

Chemistry Department Science Engagement Newsletter 2019



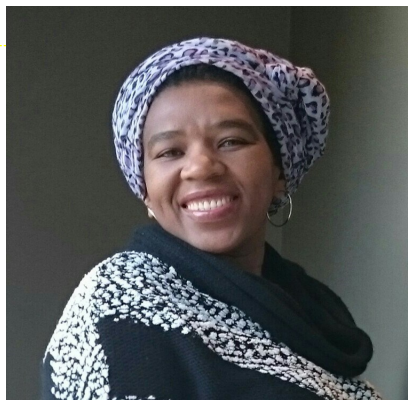
By Adeniyi Ogunlaja

Community Science
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lives

Public engagement with science, encourages people to think actively about science and understand its relevance to them in their daily lives. A key feature of a scientific process is that it results in laws and theories that must be verified by observations. Consequently, an inquiry-driven laboratory continues to be an irreplaceable element of a solid education in the sciences. In an era of increased reliance on web-based instruction, computer simulations and distance learning, it is important to appreciate the central role of laboratory practice in the education of chemists and biochemists. Our Department of Chemistry provides excellent opportunities for world-class laboratory work. Our laboratory curriculum is designed to provide hands-on training in the use of modern chemical instrumentation to reinforce and verify theoretical ideas and concepts learned in lectures, and to develop and improve students' skills in problem solving, teamwork, scientific writing and data analysis. In addition to standard general chemistry and quantitative analysis laboratories, the department offers six upper division laboratory courses designed for our majors (introductory organic, polymer, advanced organic, physical, analytical, and inorganic).

Message from the Head Of Department

Dr Buyiswa Hlangothi



To all Staff and Students, Welcome to our 1st Special Edition of Chemistry Department's Engagement Newsletter. Let me take advantage of this opportunity to thank everyone for their conscientious efforts in engaging the community of Nelson Mandela University and beyond, especially school learners. As you are aware, our success in engagement activities year after year is due to the ex-

ceptional efforts and dedication of our staff and students. I must say that all your hard work does not go unnoticed and I am very proud to be associated with this family of amazing people.

One of our goals as the Department is to actively play our part in a strive towards addressing the scientific knowledge gaps between high schools and universities. As you are aware, chemicals and general laboratory equipment are quite expensive nowadays, and many high schools are consequently unable to include practical demonstrations in their budget. This is, therefore, one of the critical gaps where I feel that our department needs to continue to make a difference by taking part in various science shows, or other related platforms, to demonstrate the power of linking theory with practical experiments. I believe that in so doing, we also cultivate a culture of learning through the application of basic scientific principles. Those who attended some of our demonstrations often spearheaded by Dr Gletwyn Rubidge and company in science shows, will agree with me that witnessing the learners' facial expressions when they see these demonstrations is priceless. Those who haven't, I hope that you will enjoy and be inspired when going through this newsletter on some of our exciting events.

Another important matter worth mentioning in this edition is that the United Nations General Assembly announced 2019 as the International Year of the Periodic Table of Chemical Elements (IYPT 2019). As the Chemistry Department, we were responsible for running a program throughout the year to highlight and reflect upon the essential aspects of the periodic table including its history. Please scroll down to read more about exciting activities and ideas which came out of this project.

The IYPT 2019 official website: <https://www.iypt2019.org/>

Forward by Gletwyn Rubidge

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2019 has been a significant year for science - it was proclaimed by UNESCO as the *International Year of the Periodic Table* and *The International Year of Indigenous Languages*.

It is important and in any production process to have a stable supply of quality raw material and education is no different. Unfortunately, in the past two decades there has been a decline in the number of scholars selecting science in the upper school grades. In addition, the weak general school education coupled with a weak economy has impacted the intake numbers for chemistry courses. One of the drives to strengthen our community engagement footprint was to increase our reach into schools and the public with the end goal of rekindling a passion for science, and in particular, chemistry.

The Chemistry Department was active in engagement this year both in school outreach events as well as in industrial engagement.

This year the Department has seen expansion of activities compared to former years with successful collaborations between the Education Department of the university and the Eastern Cape Education Department as well as the Eskom Expo. The *Science to Schools* project has also received some funding from industry and non-profit organizations marking a step toward greater sustainability.

A key to success in industrial and community engagement is dedicated staff and students, and in the Chemistry Department we are fortunate to have enthusiastic teams driving the engagement thrust; the Department is grateful for the contributions from academics, technical and administrative staff and students. Here follows a report of the chief engagement activities, so read on to learn what the Chemistry Department has been doing over the last year.

Chemistry Engagement Activities 2019

2019 has been as busy year with respect to chemistry engagement activities. The chief activities were in the form of chemistry demonstrations or chemistry shows for scholars. 2019 was pronounced “The International Year of the Periodic Table” by UNESCO, hence there was considerable focus on specific elements. The national science week was a particularly active period for the Chemistry Department – the various events hosted are summarised in the table below. The initial plan was to travel to Cala and do demonstrations and shows there but administrative problems prevented this excursion, however the Chemistry events still reached over 1600 scholars through various activities. The final event for the year was a teacher training workshop held on 14 and 15 November where 21 school teachers from junior schools learned practical skills to enable them to perform chemistry demonstrations for their scholars. The Chemistry Department wishes to thank Heraeus, Do4SA, and SAEON the Department of Education Eastern Cape for their support in taking science to schools.

