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TEACHING AND LEARNING

We say goodbye to one of our veterans

Looking back at 37 years of teaching: Henda Oosthuizen

As a child I always just wanted to be a teacher and that was it! After matric I attended the Potchefstroom University for Christian Higher Education to study BSc (Zoology and Botany) thinking I will become a biology teacher. The curriculum included Chemistry as a prerequisite and, just as our students today, I was terrified! The first few weeks in the Chemistry classes were quite traumatic because I could not understand anything the lecturer was saying. Fortunately a wonderful professor soon took over and he opened the world of Organic Chemistry for me, so much so that I decided to drop Botany and major in Chemistry and Zoology.

Lesson no. 1: A lecturer has a profound influence on a student. After obtaining my Honors degree, I was appointed as a Junior Lecturer Junior Lecturer at my alma mater. I was very young and quickly had to learn Lesson no. 2 – how to be in control of a class:

• Arrive on time.
• Dress appropriately.
• Know your subject matter.
• Treat the students with respect. Be friendly, but have boundaries, i.e. you are not their friend.

I thoroughly enjoyed my time in Potchefstroom. I learnt a lot from my professors who were now my colleagues. I enrolled for my Master’s in Organic Chemistry, but quickly realized that I was not a researcher at heart. However, I stuck to my guns and completed the degree. Two years after obtaining my Master’s the crisis for me was: what now?

I knew I had to do my PhD but the urge to teach was still much stronger than to do research. Fortunately for me I saw an advertisement for a lecturer at the then Technikon Witwatersrand (TWR): teaching and no research – that was for me!

In July 1986 I the TWR at the brand new Doornfontein Campus and despite the fact that Organic Chemistry was my field of study, I had to teach Physical Chemistry 2 straight away. Time for Lesson no. 3. Being a lecturer is about life-long learning – one has to adjust to whatever is required of you.

That brings me to our current situation. For the majority of our undergraduate students to be at UJ means huge sacrifices. They must experience that they get their money’s worth and therefore deserve our undivided attention and dedication – Lesson no. 4:

• Arrive on time.
• Do not even take your cell phone to class! Remember we expect theirs to be switched off.
• Be prepared for each lesson. Your love and enthusiasm for Chemistry must be so obvious that they also get excited – something that I find very difficult with today’s generation.
• Your Learning Guide and notes should be written properly, without glaring mistakes.
• Be on the look-out for reasons why a student is performing poorly. It might be that the student’s personal circumstances are such that he/she cannot perform better. One should not get involved personally – rather refer the student to PsyCad where he/she can get proper confidential guidance.
• Have sessions with your tutors and demonstrators before classes start. Make sure that they know what you expect of them – we all have different requirements.
• Pay special attention to test and examination papers as this is the only opportunity that students have to show what they have learned.

In conclusion: As lecturers we hold the students’ future in our hands. We determine their career prospects and we owe them our commitment.
COMMUNITY ENGAGEMENT

A star in our community - Mr Patrick Monama

The National Senior Certificate Diagnostic Reports (Department of Basic Education) for 2015 and 2016 have both indicated that Physical Science Grade 12 learners struggle the most with “Acids and Bases” – question 7” in Paper 2. This is shown by very low average performances of 34% in 2015 and 29% in 2016.

This poor performance is mainly due to the fact that the topic is challenging even to the teachers because it involves a great deal of experimental work which warrants intensive hands-on training. Unfortunately, most schools in rural areas and in the townships do not have laboratories, equipment and chemical reagents and, thereby, learners find it difficult to answer questions pertaining to this topic during examinations.

As part of my community engagement in ensuring a brighter future for new generation of STEM (Science, Technology, Engineering and Mathematics) professionals, I volunteer to teach Chemistry to Grade 11 and 12 in the afternoon during the week and also on Sundays. In addition, I also conduct boot camps to prepare the learners for national examinations. Furthermore, I organize visits for these learners to the UJ Doornfontein campus to perform Chemistry experiments. The project was initiated in 2016 and it might interest you to know that the school was able to achieve 100% pass rate (new milestone) for Grade 12 Physical Science at the end of last year. Currently, the school has 97 Grade 12 learners taking Physical Science. A significant increase compared to 42 learners in 2015.

