemens JD, Belcher RW, Kisters AFM   |
| {1,5,9-Tris(2S)-2-hydroxypropyl]-1,5,9-triazacyclododecane}zinc(II) dinitrate monohydrate   | Strasser CE, Sumani JEY, Raubenheimer HG, Luckay RC   |
| Exploring improved endoglucanase expression in <i>Saccharomyces cerevisiae</i> strains.   | du Plessis L, Rose SH, Van Zyl WH   |
| Microscopic surface and bulk morphology of semicrystalline poly(dimethylsiloxane)-polyester copolymers  | Abduallah ABE, Mallon PE  |
| Organic-inorganic hybrid copolymer fibers and their use in silicone laminate composites   | Swart M, Olsson RT, Hedenqvist MS, Mallon PE  |
| Mechanistic considerations on styrene - maleic anhydride copolymerization reactions   | Klumperman B  |
| Use of a profluorophore for visualization of the rupture of capsules in self-healing coatings   | van den Dungen ETA, Loos B, Klumperman B  |
| Extensive duplication events account for multiple control regions and pseudo-genes in the mitochondrial genome of the velvet worm <i>Metaperipatus inae</i> (Onychophora, Peripatopsidae)                                 | Braband A, Podsiadlowski L, Cameron SL, Daniels SR, Mayer G   |
| Support for vicariant origins of the New Zealand Onychophora.   | Allwood J, Gleeson D, Mayer G, Daniels SR, Beggs JR, Buckley TR                                     |
| The mitochondrial genome of the onychophoran <i>Opisthopatus cinctipes</i> (Peripatopsidae) reflects the ancestral mitochondrial gene arrangement of Panarthropoda and Ecdysozoa  | Braband A, Cameron SL, Podsiadlowski L, Daniels SR, Mayer G   |
| Systematics and phylogeography of a threatened tortoise, the speckled padloper  | Daniels SR, Hofmeyr MD, Henen BT, Baard EHW   |
| Molecular and morphological variation in a South African velvet worm <i>Peripatopsis moseleyi</i> (Onychophora, Peripatopsidae): evidence for cryptic speciation  | Daniels SR, Ruhberg H   |
| Mitochondrial phylogeography and subspecies of the wide-ranging sub-Saharan leopard tortoise <i>Stigmochelys pardalis</i> (Testudines: Testudinidae) - a case study for the pitfalls of pseudogenes and GenBank sequences | Fritz U, Daniels SR, Hofmeyr MD, González J, Barrio-Amorós CL, Siroky P, Hundsdoerfer AK, Stuckas H |

|   |   |
|---|---|
| Phylogeographic structure in the gilgie (Decapoda: Parastacidae: <i>Cherax quinquecarinatus</i> ): a south-western Australian freshwater crayfish   | Gouws G, Stewart BA, Daniels SR   |
| Deep genealogical lineages in the widely distributed African helmeted terrapin: Evidence from mitochondrial and nuclear DNA (Testudines: Pelomedusidae: <i>Pelomedusa subrufa</i> )             | Vargas-Ramírez M, Vences M, Branch W.R., Daniels SR, Glaw F, Hofmeyr MD, Kuchling G, Maran J, Papenfuss TJ, Siroky P, Vieites DR, Fritz U |
| Exhumation of Mesoarchean TTG gneisses from the middle crust: Insights from the Steynsdorp core complex, Barberton granitoid-greenstone terrain, South Africa                                   | Lana C DEC, Kisters AFM, Stevens G  |
| A single amino acid residue, Ala 105, confers 16 $\alpha$ -hydroxylase activity to human cytochrome P450 17 $\alpha$ -hydroxylase/17,20 lyase   | Swart AC, Storbeck K-H, Swart P   |
| Hypocortisolism in the South African Angora goat: The role of 3 $\beta$ HSD   | Goosen P, Swart AC, Storbeck K-H, Swart P   |
| The ability of Nisin F to control <i>Staphylococcus aureus</i> infection in the peritoneal cavity, as studied in mice.  | Brand A, de Kwaadsteniet M, Dicks LMT   |
