

June 2014



Faculty of Science NEWSLETTER

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DST MINERAL AND ENERGY RESOURCE ANALYSIS CoE: A FIRST AT UJ



The N'Chwaning II mine headgear in the Kalahari manganese field, South Africa. (Bruce Cairncross photographer)



Prof Nic Beukes



Rhodochrosite specimen and faceted gemstones from the Kalahari manganese field. (Bruce Cairncross photograph)



Ettringite mineral specimen from the Kalahari manganese field. (Bruce Cairncross photograph)

The Department of Science and Technology (DST) and the National Research Foundation (NRF) have awarded the Centre of Excellence (CoE) for Integrated Minerals and Energy Resource Analysis (CIMERA) to the University of Johannesburg.

CIMERA, which is co-hosted by the University of the Witwatersrand (Wits), is the first CoE to be hosted by the University of Johannesburg (UJ).

CIMERA's research focus is especially relevant to South Africa, because it will adapt an integrated understanding of the nature of some of the country's major and minor mineral and fossil energy resources and their geometallurgical characteristics. This will ensure the maintainable extraction of resources, while preventing and mitigating negative environmental effects. The emphasis is on integrating cutting-edge academic research with strategic applications in wealth generation and human resource development – not only in South Africa, but also the rest of Africa.

The main focus of CIMERA is to train skilled economic geologists through postgraduate research studies on mineral and energy resources, with a particular, although not exclusive, focus on Africa.

CIMERA is built on the foundation of two world-class economic geology research units in South Africa, namely the Palaeoproterozoic Mineralization Centre (PPM) at UJ and the Economic Geology Research Institute (EGRI) at Wits, with collaboration of the Universities of Rhodes, Pretoria (UP), Stellenbosch (SU), Venda and Fort Hare.

The Centre's research team is headed by UJ's A-rated scientist, Prof Nic Beukes from the Department of Geology.

The Department of Biotechnology and Food Technology is part of the new CoE in Food Security

The Department of Biotechnology and Food Technology of the Faculty is part of the new Centre of Excellence (CoE) in Food Security, awarded to the University of Pretoria (UP) and the University of the Western Cape as co-hosts.

This CoE will focus on five key areas, i.e., sustainable production; post-harvest technology and processing; access to food; consumer demand, food utilization and nutritional outcomes; and knowledge transfer and leadership in the food system.

Hypatia: From a chance discovery of a space- and time capsule

Prof Jan Kramers and Dr Georgy Belyanin from the Department of Geology and Dr Marco Andreoli of the South African Nuclear Energy Corporation report findings on the comet that struck Earth about 28 million years ago.

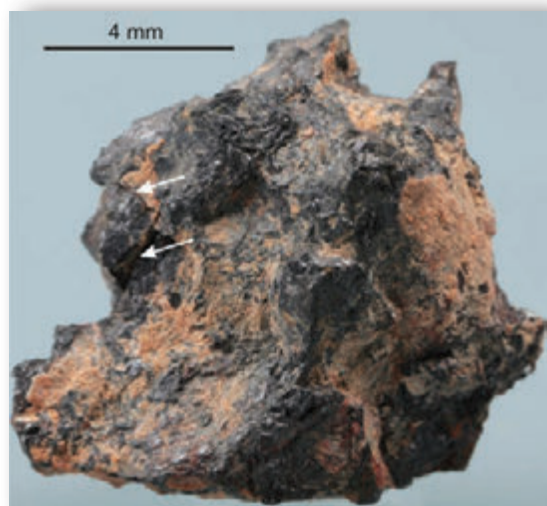
In January 2006, the sample capsule from NASA's *Stardust* mission to comet Wild II landed in the desert of Utah, US, containing several hundred captured dust grains totalling less than a milligram. The cost of the mission is not easy to estimate.

In December 1996, Aly Barakat, a geologist of the Egyptian Geological Survey, was exploring the extremely inhospitable desert area in the south west corner of Egypt where the fabled Libyan Desert Glass is found. In the course of this work he collected a ca 30 gram black stone partly covered in desert varnish, which he took to his laboratory and proceeded to study it, along with his other samples. When he attempted to cut it with a diamond saw to make a thin section for microscopy, the saw blade shattered. Although quite brittle, the extreme hardness of the stone made it impossible to cut it. X-ray diffraction subsequently confirmed the presence of diamond in the stone. Owing to this, some fragments found their way into museum collections in Italy. Meanwhile, its origin remained a matter of speculation. The prevailing opinion was that it was an unusual sample of the equally mysterious polycrystalline "carbonado" variety of diamond, which occurs in Brazil and the Central African Republic.

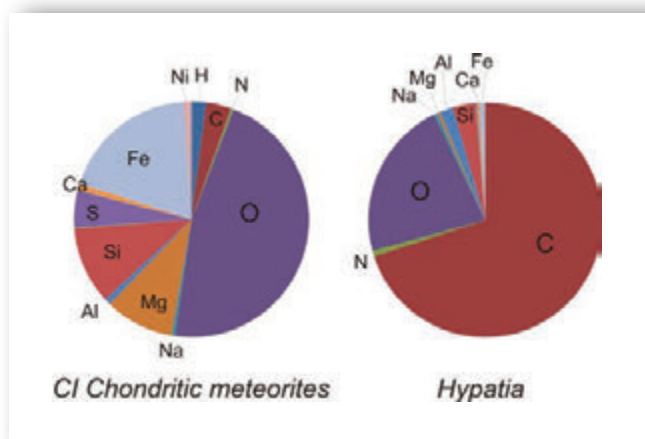
This is the stone we have now baptized "Hypatia" in honour of the 4th century female mathematician and astronomer of Alexandria, and for which we have every reason to postulate that it is a fragment of the nucleus of a comet, the first macroscopic one ever found on Earth. How did a fragment of this stone find its way to South Africa and UJ, on what basis do we make this extraordinary claim about it, and what does it further hold in store for science?