In addition, I am involved in training of teachers on how to teach science – methodology including setting good quality assessment papers: an initiative driven by the Gauteng Department of Basic Education (GDE). I also coordinate and oversee (on voluntary basis) a Saturday School Program for high school learners (Grade 10-12) at the Soweto Science Centre. The Soweto Science Centre offers additional and intervention classes for mathematics and physical sciences for over 100 schools in Soweto and the surrounding areas such as Lenasia, Eldorado Park, Vaal, Orange Farm, Magale City, Ekurhuleni and Johannesburg CBD on Saturdays and also during school holidays. My involvement besides teaching chemistry to Grade 12 learners is to ensure the schools are run efficiently and proficiently.

Schools that have already benefited from the above initiative includes; Almont Technical High School (40 learners), Emdeni High School (24 learners), Windmill Park Secondary School (139 learners), Freedom Park Secondary School (62 learners), Freedom Park Secondary School (14 learners), Tetelo Secondary School (56 learners) and 22 teachers from several schools in Soweto.

My passion for teaching has lead me on this journey and I have made it a challenge to myself to ensure that the future generation achieve their goals in terms of STEM. I would like to also sincerely thank my colleagues who assist these initiatives.
Cleaning up schools in Yeoville

In partnership with Yeoville primary school the Department of Applied chemistry started a cleaning campaign, "Cleaning schools in Yeoville", and as a result recycling bins were donated to the school. The aim of this clean-up is to ensure that the schools around Yeoville have a clean and germ free environment where kids will be educated. The environment of the school does have an impact in the wellbeing of students. Making sure the students are educated in a clean environment, this will give a positive spirit within the school and learners.

When the project is completed at the Yeoville primary school, we hope to expand and assist the rest of the schools within Yeoville. We thank the Applied chemistry staff members who donated to the purchase of the recycling bins. It is envisaged that this project will continue in 2018 to other surrounding schools.

SCIENCE WEEK

The Department of Applied Chemistry were involved in various initiatives during Science Week. Mr Patrick Monama participated at the launch of National Science Week at NMMU on 5 August. Various other colleagues from the department participated during Science Week at events at SciBono, Soweto Science Centre and at various schools in Tembisa. Colleagues that participated: Ms du Plessis, Ms Oosthuizen, Dr Mabuba, Dr Malinga, Dr Moutloali, Mr Monama, Mr Dimpe, Mr Msomi, Dr Nkosi.

RESEARCH AND INNOVATION

Featured research: Natural product Drug discovery and smart materials research group

Prof. Derek Tantoh Ndinteh obtained his first degree at the University of Buea in Cameroon, majoring in chemistry and minoring in Industrial Chemistry. He later obtained two Masters Degrees in Organic Chemistry and Pharmacognosy respectively from the University of Yaoundé 1 in Cameroon. He obtained his PhD from the same University with an exchange programme involving the University of Johannesburg under the supervision of Professor ZT Fomum. He then did three years Post-doctoral research in Professor Rui Krause’s group.
He then left and worked in industry for a while as a Chromatography Mass spectrometry expert, covering sub Saharan Africa. He returned to the University of Johannesburg where he now heads the Natural product Drug discovery and smart materials research group. Some of the projects he runs involves the synthesis and biological activities of nitrogen and sulphur heterocycles, phytochemical and pharmacological studies of naturally occurring heterocycles, synthesis of stimuli-responsive and smart drug delivery systems based on biocompatible polymers.

He has obtained research grants from South African funding bodies like the National Research Foundation (NRF), Technology Innovation Agency (TIA) and European Union. He has carried out research visits to Brazil, China, Hungary, Bulgaria, France, Germany, Cameroon, Kenya, Mauritius and within South Africa. In addition he manages the chromatographic cluster of instruments in the Department of Applied Chemistry at the University of Johannesburg. These include High Pressure Liquid Chromatography, Liquid Chromatography Mass Spectrometry, Flash Chromatography, Comprehensive Gas Chromatography coupled to Time of Flight Mass spectrometry systems amongst others. Recently, he was interviewed by a Swiss/German scientific newspaper and this is what they had to say.