| Power and energy scaling of a diode-end-pumped Nd:YLF laser through gain optimization   | Bollig C, Jacobs C, Esser MJD, Bernhardt EH, Von Bergmann HM  |
| Solvent and counter ion effects in bis(imidazole) dinuclear heterometallacyclic complexes of gold(I): Some considerations of porosity   | Strasser CE, Dobrzanska L, Schmidbaur H, Cronje S, Raubenheimer HG  |
| Isolation and characterization of three estrogen receptor transcripts in <i>Oreochromis mossambicus</i> (Peters)  | Esterhuyse MM, Helbing CC, Van Wyk JH   |
| Cross-species chromosome painting in bats from Madagascar: the contribution of Myzopodidae to revealing ancestral synteny in Chiroptera   | Richards LR, Rambau RV, Lamb JM, Taylor PJ, Yang F, Schoeman MC, Goodman SM   |
| Constraints on the Proterozoic evolution of the Aravalli-Delhi Orogenic belt (NW India) from monazite geochronology and mineral trace element geochemistry.                                     | Buick I, Clark C, Rubatto D, Hermann J, Pandit M, Hand M  |
| Packing motifs in organic ammonium carboxylate salts: extension of the ring-stacking and ring-laddering concepts  | Odendal JA, Bruce JC, Koch KR, Haynes DA  |
| Pyridine-derived N-heterocyclic carbenes: An experimental and theoretical evaluation of the bonding in and reactivity of selected normal and abnormal complexes of nickel(II) and palladium(II) | Stander-Grobler E, Schuster O, Heydenrych G, Cronje S, Tosh E, Albrecht M, Frenking G, Raubenheimer HG                                    |
| Exceptionally large positive and negative anisotropic thermal expansion of an organic crystalline material  | Das D, Jacobs T, Barbour LJ   |

|   |   |
|---|---|
| Solvent-mediated conformational similarities within a series of 1D coordination polymers constructed from a new flexible ditopic bis-imidazole ligand                                   | Potts S, Barbour LJ   |
| Reversibly thermochromic micro-fibres by coaxial electrospinning  | Malherbe I, Sanderson RD, Smit AE   |
| Granulite facies anatexis in the Ancient Gneiss Complex, Swaziland, at 2.73 Ga: Mid-crustal metamorphic evidence for mantle heating of the Kaapvaal craton during Ventersdorp magmatism | Taylor J, Stevens G, Armstrong RA, Kisters AFM  |
| Fischer-type tungsten acyl (carbeniate), carbene and carbyne complexes bearing C5-attached thiazolyl substituents: interaction with gold(I) fragments                                   | Strasser CE, Cronje S, Raubenheimer HG  |
| Bis(1,1,2,2-tetramethyldiphosphane-1,2-dithione- K 2 ' )gold(I) trifluoromethanesulfonate   | Strasser CE, Cronje S, Raubenheimer HG  |
| A multiple data ser phylogeny for the endemic South African freshwater phreatoicidean isopod genus <i>Mesamphisopus</i> : Taxonomic and biogeographic implications                      | Gouws G, Matthee CA, Stewart BA   |
| Genetic diversity levels in fishery - Exploited Spiny Lobster of the genus <i>Palinurus</i> (Decapoda: Achelata)  | Palero F, Abelló P, Macpherson E, Matthee CA, Pascual M   |
| Four p67 alleles identified in South African <i>Theileria parva</i> field samples   | Sibeko K, Geysen D, Oosthuizen MC, Matthee CA, Troskie M, Potgieter FW, Coetzer JAW, Collins NE |
| Interplay of the Inflammatory and Stress Systems in a Hepatic Cell Line: Interactions between Glucocorticoid Receptor Agonists and Interleukin-6  | Visser K, Smith C, Louw A   |
| Molecular phylogenetics and historical biogeography of <i>Rhinolophus</i> bats  | Stoffberg S, Jacobs DS, Mackie IJ, Matthee CA   |
| Remarkably low mtDNA control region diversity in an abundant demersal fish  | Von der Heyden S, Lipinski MR, Matthee CA   |