Marco Andreoli has a research interest in carbonado diamonds, and was alerted to the existence of the stone by an Italian colleague, who then secured a fragment of it for him, shown here <Fig. 1>. Small parts of this were subjected to various non-destructive analytical procedures including mineral analysis by X-ray diffraction and Raman spectroscopy, and chemical analysis by X-ray fluorescence and deuteron nuclear reaction analysis (at Wits, the Council of Geosciences and NECSA in Pelindaba). Carbon isotope analysis on small fragments was carried out at UCT. The results of these analyses showed what the Hypatia stone was not: it was not a piece of terrestrial coal or shale in which diamonds were produced by some shock (such as a meteorite impact), it was not a carbonado, and it was not a known type of meteorite. In short, it was unlike any material ever found on Earth.

It was at this stage, early in 2011, that the newly re-established noble gas isotope laboratory of the Spectrum analytical facility at UJ became involved in the stone. This laboratory, the only one of its kind in Africa, had originally been installed at De Beers Geosciences laboratories, where it was used to obtain the ages of (diamond-hosting) kimberlite pipes. When it became surplus to De Beers's requirements, it was donated to UJ. Isotopes of a given chemical element are atom species differing from each other only in their number of neutrons, i.e. in their mass. Because they are chemically identical, their relative abundances in a sample (whether terrestrial or extraterrestrial) are not strongly affected by physical or chemical processes and are therefore ideal tracers, or fingerprints, for the origin of

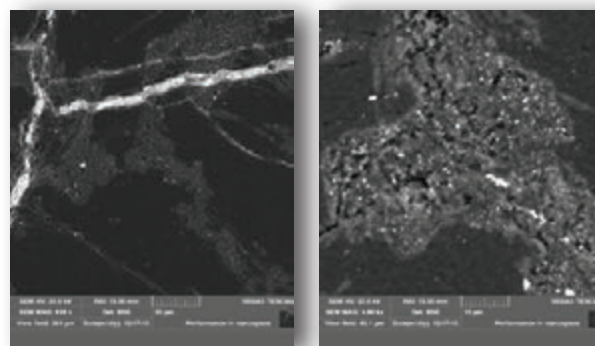


materials. In a material like the Hypatia stone, which cannot be dissolved for other types of analyses, noble gas isotope analyses can be achieved by heating the sample in vacuum, whereby the gases diffuse out. The relative abundances of argon with mass 40 (^{40}Ar) and that with mass 36 (^{36}Ar) are a particularly strong indicator for extraterrestrial matter: ^{40}Ar is $>300\times$ more abundant than ^{36}Ar in all terrestrial matter, and less abundant than ^{36}Ar in all extraterrestrial material. For Hypatia, $^{40}\text{Ar}/^{36}\text{Ar}$ abundance ratios between 30 and 300 indicated mixtures: this showed that this was part of an extraterrestrial object that had picked up argon from the Earth's atmosphere before impacting on solid Earth. Subtle variations in the isotopic composition of neon, krypton and xenon also reveal extraterrestrial matter.



Having established an extraterrestrial origin for the stone, the next step was to compare it with meteorites. <The figure> shows a comparison of the chemistry of Hypatia (in atomic proportions) with the most carbon-rich meteorites known, carbonaceous chondrites, and the huge difference is immediately apparent. Therefore Hypatia became, in the first instance, a comet fragment by default – as it did not fit any other description. But comets are considered to be volatile-rich, fluffy objects that fall apart at the slightest perturbation. How does that description rhyme with the exceedingly hard, diamond-bearing stone? The proposed scenario is one of a comet impacting the Earth's atmosphere, heating up and exploding in a giant fireball (a so-called aerial burst) that incidentally caused surface melting of the land below it, giving rise to the Libyan Desert Glass. One or several larger fragments of the comet nucleus impacted on the ground below with such force that the shock pressure transformed most of the carbonaceous matrix into a glassy (amorphous), but extremely hard material, in which microdiamonds occur patchily distributed.

The Libyan Desert Glass has been dated at 28.5 million years, and following this scenario that is how long the stone Hypatia would have lain on the ground, or in the soil. The object is crisscrossed by fractures in which clay minerals and calcite have formed over this very long time period. An ordinary meteorite would long since have fallen apart due to weathering, but the glassy matrix of Hypatia, away from the fractures, is completely unweathered and retains a treasure of exotic minerals, mostly very fine grained, that are currently being studied by Georgy Belyanin. Among these are silicon carbide, nickel phosphide, pure iron sulphide, and metallic aluminium, zinc and silver.



<The figure (right hand frame is enlarged from central portion of left hand frame)> shows nickel phosphide (the bright grains) and iron sulphide (the clouds of extremely fine, sub-micrometer grains) which typically occur together, embedded in the dark carbonaceous matrix. No silicate or other oxygen-bearing minerals have so far been found as inclusions in Hypatia's matrix. The appreciable oxygen content seen in the pie chart resides in the amorphous carbonaceous matrix. This is a feature of comets, also observed in the dust returned by Nasa's *Stardust* mission. It appears that all the mineral inclusion content of the Hypatia stone is in fact stardust, mineral grains formed in interstellar space before the formation of the solar system, in an extremely reducing environment and mostly at very low temperatures. The association of nickel phosphide and iron sulphide dust shown in <the figure> has never been observed in meteorites, and the reason is that temperatures in the asteroid belt, where meteorites come from, were high enough for such material to be annihilated by chemical reactions. In the Kuiper Belt beyond the orbit of Neptune, where most comets originated, temperatures were at most tens of degrees above absolute zero even during the formation of the solar nebula, so that stardust could be captured unchanged by cometary matter as it agglomerated. The instantaneous transformation of the carbonaceous matrix into a hard, diamond-bearing glassy material provided the time capsule that preserved this material for science.

Winter Graduation 2014

The Faculty of Science celebrated the award of seventeen Doctoral degrees and seventy-five Master's degrees at its Winter Graduation Ceremony in June.

Prof Dirk Knoesen, Director of the Nanoscience Platform, University of Western Cape joined the congregation as a special guest to award the first two Master's graduates in Nanoscience at the University of Johannesburg.