“The quiet rotation of a vacuum pump penetrates the room. Such a device is available in every laboratory for organic chemistry. Also in that of Derek Ndinteh at the University of Johannesburg in South Africa. The 41-year-old natural product chemist from Cameroon examines native plants in Africa. Some of their active ingredients can be used in medicine. ‘Nature is the best laboratory, I lost a cousin when we were studying together, I was very attached to her, she died of diabetes, and since that day I want to cure diabetes and I’ll make it, I’ll win the Nobel Prize, Will be the first black Nobel Prize in Chemistry.” Science has a hard time in Africa. More than half of all African countries invest less than 0.5 percent of gross domestic product in research. In Germany it is almost three per cent. Well-equipped libraries, laboratories and funds for research and teaching are not very available in Africa. Scientists often only collect data, which are then analysed and published at Western universities. At home we had nothing, nothing at all. You pay for the university. We had so-called 'Theoretical Practical Exercises’ in the study, where we were told: ‘Imagine a test tube.’ So we introduced ourselves to a test tube, ‘Imagine you’re pouring something into it ...’ That’s how it went.

Many students and scientists go to Europe or the USA to study and research. Ndinteh changed the country, but remained on the continent. ‘All of my friends have gone to the US after graduation or bachelor's degree, so I stayed in Africa and I want to prove to them that good science is possible in Africa that influences the world.” According to experts, this achievement is seldom appreciated. Meanwhile, the research is on the rise. There are excellence centers all over the continent.

Derek Ndinteh has made a virtue out of the hardship of an empty laboratory.

Cameroonian Derek Ndinteh grew up as the third of seven children in the capital, Yaoundé. As a young boy, he wanted to become a pilot, a profession that many young boys in Africa dream of. But good school notes led him to the university. Most of his siblings today also have a career in science. His father was a vibrant Christian leader chemistry professor and his great model and sponsor. Before he died, he urged his son to leave the nest and find a university where he can research. So he came to Johannesburg.

“The danger in a well-equipped laboratory is that you do not use your brain, you do not have to improvise, do not think about the corner, do not find solutions, I try to stay away from it, use sophisticated equipment, You find something new, but you did not have to worry about it. “Derek Ndinteh has made a virtue out of the hardship of an empty laboratory in Cameroon - which is now also recognized. The South African government has just given him 50,000 euros of research funding to extract two drugs from an invasive plant species for medicines. His students encourage him not to despair of the difficulties in the African research landscape.

“I would like to motivate a lot of young Africans: You can do it, I have done it in Africa, too.” I say to all of you when I am at home in Cameroon or speaking to the faculty. Derek Ndinteh has published close to fifty articles in international journals and has presented his work at many international conferences.

One of Derek’s slogans is; “Excellent science can be done from Africa, for Africa and that is relevant to the rest of the world.”
REACHING GREATER HEIGHTS

The University of Johannesburg prides itself in its association with Prof. Suprakas. Prof. Suprakas is a Chief Researcher and Director of the DST/CSIR National Centre for Nano-Structured Materials at CSIR, and a visiting professor in the department (Applied Chemistry) was featured on CNBC Africa under the topic "What nanotechnology can do for healthcare and cosmetics". He was asked to define nanotechnology and in short he said “nanotechnology is a cutting edge subject that confers unimaginable mystery that operates on a truly remarkable scale. The passion and energy of Prof. Suprakas is focused in greener processes that are environmentally friendly especially the prototype that is used to detect diabetes (healthcare) and natural products used as cosmetics. The council (CSIR) celebrates 10 years of conducting world-class research and development in the field of nanotechnology and Prof’s highlights was the development of knowledge and relevant infrastructure to carry-out research. He continued to explain nanotechnology as a technology that has potential in job creation which will provide economic freedom for South Africans and Africa at large. One of the most overlooked topic according to him was entrepreneurship, says Prof. Suprakas which is imperative to link it with research in order to better our economic status. He also encouraged and invited small medium enterprise to bring forth their technology and they (CSIR) will develop their technology and with scaling-up of promising products.

VISITING PROFESSOR'S CORNER

We would like to thank our visiting professors/researchers for their contribution to the Department. The following visiting professors/researchers gave lectures/training during their visit:

1. Prof Ramasami (University of Mauritius)
   - Theoretical study of the micro hydration of sulfur mustard
2. Prof B. Mizaikoff (Ulm University, Germany)
   - Molecular imprinted polymers: technology, applications and perspectives
   - Sensor technology based on biomimetic recognition
3. Prof Y Gogotsi (Drexel University, United States)
   - Two-Dimensional Carbides and Nitrides Expand the Flatlands
4. Prof Ashutosh Tiwari (Linkoping University, Sweden)
   - Digital healthcare – perceptions of living laboratory
5. Prof Adeyemi (Olabisi Onabanjo University, Nigeria)
   - Corrosion inhibition and adsorption properties of petiveria alliacea extract on mild steel in acid media
6. Prof Oki (Taxis, USA)
7. Dr Miloslav Klinger (Institute of Physics of the Czech Academy of Sciences Na Slovance)
8. Prof Weiss (USA)
DEPARTMENTAL HIGHLIGHTS

Promotions
- Prof Oluwafemi was promoted to FULL Professor.
- Dr. Govender, Dr. Ndinteh, Dr Nomngongo and Dr. Pillay were promoted to ASSOCIATE Professors.
- Dr. Dlamini, Dr Mabuba, Dr. Nkosi and Dr Malinga were promoted to SENIOR lecturers.