| Effects of small increases in copper levels on culturable basidiomycetous yeasts in low nutrient soils.   | Vreulink J, Stone W, Botha A  |
| Sunflower press cake as a substrate for eicosapentaenoic acid production by representatives of the genus <i>Mortierella</i> .   | Jacobs A, Botha A, Reddy JK, Van Zyl WH   |
| A Rapid and Inexpensive Method for the Direct PCR Amplification of DNA from Plants  | Bellstedt DU, Pirie MD, Visser C, De Villiers M, Gehrke B                                       |
| Genetic alterations for increased coumarin production lead to metabolic changes in the medicinally important <i>Pelargonium sidoides</i> DC (Geraniaceae)                               | Colling J, Groenewald JH, Makunga NP  |
| Nanofibers offer alternative ways to the treatment of skin infections   | Heunis TDJ, Dicks LMT   |

|  |   |
|--|---|
| Diversity of Lactobacillus and Bifidobacterium in feces of herbivores, omnivores and carnivores.   | Endo A, Futagawa-Endo Y, Dicks LMT  |
| Lactobacillus florum sp. nov., a fructophilic species isolated from flowers  | Endo A, Futagawa-Endo Y, Sakamoto M, Kitahara M, Dicks LMT  |
| The chromosomal arsenic resistance genes of Sulfolobus solfataricus  | van der Merwe JA, Deane SM, Rawlings DE   |
| A molecular diagnostic for identifying central African forest artiodactyls from faecal pellets   | Ntie S, Johnston AR, Mickala P, Bowkett AE, Jansen van Vuuren B, Colyn M, Telfer P, Maisels F, Hymas O, Rouyer RL, Wallace RA, LeBlanc K, van Vliet N, Sonet G, Verheyen E, Pires D, Wickings EJ, Lahm SA, Anthony MN |
| A molecular identification approach for five species of mealybug (Hemiptera: Pseudococcidae) on citrus fruit exported from South Africa  | Pieterse W, Muller DL, Jansen van Vuuren B  |
| Relative importance of habitat connectivity in shaping the genetic profiles of two southern African elephant-shrews  | Smit HA, Watson J, Jansen van Vuuren B  |
| Selective entrainment of peritectic garnet into S-type granitic magmas: Evidence from Archaean mid-crustal anatectites   | Taylor J, Stevens G   |
| Effect of vinyl pivalate/vinyl acetate comonomer composition on the self-assembled morphology of poly(vinyl alcohol) prepared by <i>in situ</i> fibrillation: Preparation of PVA with a spherical morphology | Chirowodza H, Zou M, Sanderson RD   |
| Surface modification of poly(vinyl alcohol) fibers   | Chirowodza H, Sanderson RD  |
| Solution electrospinning of polyolefins: The effect of comonomers in propylene/alpha-olefin copolymers   | Van Reenen AJ, Keulder L  |
| Hyperglycemia-mediated activation of the hexosamine biosynthetic pathway results in myocardial apoptosis.  | Rajamani U, Essop MF  |
| Disentangling the dynamics of invasive fireweed ( <i>Senecio madagascariensis</i> Poir. species complex) in the Hawaiian Islands   | Le Roux JJ, Wiczorek AM, Tran CT, Vorsino AE  |
| Molecular systematics and ecology of invasive Kangaroo Paws in South Africa: management implications for a horticulturally important genus   | Le Roux JJ, Geerts S, Ivey P, Krauss S, Richardson DM, Suda J, Wilson JRU   |
| Cu(II) and Ni(II) complexes based on monofunctional and dendrimeric pyrrole-imine ligands: Applications in catalytic liquid phase hydroxylation of phenol  | Mugo J, Mapolie SF, van Wyk J   |
| Oxidative Decolorization of Acid Azo Dyes by a Mn Oxide Containing Waste   | Clarke CE, Kielar F, Talbot M, Johnson KL   |

|  |  |
|--|--|