Dr Frans Korb of the Southern Africa Association for the Advancement of Science presented **Nontando Mkhize** (Department of Applied Chemistry) with the Medal of the Southern Africa Association for the Advancement of Science (S2A3) for the Best Scientific Master's dissertation in the Faculty for 2013. Nontando is also the recipient of the Chancellor's Medal for the Best Master's student in the Faculty for 2013, with a final mark of 94%.

Dissertation: Development of analytical methods for the determination of volatile fatty acids and nutrients

Supervisor: Dr TAM Msagati

Co-supervisor: Prof BB Mamba

Co-supervisor: Prof M Momba



Nontando Mkhize



Darren Tiddy from the Department of Geology received the prize for the Best BSc Honours student for 2013 in the Faculty with a final mark of 83%.

The PhD degree was conferred on the following students:



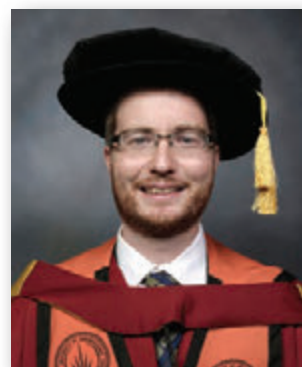
Ballav, Niladri
PhD in Chemistry
Supervisor:
Prof SB Mishra
Co-supervisor:
Dr A Maity (CSIR)



Bredenkamp, Tyler Morgan
PhD in Chemistry
Supervisor:
Prof DBG Williams



Bvumbi, Suzan Phumudzo
PhD in Physics
Supervisor:
Prof SH Connell
Co-supervisor:
Prof JF Sharpey-Schafer
(University of the Western
Cape)
Co-supervisor:
Prof SM Mullins (iThemba)



Cook, Martin Nkululeko Hogan
PhD in Physics
Supervisor:
Prof SH Connell



Elkhadir, Afag Yasin Fadelelmawla
PhD in Chemistry
Supervisor:
Prof J Darkwa



Gere, Jephris
PhD in Botany
Supervisor:
Prof M van der Bank
Co-supervisor:
Dr O Maurin



Lakkakula, Jaya
PhD in Chemistry
Supervisor:
Prof RWM Krause
Co-supervisor:
Prof AM Raichur (Indian
Institute of Science)



Liebenberg-Enslin, Hanlie
PhD in Geography
Supervisor:
Prof HJ Annegarn

ABSENT:

Fodjo Magne Fomogne, Cyrille Yollande
PhD in Chemistry
Supervisor: Prof RWM Krause
Co-supervisor: Dr DT Ndinteh, Rhodes University



Mbuli, Bhekani Sydeney
PhD in Chemistry

Supervisor:
Prof BB Mamba
Co-supervisor:
Prof Y Oren (Ben Gurion
University)
Co-supervisor:
Prof RWM Krause (Rhodes
University)
Co-supervisor:
Prof VL Pillay (University of
Stellenbosch)



Mishra, Gargi
PhD in Geology

Supervisor:
Prof KS Viljoen
Co-supervisor:
Prof H Mouri



Mpofu, Smart
PhD in Chemistry

Supervisor:
Prof RWM Krause
Co-supervisor:
Dr DT Ndinteh (Rhodes
University)



**Nomngongo, Philiswa
Nosizo**
PhD in Chemistry

Supervisor:
Prof JC Ngila
Co-supervisor:
Dr B Moodley (University of
KwaZulu-Natal)
Co-supervisor:
Prof TAM Msagati
Co-supervisor:
Dr JL Fischer (Sasol
Technology (Pty) Ltd)



Ntsendwana, Bulelwa
PhD in Chemistry

Supervisor:
Prof OA Arotiba
Co-supervisor:
Prof BB Mamba
Co-supervisor:
Dr S Sampath (Indian
Institute of Science)



**Olorundare, Oluwasayo
Folasayo**
PhD in Chemistry

Supervisor:
Prof BB Mamba
Co-supervisor:
Prof J Okonkwo (Tshwane
University of Technology)
Co-supervisor:
Prof RWM Krause (Rhodes
University)



Sethusa, Mamadi Theresa
PhD in Zoology

Supervisor:
Prof H van der Bank
Co-supervisor:
Prof M van der Bank
Co-supervisor:
Mr IM Miller (Agricultural
Research Council, University
of Stellenbosch)



**Shaddock, Bridget
Florence**
PhD in Aquatic Health

Supervisor:
Prof V Wepener

UJENIUS CLUB 2014

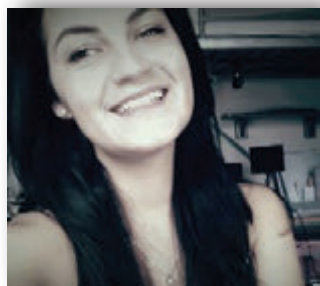
The Faculty of Science is proud to announce that in 2014 ten students of the Faculty are members of the *UJenius Club*, (formerly known as the UJ Top Achiever's Club) - a initiative of UJ to acknowledge outstanding performance by undergraduate students. Membership to the *UJenius Club* is by invitation only. Members have to achieve and maintain an annual average of at least 75% during their undergraduate studies and must achieve a final mark of at least 70% in each module. Membership commences at the end of the first year of study.

The purpose of the *UJenius Club* is to;

- Promote academic excellence as a core component of the UJ student identity
- Expose top students to other disciplines and to a broader range of academic debates in view of the growing importance of interdisciplinary
- Further promote UJ values, with participants expected to contribute as well as to receive
- Create a social space where top performing students (from different faculties and campuses) are able to interact and to build partnerships and friendships

Various privileges are associated with UJenius Club membership; inter alia, student exchanges, student ambassadorships, industry or professional mentorships, undergraduate research opportunities, and first choice residence accommodation.

The UJenius Club members of 2014 in the Faculty of Science are:



MELISSA ANNANDALE (BSC MATHEMATICAL SCIENCES)

"The decision to study at UJ in the Faculty of Science was sort of a forced decision. From a young age I always realized I love maths. So naturally when it came to deciding what I wanted to do with my life it had to be something that was mathematically based and challenging. That left me with two options, either engineering or mathematical sciences. In the end I decided to pick the mathematical sciences route, as I thought I'd enjoy it more and it would open up more doors which would allow me explore my options in the working world in the future. I'm very happy with my decision to study at UJ and have enjoyed it so far quite thoroughly, especially within the Faculty of Science."