Awards
The Department of Applied Chemistry received the Faculty Department Award.
- Mr Monama received the Faculty community engagement award.
- Prof Govender received the Faculty’s best researcher award in the category of lecturer or senior lecturer.
- Prof PN Nomngongo was awarded the DST Women in Science Awards (WISA): Distinguished Young Woman Researcher in Natural and Engineering Sciences.
- Prof Nomngongo received the 2017 Vice-Chancellor’s Distinguished Award for Most Promising Young Researcher category.
- Prof Gupta (SARChI Chair) received Special Vice-Chancellor’s Award For Highest Cited Researcher.

Rating
- Prof Arotiba obtained “C1” NRF rating
- Prof Oluwafemi is now a “C3” rated researcher

Collaborations/Research visit
- Dr Richard M. Moutloali was part of the DST delegation to Egypt, where he participated in the bilateral workshop and presented aspects of his bilateral project with the National Research Center in Cairo, Egypt. The presentation was titled “Nanotechnology and Osmosis Membranes for Brackish Water Desalination”.
- The Department of Applied chemistry in collaboration with Eskom hosted the UJ-Eskom annual workshop in November 2017. During the workshop researchers from UJ and ESKOM showcased their work through presentations and this interaction strengthens our collaboration with ESKOM as our industrial partner.
- Dr Dr NW Maxakato was on a research visit in ICFO The Institute of Photonic Science, Spain (June – Sep). She was interviewed by Michele Catanzaro, a journalist from El Periodico de Catalunya (Ed.Catala) newspaper (one of the top scientific newspapers in Spain) and her interview was published by the same newspaper under the Theme “Africa Excellency” http://wwwelperiodico.com/es/ciencia/20170723/africanas-excelentes-6184722; She also featured on the ICFO newsletter under the theme “Women for Africa Foundation at ICFO: Science by Women program makes possible sabbatical stay of Dr Wendy Maxakato” https://www.icfo.eu/newsroom/news/article/3710

STUDENT CORNER
- Mrs. Denga Ramutshatsha-Makhwedzha (PhD student under the supervision of Prof Nomngongo, Prof Ndungu and Prof Ngila) won the Excellent Shotgun Communication Award in II International Caparica Conference on “Pollutant Toxic Ions and Molecules (PTIM) held on the 6-9 November 2017 in Portugal.
- Mr. Idris (PhD student under the supervision of Prof Arotiba and Dr. Mabuba) won the first prize for his oral presentation in the South African Nanotechnology Initiative (7th Annual Gauteng Nanoscience Young Researchers Symposium) held at Tshwane University of Technology on the 20th October 2017.
- Mr. Idris (PhD student under the supervision of Prof Arotiba and Dr. Mabuba) won the first prize for oral presentation in South African Chemical Institute (SACI) Gauteng Central Section Young Chemist’s Symposium, held at University of Johannesburg, APK Campus on 30th November 2017.

Mrs. Denga Ramutshatsha-Makhwedzha
GRADUATION

The Department valuable resources are its students. We would like to thank the following graduating students for their contribution towards the growth of the Department of Applied Chemistry. We wish you all the best on your future avenues and have faith that you will continue to fly the flag as an alumni of the Department of Applied Chemistry.