| Nitrogen supply and abiotic stress influence canavanine synthesis and the productivity of <i>in vitro</i> regenerated <i>Sutherlandia frutescens</i> microshoots | Colling J, Stander MA, Makunga NP  |
| Petrological discrimination among Precambrian dyke swarms: Eastern Kaapvaal craton (South Africa)  | Klausen MB, Söderlund U, Olsson JR, Ernst RE, Armoogam M, Mkhize SW, Petzer G                        |
| The defouling of membranes using polymer beads containing magnetic micro particles   | McLachlan DS   |
| Characterisation of an antiviral pediocin-like bacteriocin produced by <i>Enterococcus faecium</i>   | Todorov SD, Wachsmann M, Tomé E, Dousset X, Destro MT, Dicks LMT, Franco BDGM, Vaz-Velho M, Drider D |
| Ophiostoma species, including <i>Ophiostoma borealis</i> sp. nov., infecting wounds of native broad-leaved trees in Norway.                                      | Nkuekam GK, Solheim H, De Beer ZW, Grobbelaar JW, Jacobs K, Wingfield MJ, Roux J                     |
| Barcoding and microcoding using 'identiprimers' with <i>Leptographium</i> species.   | van Zuydam NR, Paciura D, Jacobs K, Wingfield MJ, Coetzee MPA, Wingfield BD                          |
| Transient chirality in a distal-substituted resorcinarene metal complex  | Kleinhans DJ, Arnott GE  |
| Biocatalytic Production of Coenzyme A Analogues  | Strauss E, De Villiers M, Rootman I  |
| Creating Cellulose-Binding Domain Fusions of the Coenzyme A Biosynthetic Enzymes to Enable Reactor-Based Biotransformations                                      | Rootman I, De Villiers M, Brand LA, Strauss E  |
| 3-Fluoroaspartate and Pyruvoyl-Dependant Aspartate Decarboxylase: Exploiting the Unique Characteristics of Fluorine To Probe Reactivity and Binding              | De Villiers J, Koekemoer L, Strauss E  |
| Michael Acceptor-Containing Coenzyme A Analogues As Inhibitors of the Atypical Coenzyme A Disulfide Reductase from <i>Staphylococcus aureus</i>                  | Van der Westhuyzen R, Strauss E  |
| Influence of clay content on bioavailability of copper in the earthworm <i>Eisenia fetida</i>  | Owojori OJ, Reinecke AJ, Rozanov AB  |

Appendix 2: A summary of the 2012 CAF training initiative

| <b>Training Week, 9-13 July 2012</b>                                       | <b>Applications</b> |                 |
|--|---------------------|-----------------|
|  | <b>Received</b>     | <b>Accepted</b> |
| <b>Workshop Title and Presenter</b>  |                     |                 |
| Short Course in Mass Spectrometry of Small Molecules: Dr Marietjie Stander | 22                  | 22              |
| Short Course in Mass Spectrometry Based Proteomics: Dr Salome Smit         | 21                  | 21              |
| Solution State NMR Workshop: Dr Jaco Brand                                 | 20                  | 15              |
| Solid State NMR Workshop: Dr Susanne Causemann                             | 8                   | 8               |
| Basic and Advanced Fluorescence Microscopy: Dr Ben Loos                    | 14                  | 12              |
| Scanning Electron Microscopy (SEM) Workshop: Ms Madelaine Frazenburg       | 21                  | 10              |
| Flow Cytometry Workshop: Ms L. Engelbrect                                  | 13                  | 12              |
| CT Scanner Workshop: Dr A du Plessis                                       | 5 + 5 SASOL         | 10              |
| Bio-informatics: Ms A van der Walt   | 26                  | 26              |
| GCMS Workshops: Mr L. Mokwena  | 31                  | 31              |