**MIZAN FERREIRA
(BSC LIFE AND ENVIRONMENTAL SCIENCES)**

"I've decided to study at UJ in the Faculty of Science because I was always fascinated by science and especially biochemistry. After I have completed my studies I would like to do scientific research. The University and the Faculty are where my mother obtained her degree, where my sister is studying and where my brother wants to study next year. (Ek het besluit om aan die Fakulteit Natuurwetenskappe by die Universiteit van Johannesburg te studeer, omdat ek nog altyd geïnteresseerd was in wetenskap, veral biochemie, en sal graag na my studies wetenskaplike navorsing wil gaan doen. Die Universiteit en Fakulteit is ook waar my ma haar graad verower het, waar my suster ook tans studeer en waar my broer volgende jaar wil studeer.)"



**MARUSCHKA GONSALVES
(BSC LIFE AND ENVIRONMENTAL SCIENCES)**

"On several occasions it was suggested, by many people, that I study my scientific degree at the University of Johannesburg due to the fact that the University of Johannesburg is widely respected as being one of the finest scientific and research institutions in South Africa, and is amongst the top 4% of universities in the world. Thus, I am grateful that I took their advice and decided to study further at the University of Johannesburg. I have registered at the University of Johannesburg for my Bachelor of Science degree (BSc) in Environmental Management and Geography. I am very proud that I can associate myself with the University of Johannesburg and that I have the opportunity to experience top class education by brilliant, passionate lecturers, whom are moulding and supporting me to become one of the best Environmental Managers and Geographers South Africa has to offer."

With no regret, with great honour and without hesitation, I can refer anyone that wants to further their studies in the scientific field to the University of Johannesburg, as it is one of the best scientific teaching institutions, providing world class education."



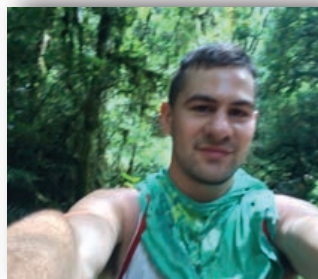
**ABEL MNYAKENI
(BSC MATHEMATICAL
SCIENCES)**

"I came to UJ because it is a new, vibrant, diverse and growing learning institution and I wanted to be part of the growth that is taking place. After learning about Dromedaris Mens Residence I was very eager to be part of the brotherhood. I chose the Faculty of Science because I am very passionate about mathematics and I cannot imagine myself doing any other degree. I believe that numbers are the keys to everything in the universe. I am really enjoying my studies and proud to be a mathematician in UJ."



**RENIER SWANEPOEL
(ELECTRICAL &
ELECTRONIC
ENGINEERING WITH
INFORMATION
TECHNOLOGY)**

"I learnt from a young age that education is a path to success, I saw the University of Johannesburg as my bridge. Every day is a new experience, a new insight into the face of technology and science. UJ offers a wide variety of courses, one of which combines my interest in physics and information technology. I have grown not only as a student but as a person as well and look forward to finishing my degrees. The main reason why I came to UJ was to acquire my masters and do research in computerize intelligence."



**KEVIN MYERS (BSC
PHYSICAL SCIENCES)**

"I chose to study science because it was the subject I enjoyed the most at school, by far. It was (and still is) the most thought invoking and mentally demanding area of study, in my opinion, and I love a good challenge. My science teachers were extremely motivational and so smart, so interesting. We always had such unbelievable conversations. I also used to watch many science related documentaries at that stage in my life. So I thought I should study science as it's what I enjoy. And if I decide it's not for me, then at least it's a great skill set to have and it'll open up plenty doors."



**TRACEY OLLEWAGEN
(BSC LIFE AND ENVIRONMENTAL
SCIENCES)**

"I initially decided to go to UJ as it was near my home and I only heard good things about it from students I was previously at school with. I received thorough feedback with regards to my application and the steps to follow upon entry into the study process were very informative. The online tracking process gave me the assurance that I was more than just a number. All of these factors made my choice of UJ that much easier. I chose the Faculty of Science because I felt it suited my field of interests and gave me more opportunities for the future. For a young person entering the world of academia, it was very difficult making the choice on what field of study to follow. My choice was made easier by a fellow student I met at the first year orientation."



**BENICE VAN DER
WALT (BSC PHYSICAL
SCIENCES)**

"Since a very young age I've always been interested in wanting to know and understand how things work and why things are the way they are. Later on in life these questions were answered by science which sparked my interest and also guided me in choosing a BSc degree as my field of study. UJ became my first choice as the Faculty of Science at UJ offers a wide range of science degrees with a number of different major combinations compared to other universities. The ability to study chemistry and biochemistry as majors at UJ is both a privilege and an honour. Studying a science degree at UJ, not only provides you with a degree of international standard, but the support you receive whilst obtaining the degree towers above all. The Departments of Biochemistry and Chemistry in particular train their students with such enthusiasm and motivation, encouraging us to become the best in our fields of study. It is a tough journey which requires hard work and dedication, but also teaches discipline, the ability to think and gives you that little bit extra to enable you to push just a little bit harder which in the end is rewarding. Science has inspired me to do more, to become more and has taught me that I too can make a difference in this world."



**VUYANE NGWENYA
(ELECTRICAL &
ELECTRONIC
ENGINEERING WITH
INFORMATION
TECHNOLOGY)**

"My decision to study at UJ was clear from the start. I had to study at an institution (UJ) that would reward academic diligence to such a point that as long as I performed academically, finance would not be an issue. The achievements of the Academy of Computer Science and Software Engineering in the Faculty of Science and the Faculty of Engineering had me all the more encouraged to enrol for the combined degree programme. UJ has provided me with a platform to grow academically and become one step closer to reaching my potential. I am fully satisfied with the decision I've made, this is the ideal platform for me."