**PhD: Chemistry**
- Dr. Mohanned elbushra Hassan Ahamed
- Dr. William Wilson Anku
- Dr. Mokae Fanuel Bambo
- Dr. Eutilerio Felizardo Crisino Chauque
- Dr. Damodar Mosangi
- Dr. Moses Gbenga Peleyeju
- Dr. Bonani Seteni

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- Ms Mashile (MSc student under the supervision of Prof Nomngongo) won third prize for her oral presentation in South African Chemical Institute (SACI) Gauteng Central Section’s Young Chemist Symposium on Friday, held at University of Johannesburg, APK Campus on 30th November 2017.
The Department has distinguished itself as leaders in nanotechnology and water research in the country. It has memoranda of understanding with industry partners such as Johannesburg Water, the Water Research Commission and ESKOM. Most of its research funding comes from a number of sources including ESKOM, DST/Mintek NIC, the Water Research Commission, the National Research Foundation (NRF), the DST/NRF Centre of Excellence in Strong Materials, IBSA, the University Research Funding, Johannesburg Water and Bilateral agreements with external institutions.

9.1 ANALYTICAL ENVIRONMENTAL CHEMISTRY
This research group combine two disciplines for research projects. Environmental Chemistry involves the investigation of the effects of chemical compounds in nature (air, water, soil, food chains and organisms). Analytical Chemistry involves the development of analytical methods to be used to solve problems in environmental chemistry, such as environmental monitoring, studies of the quality of water and pollutants contents in effluents. Research activities in this area include sample preparation comprising of development of sample preparation strategies to improve detection limits for applications in trace analysis. In addition, analytical chemistry activities include water analysis for persistent organic pollutants, emerging pollutants, heavy metals and toxins such mycotoxin and cyanotoxins, method development for optimization of analyte detection. The analytical techniques include chromatographic coupled with different detectors (GC, LC, GC-MS and LC-MS). Analysis of inorganic contaminants mainly heavy metals and other oxyanions; chemical speciation studies of heavy metals in drinking water and wastewater from industrial effluents using electroanalytical techniques, spectrometric methods such as ICP-OES and ICP-MS.

9.2 ELECTROCHEMISTRY
Application of electrochemistry in solving water, biomedical and environmental problems. They develop analytical tools (called biosensors) that can be used for simple, low cost detection of important chemical species such as cholera toxin, urea, cholesterol, glucose, heavy metals in water, organic pollutants and so on. Their research group is the foremost in the development of DNA biosensors in South Africa and one of the top in Africa. They have recently diversified their research into the area of water treatment where they use the power of electrochemistry and light (photo electrochemistry) to degrade organic pollutants in water in a manner that is safe to the environment (green) and sustainable.

9.3 COMPUTATIONAL CHEMISTRY
The group focuses on using molecular modelling as a probing tool prior to experimental analysis. On addition, they also use their research as a post-tool to validate experimental results. Recently the group has hybridised both methodology and have been able to conduct research in areas of research such as bio-inorganic systems, biosphosphates, water chemistry, natural products and photocatalysis. Theoretical calculations are run on clusters housed at the Centre of High Performance Computing (CHPC) based in Cape Town. The main software programs include windows and unix based Gaussian 09 together with the graphical user interface like GaussView5.0, HyperChem Professional, Mercury3.0 and Chemcraft.

9.4 MEMBRANES
The group focuses on investigating nanocomposite electrospun fibers sorbents and nanocomposite membranes for removal of pollutants in contaminated drinking water and wastewater effluents. In addition, the group develop new reactive membranes embedded with materials such as dendrimers, hyperbranched polymers, bimetallic nanoparticles and enzymes. The membranes are then evaluated for the removal of various pollutants such as humic acid and chlorinated organic pollutants.

9.5 NANOMATERIALS
The group focuses on the synthesis of nanomaterials, specifically on quantum dots and their applications in various fields of biology and chemistry. The group also focuses on green synthesis of quantum dots and their applications to water purification and anti-bacterial activity.

9.6 NATURAL PRODUCT
The group focuses on the isolation and characterisation of naturally occurring bioactive compounds from African plant and marine sources using various spectroscopic techniques such as: NMR, IR , MS, UV, GC-MS, GCxGC-TOFMS, HPLC, LC-MS. The group also focuses on designing smart nano materials for drug delivery vehicles both for existing and novel bioactive moieties.

9.7 ORGANOPHOSPHORUS
The group focuses on organic syntheses of various organophosphorus compounds for biomedical applications such as targeted treatments of bone cancer. The research also investigate the incorporation of organophosphorus compounds conjugated to nano-materials and their applications in water purification technologies.

9.8 POLYMER NANOCOMPOSITES
The group focuses on the syntheses, characterization and broad phase applications of polymer nanocomposites. The group also synthesis biodegradable polymer nanocomposites for food packaging applications. Some of the research focuses on polymer-based advanced nano-structured materials and their applications in water treatment and energy devices.