**AMISHA NAGAR
(BSC LIFE AND
ENVIRONMENTAL
SCIENCES)**

"The reason I decided to study at University of Johannesburg, within the Faculty of Science, is because I am generally fond of learning about the body we live in and I intend on helping people, and making a change, even if it's the slightest change."

New books in Science

International edition – Kew Publishers and University of Chicago Press (left) and South African edition – Briza Publications

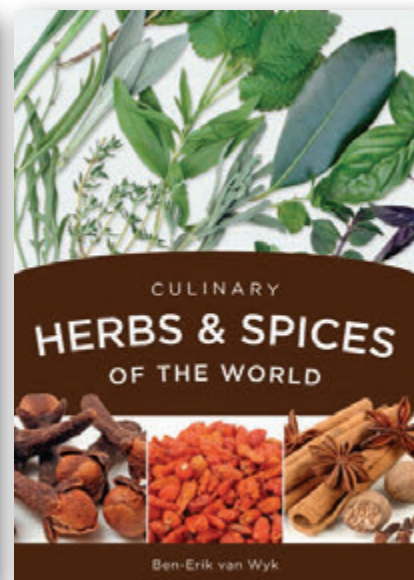
Publications presented to the Royal Botanic Gardens, Kew

Two research publications were presented to the library and herbarium of the Royal Botanic Gardens in Kew, UK. Prof Ben-Erik van Wyk of the Department of Botany and Plant Biotechnology handed over copies of the books to Prof David Simpson (Director of the Herbarium, Library, Art and Archives at Kew) and Mrs Fiona Ainesworth (Librarian).

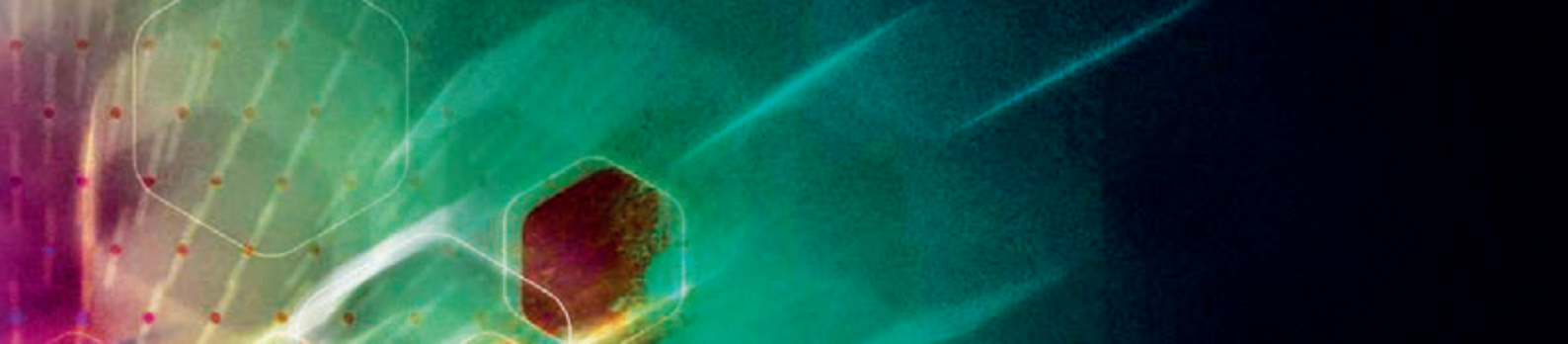
African Apiaceae is an academic book written by Prof Ben-Erik van Wyk, Prof Patricia M Tilney and Dr Anthony R Magee. It is a comprehensive review and synthesis, in full colour, of the taxonomic diversity of the family Apiaceae in Africa and Madagascar. This research project was initiated in 1985 and was partially funded by the National Research Foundation of South Africa and The University of Johannesburg.

The second book is the Proceedings of the 6th International Legume Conference hosted by UJ in January 2013. The hard copy was published in November 2013 and comprises 33 scientific papers on the legume family, a plant group of considerable commercial importance.

The proceedings, entitled **Advances in Legume Systematics 12** were published as a Special Edition of the South African Journal of Botany (an International Elsevier Journal), with Prof Ben-Erik van Wyk and Dr Stephen Boatwright (a former PhD student) as guest editors. Extra copies of a special hardbound edition were also donated to several leading experts at Kew who have attended the conference and contributed papers.



From left to right: Mrs Fiona Ainsworth, Prof Van Wyk and Prof Simpson



New academic book on African plants

Prof Ben-Erik van Wyk, Prof Patricia M Tilney and Dr Anthony R Magee from the Department of Botany and Plantbiotechnology have published a new book on African plants namely ***African Apiaceae: A synopsis of the Apiaceae/Umbelliferae of sub-Saharan Africa and Madagascar.***

The Apiaceae/Umbelliferae includes many commercially important food plants such as carrots, celery, parsley, coriander, anise, dill, fennel, cumin, etc. In sub-Saharan Africa and Madagascar, the family has remained scientifically poorly known despite the critical importance of African species in understanding the early evolutionary history of the family as a whole. This scientific review gives a bird's eye view of the morphological and anatomical diversity of the family in Africa and Madagascar. The book provides an introduction to the structural diversity and gives the correct botanical terminology – especially for the interesting fruits (schizocarps) that are typical of the family. Descriptions and illustrations for all members of the family known from sub-Saharan Africa and Madagascar (77 genera and 368 known species) are provided, as well as a key to the genera.

The project on **African Apiaceae** was initiated in 1985 and was partially funded by the National Research Foundation of South Africa and the University of Johannesburg. Following a successful international conference organised by Prof Van Wyk and Prof Tilney in Pretoria in 2003, several international specialists collaborated with the UJ-based group. Postgraduate students who contributed to this programme include Izelle Allison, Mahalia Schubert, Tony de Castro, Pieter Winter, Bernard de Villiers, Nicole Vessio, Rebecca (Mei) Liu and Anthony Magee.

Ben-Erik van Wyk is a professor of botany at the University of Johannesburg, with a research interest in plant taxonomy and useful plants. He is the author of 17 best-selling scientific books (some translated into several languages) and about 300 research papers in peer-reviewed journals.

Patricia May Tilney is also a professor of botany at the University of Johannesburg (retired at the end of 2013). Her speciality research field is plant anatomy, with a strong emphasis on the fruit anatomy of the family Apiaceae. Patricia is the author or co-author of over 70 research papers, dealing mainly with the taxonomy and anatomy of the Apiaceae.

Anthony Richard Magee is a senior researcher based at the Compton Herbarium, Kirstenbosch Botanical Gardens, Cape Town. He obtained a PhD degree at the University of Johannesburg in 2008, for multi-disciplinary research on African Apiaceae, which included the use of DNA sequencing. His studies of Apiaceae alone resulted in 15 papers in leading botanical journals and included, amongst others, a new classification system for the family.

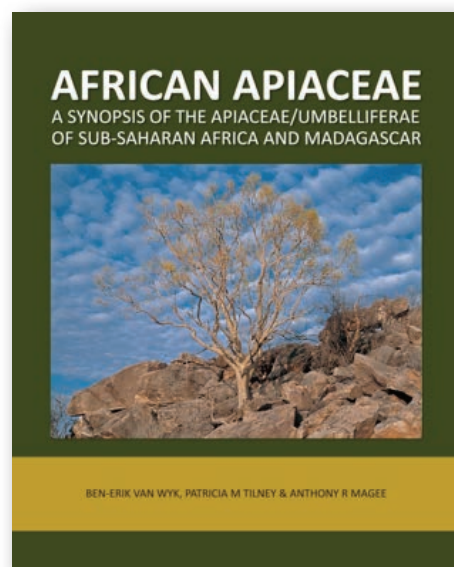
Culinary Herbs and Spices of the World is another new book by Ben-Erik van Wyk, Professor in the Department of Botany and Plant Biotechnology at the University of Johannesburg.

Eating and drinking have become an increasingly exciting adventure because the diverse tastes and flavours from around the world have become readily accessible to all food lovers. This book provides essential information on the various culinary herbs, spices and other sources of flavours used commercially in all the major culinary traditions of the world.

Introductory chapters provide basic information about the history of herbs and spices, herb and spice mixtures, condiments and sauces, with notes on propagation, cultivation and culinary uses. Of special interest is a detailed review of the chemistry of tastes and flavours which explains the underlying principles, not only of how we perceive taste and flavour, but also of the synergies between various ingredients that are traditionally used to create an excellent dish or beverage.

The main part is a series of monographs dealing with more than 150 of the most important botanical sources of tastes and flavours, including some exotic herbs and spices that are not yet widely known. Each plant product and its characteristics and uses are described and richly illustrated. Of special interest are the main chemical compounds responsible for its distinctive taste and/or aroma. In most cases, signature dishes associated with that particular herb or spice are highlighted.

This publication appears to be the only fully illustrated, multilingual scientific guide and accurate reference work to practically all commercial herbs and spices.



Finalists for NSTF-BHP Billiton awards

Prof Michael Henning and **Prof Azwinndini Muronga** are finalists for the prestigious 2013/2014 NSTF-BHP Billiton awards in Science, Engineering, Technology and Innovation (SETI).

The National Science and Technology Forum (NSTF) hosts the awards in partnership with BHP Billiton, for outstanding individual contributions in Scientific Research, Technological Innovation, Education, Management, Capacity Building and Communication.

Prof Michael Henning, from the Department of Pure and Applied Mathematics, is a finalist for the 2013/2014 NSTF-BHP Billiton lifetime award.

Prof Henning made significant contributions to several topics in graph theory and hypergraph theory including colorings, matchings, independence, domination theory, identifying codes, transversals, and digraphs.

Prof Henning holds an A-rating from the NRF.

Prof Azwinndini Muronga, from the Department of Physics and Director of UJ's Soweto Science Centre, is a finalist for the NSTF award to an individual or a team for an outstanding contribution to SETI through communication for outreach and creating awareness over the last five years.

The award is sponsored by the South African Agency for Science and Technology Advancement (SAASTA).

Professor Muronga's research field is theoretical particle and nuclear physics, particle and nuclear astrophysics.

As Director of the Soweto Science Centre, Prof Muronga works towards strengthening the implementation of the science and maths curricula at secondary school level. The Centre assists learners with theory and laboratory sessions. The Centre provides guidance and support to science and maths teachers as well.

The winners of the 2013/2014 NSTF-BHP Billiton Awards will be announced on Thursday, 03 July 2014.



Prof Henning



Prof Muronga

Staff Day 2014

The University of Johannesburg celebrated ten years of Research Excellence at the UJ Staff Day. The festivities included exhibitions of selected Research Programmes, presented within a marquee tent in stalls. The Departments of Applied Chemistry, Geology, Physics and the Academy of Information Technology and Software Engineering showcased some of their research achievements over the past ten years. The research exhibition was attended by staff from the University, and was an opportunity for staff to be exposed to the leading research of their colleagues. Other activities of the day included music and teams sport games.

Department of Applied Chemistry



Dr James Ramontja interacting with visitors to the Nanotechnology stall of the Department of Applied Chemistry



Staff members of the Department of Applied Chemistry enjoying a game of sitting volleyball

Geology



Prof Bruce Cairncross, HOD of the Department of Geology at their exhibitions

Information Technology



Dr Ian Ellefsen and Frans Blauw representing the Academy of Information Technology & Software Engineering

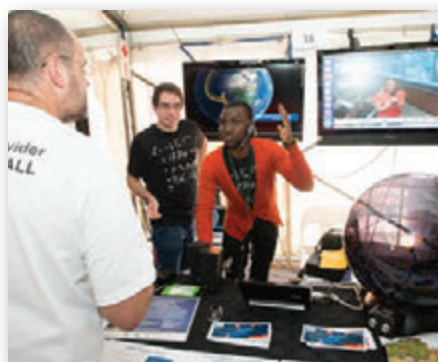
Physics

The SKA project as well as the High Energy Physics Programme at the ALTAS Experiment have been selected for display.



The virtual tour of ATLAS was part of the display

Physics



Virtual Tour of the ATLAS Control Room facility live from CERN with Claire, Richard and Doomnull at the staff day



REPRESENTATIVE ON SAAMS

The community have unanimously nominated Prof Ian Dubery from the Department of Biochemistry as the South African Association for Mass Spectrometry (SAAMS) Metabolomics representative.

The South African Association for Mass Spectrometry (SAAMS) is the mass spectrometry subdivision of the South African Chemical Institute. As a non-profit organization its functions are to coordinate mass spectrometry in Southern Africa and to create and maintain an official body for the mass spectrometry technique interest and application group. SAAMS mediates the presentation of research and development in mass spectrometry. New developments and new instrumentation in mass spectrometry are introduced to the group and users and instrument suppliers are brought together. The SAAMS target group is wide, from students, novel and inexperienced mass spectrometrists to experienced academics and industry based scientists.



Focus on women and education at the Oxford Round Table

Dr Melanie Jacobs from the Faculty of Science has been invited to become a member of the Oxford Round Table. The purpose of the Oxford Round Table is to promote education, art, science, religion and charity by means of academic conferences and publication of scholarly papers. Membership is limited to approximately thirty-five interdisciplinary scholars who have a particular interest in the above mentioned subjects. Sixteen years ago, a highly successful Round Table was specifically designed to explore women and education.

Dr Jacobs was also nominated to attend the Oxford Round Table's 16th Annual Conference on Women and Education at Brasenose College in the University of Oxford in England. At the conference she held a talk on *The Growing Disparity Between Teaching and Research Prominence in South African Universities: Gender-Based Implications for a Science Faculty*.

Brasenose College is one of the thirty-eight colleges that form the University of Oxford and was founded in 1509.

A CORRECTION AND APOLOGY

In the previous Faculty of Science Newsletter it was stated that the UJ now has two Fellows of the African Academy of Sciences. It has now been brought to our attention that there are actually three such Fellows at UJ, the third being Professor J Darkwa of the Department of Chemistry who was elected in 2012. We apologise to Prof Darkwa for his omission and wish to assure him that it was an inadvertent oversight and in no way intended to reduce his stature. It is our hope that Prof Darkwa will accept this apology.



First ISMGAf in Africa

The University of Johannesburg was proud to launch and host the First International Symposium on Medical Geology in Africa (ISMGAf), which was inaugurated by Prof TS Maluleke, Deputy Vice-Chancellor Internationalisation and Prof A Moteetee, Acting Dean of the Faculty of Science, UJ.

The program of the event consisted of a one day symposium (oral presentations and discussions) and two days short course presented by Prof Jose Centeno, a toxicologist from the Joint Pathology Center, USA, Past Chairman of the International Medical Geology Association (IMGA) and Dr Mark Cave, a Project Manager of the Geochemical Baselines and Medical Geology division from the British Geological Survey (BGS), United Kingdom.

Delegates from different organisations (including public health, universities, consulting and mining companies), representing five countries (including South Africa, Nigeria, Germany, USA and UK) attended this successful symposium.

The oral presentations by delegates covered a wide range of topics from sources and characterisation of potentially harmful elements and compounds, to determination of geochemical backgrounds and development of comprehensive databases pertaining to medical geology, to the effects of geophagy in Africa.

Dr Madela-Mntla, Director of the International Council of Science (ICSU)- Regional Office Africa (ROA) gave a presentation in which she highlighted the objectives of the "Future Earth" 10 years ICSU initiative.



From left to right: Dr Mark Cave, Senior Scientist and Leader Medical Geology Projects, British Geological Survey (Guest speaker); Prof Dr Jose Centeno, Director, Division of Biophysical Toxicology, The Joint Pathology Center, WDC, USA (Guest speaker); Prof Catherine Ngila, HOD Applied Chemistry, UJ (delegate); Prof Annah Moteetee, Acting Dean of the Faculty; Prof Hassina Mouri, Chair of the "1st International Symposium on Medical Geology in Africa; and Dr Edith Madela-Mntla Director Regional Office Africa – International Union of Science (ICSU-ROA). At the back: Prof Maluleke, DVC International Office, UJ; and Delegate



Prof Willem van Biljon, first HOD of Geology (1967-1984) at UJ (previously RAU) received his certificate of attendance at the short course delivered by Prof Jose Centeno.



CERN first beam line competition for schools

To coincide with CERN's 60th anniversary this year, the laboratory launched the *Beam line for schools Competition*.

UJ worked with St John's College in the *CERN Beam line Competition* and made it to the top sixteen, with the status of "highly commended".

Following almost 300 submissions from school groups around the world, two teams have been selected to come to CERN to carry out their own experiments at a CERN beam line. The winners are the *Odysseus' Comrades* team from Varvakios Pilot School in Athens, Greece and the *Dominicuscollege* team from Dominicus College in Nijmegen, the Netherlands. The idea is to make a fully equipped beam line available for highschool students to run an experiment in the same way that the laboratory's researchers do.

In proposals of fewer than 1000 words, teams had to explain why

they wanted to come to CERN, what they hoped to take away from the experience and give initial thoughts on how they would use the particle beam for their experiment. They also had to summarize their written proposal in a creative and entertaining video.

Teams of CERN scientists then evaluated proposals based on creativity, motivation, feasibility and scientific method. After two rounds of evaluation, sixteen teams were highly commended and put forward for final selection by an official CERN committee that assigns beam time to experiments. The committee decided to choose not one but two winning teams, both of which have been invited to CERN to carry out their experiments together.

UJ and St Johns plan an improved and strengthened application on the occasion of the next CERN beam line competition.

Zoology in the spotlight

The Department of Zoology has recently held its first colloquium for 2014. During this event, eleven MSc and three PhD students presented their research proposals. Research topics varied from aspects of aquatic health assessment to molecular genetic studies. A common theme through all the projects was that students recognized the importance of their work for the broader community, and stressed the practical application of their work. Prof Piet King, the Head of the Department of Biology, University of Limpopo (Medunsa campus), attended and acted as the adjudicator. Prof King, who is a well-known and respected parasitologist, commended the students for excellent presentations. The best MSc proposal was presented by **Ryaz Musa** who will use diatom community assemblages to assess water quality in the Nyl River System (supervisors Dr Richard Greenfield and Prof Johan van Vuren). The best PhD presentation was done by **Jamie-Lee Szamosvari** who will study sperm motility and testes histopathology as reproductive indicators of aquatic health in fish species in the Albasini Dam (supervisor Prof Ina Wagenaar).



Department of Zoology students and staff



From left to right: Ryaz Musa, Prof Piet King, Jamie-Lee Szamosvari, Prof Bettine van Vuuren

10 TAG @ UJ 2013 (1st year 2012)



The students with Prof Hassina Mouri

10 TAG@UJ 2013: A first, yet successful experience

10 TAG (10 Top Achievers in Geology) at UJ is an initiative aimed at encouraging the top ten students in each academic year to enhance their interest in the field of geoscience and inspire them to pursue their studies through to a postgraduate level.

The initiative was implemented for the first time in 2013 and ran over six weeks during the second semester of the academic year. The process involved the identification of the top ten students of the first year class of 2012 and offered these top achievers a special program outside of scheduled lecturing time.

The main idea is to expose these students to research activities and inform them on activities in the geological world outside the classical undergraduate lecturing and to create a healthy and a culture of competition in the class.

These TAG members were invited to the Department twice monthly on Fridays for one hour, or on a Saturday for visits outside the campus. The program consisted of offering either special informal and interactive talks on various research activities conducted in the Department of Geology, or visits to various analytical laboratories, museums, and interesting geological localities. At the end of the program, the students attended a social function arranged by the Department.

The results of this initiative were very promising and positive, as expressed by the students themselves in the message copied below. From an academic perspective, the initiative is indeed working as five students of the group have scored high marks during their second year class and five new students managed to be part of the 10 TAG 2013.

Feedback from the students to Prof Mouri

"We thought that the Top10 program was a brilliant initiative. We were given the opportunity to learn even more, and we did. The program also helped us to identify a few geological fields we might be interested in going into.

We would like to see that such initiatives are adopted by other departments in the Faculty of Science or even by the whole University. Because as a student it is difficult to sometimes understand how these things we learn in class apply in the real world of our fields. This program helped us learn more about Geology in the real world and stuffs we wouldn't learn in class.

The program also serves as a form of inspiration and encouragement to other students to work even harder to perform so they can also make it in the Top10 program. It creates a positive sense of competition amongst the students.

We enjoyed being part of this program very much and we hope that it will continue for years to follow.

Thank you, Professor Mouri, for believing in us and sending us on this much rewarding journey."

Student honoured for outstanding research

The Department of Zoology 2013 prestigious medal for the best postgraduate (MSc / PhD) dissertation in Zoology was awarded to Mr Beric Gilbert, for his dissertation entitled *The accumulation and distribution of metals in the pseudophyllidean cestode Bothriocephalus acheilognathil (Yamaguti, 1934) in comparison to the host Labeobarbus kimberleyensis (Gilchrist and Thompson, 1913) from the Vaal Dam, South Africa*. Beric is a postgraduate student of Prof Annemarie Oldewage.



Beric Gilbert and Prof Bettine van Vuuren

Following the death of Prof HJ Schoonbee, the first Head of the Department of Zoology, international collaborators donated funding to commemorate the legacy of Prof Schoonbee. The Department forged a medal in his honour and awards this prestigious medal annually.

Exchange student from Geography

Keagan Collins, a master student in the Department of Geography, Environmental Management & Energy studies in the Faculty of Science, has been selected to take part in a four month academic exchange at Oulu University, Finland. The University of Johannesburg has a Memorandum of Understanding with the University of Oulu in Finland.



Open Day 2014



Learners visiting the Faculty at one of the Open Day of UJ experiencing the wonders of Chemistry

INFORMATION TECHNOLOGY

The Winter School in Information Technology (IT), hosted by the Academy of Computer Science and Software Engineering at the University of Johannesburg since 2009, will once again give learners the opportunity to revise work before the final examinations in IT.

The Winter School will be at the Academy for Computer Science and Software Engineering on the UJ Kingsway Campus in Aucklandpark, Johannesburg

From 30 June to 4 July 2014 Delphi programming language will be used and Java programming language from 11 to 15 August 2014.

The best learner of the group will receive a R10 000 bursary to study IT at UJ.



UJ Science Centre helps Mathematics and Science school teachers

The Faculty's Science Centre at the Soweto Campus is playing a crucial part in mathematics and science education. The Centre, which was established in 2010, will host 600 mathematics and science educators during a teacher's development workshop from 30 June – 2 July 2014.

The Soweto Science Centre is ideally poised to play an important role in nation-building efforts through the provision of innovative science theory and laboratory lessons, computer training, exhibitions stressing on aspects of everyday life and other developments relevant to South Africa. The Centre was established to open the door of knowledge for school children, teachers and the community of Soweto.

The key activities of the Science Centre include:

- Teaching theory lessons in mathematics, physical sciences, life sciences and environmental sciences
- Conducting supervised laboratory and tutorial sessions
- Teaching English for scientific communications and conducting computer training
- Organizing and participating in public talks, expo days, science days, career festivals, science beyond borders exhibitions and other science related activities.

In 2013, the Centre had a total number of 821 learners from 136 schools around Soweto and surrounding regions. A substantial number of learners exhibited considerably improved performance in various key subjects as a direct result of the sustained appropriate interventions provided by the Centre. As part of the key activities of the Centre, learners attend supervised laboratory and tutorial sessions on Friday afternoons and theory lessons on Saturdays and during school recess. The Centre also coordinates a well-structured teacher professional development programme.

The design of the year planner is based on a university model in order to introduce learners to a university culture thereby bridging the cultural gap between high school and university. The learners are also provided with the necessary learning material for each grade level.

Prof Azwinndini Muronga is Director of the Centre.



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