Activities that took place in 2019

Activity	Proposed Date	Responsible persons
1. Public lecture by Dr R. Betz Title: The Periodic Table of the Elements – Where from? Where at? Where to?	29 May 2019 (NMU, Building 127 Auditorium, 13:00-14:00)	Mr Nehemiah Latolla, Ms Zimkitha Dyan, Ms Anita Noah, Dr Buyiswa Hlangothi, Prof Zeni Tshentu and Dr Richard Betz
2. Chemistry Demonstrations and naming exercise (Western Suburbs schools)	12 June 2019 (NMU, 35:01:01, 14:00-16:00)	Mr J. Austin, Mr N. Latolla, Dr R. Betz, Dr G. Rubidge, Ms A. Noah, Dr Z. Kondowe, Dr B. Hlangothi, Mr A. Klaas, Ms Y. Sonqishe, Dr M. Phiri, and Prof. Z. Tshentu
3. EXTRA Papenkuils Primary Show	PP School hall, 100 children, 10:30-12:30	GR
4. Chemistry Demonstrations and naming exercise (Motherwell Schools)	18 July 2019 (Raymond Mhlaba center, 12:00-14:00)	Mr M. Swartbooi, Mr N. Latolla, Dr R. Betz, Dr G. Rubidge, Ms A. Noah, Dr Z. Kondowe, Dr B. Hlangothi, Mr A. Klaas, Ms Y. Sonqishe, Dr M. Phiri, and Prof. Z. Tshentu
5. Chemistry Demonstrations and naming exercise (NMU Students and Staff)	Proposed date: 3 October	Mr N. Latolla, Dr R. Betz, Dr G. Rubidge, Ms A. Noah, Dr Z. Kondowe, Dr B. Hlangothi, Mr A. Klaas, Ms Y. Sonqishe, Dr M. Phiri, Mrs Kina Muller and Prof. Z. Tshentu
6. Chemistry Demonstrations and naming exercise (Cala)	Canceled	Dr Rubidge, Mr Nehemiah Latolla, and other
7. Chemistry show for Expo Event Diaz Primary	25 July 11:30-12:30	Dr Rubidge and ISTs
8. Chemistry Demonstration – Expert Minds (Walmer)	26 July 8:30-9:30	Dr Rubidge & Son
9. Chemistry Stall and Show Walmer High	29 July 9:00 – 12:00	Dr Rubidge, T Swartbooi, Ocean Sciences Staff

Chemistry Engagement Activities 2019...

Activity	Proposed Date	Responsible persons
10. Public lecture by Dr M. Weigt. Title: The creation of the elements of the periodic table in stars.	NSW, 1 August 2019, (NMU, Building 127 Auditorium, 13:00-14:00)	Dr G. Rubidge, Dr R. Betz, Mr Nehemiah Latolla, Ms Zimkitha Dyan, Dr Buyiswa Hlangothi, Prof Zeni Tshentu and Dr Martin Weigt.
11. Chemistry Demonstrations and naming exercise (NMB Science and Technology Centre)	NSW, 2 August 2019, NMB Science and Technology Centre in Uitenhage (10:00-12:00)	Mrs Singathwa Kuli, Mr N. Latolla, Dr R. Betz, Dr G. Rubidge, L Waka, K Govender, Ms A. Noah, Dr Z. Kondowe, Dr B. Hlangothi, Mr A. Klaas, Ms Y. Songqishe, Dr M. Phiri, Mrs Kina Muller and Prof. Z. Tshentu
12. Eskom Expo – Juniors chem show and possibly naming	6 Aug Missionvale Sports center ~12:00	Dr G Rubidge, K Govender, L Waka
13. Eskom Expo – Seniors chem show and possibly naming	7 Aug Missionvale Sports center ~12:00	Dr G Rubidge, K Govender, L Waka
14. STEM group visit North Campus labs A219	10 Sept 14:00 A219	Dr G Rubidge, K Govender, L Waka
15. Northern Areas Schools visit to NC labs Chem Show and Naming (Cedric Frank)	16 September, A219 11:00	Dr G Rubidge, K Govender, L Waka
16. Public lecture on “A journey on naming of chemical elements in indigenous languages” at NMU	9 September 2019, NMU, Council Chambers, Main Building, (13:00-14:00)	Mr N. Latolla, Dr R. Betz, Dr G. Rubidge, Ms A. Noah, Dr Z. Kondowe, Dr B. Hlangothi, Mr A. Klaas, Ms Y. Songqishe, Dr M. Phiri, Mrs Kina Muller and Prof. Z. Tshentu
17. Grey Grade 4 Science show	25 October, Grey Junior Hall	Prof B Barton, G Rubidge, assistants, L Waka, Ulrich,
18. Teacher training - chemistry demonstrations for scholars (Richman Festile)	Proposed date: Nov(2019) during exam time at N Campus A219	Dr G Rubidge, K Govender, L Waka



Sound travels faster in helium applying this concept the scholars made amusing voice changes



Hydrogen combustion – it's clean forming only water

High School Experiments



Electrically induced strontium emission



Electrically induced strontium emission



Introducing the gas laws using liquid nitrogen



Two Expert Minds scholars freezing bubbles

Grey School Engagement

Left: A Grey boy volunteers to assist with a reaction

Right: The blue bottle experiment



Left: Combustion of CS_2 and N_2O – the barking dog reaction

Bottom: Grey Grade 4 – Prof Barton introduces the periodic table



Teacher training workshop

Below are a few pictures taken at the teacher training workshop was held on at North Campus in November by Dr Rubidge in conjunction with Richman Festile who is a Senior Education Specialist for *Natural Science and Technology* at the Eastern Cape Department of Education.



Left Image: Dr Gletwyn teaching safety aspects of practical chemistry .

Bottom Image: Converting latex liquid into a bouncing ball .



Top Image: A teacher learning to demonstrate the principle of the internal combustion engine.

Climax reaction-video link

Copy and Paste this link onto your browser: shorturl.at/coqtC

OR

<https://www.dropbox.com/s/dl9gk2edrtgpzlp/VID-20190802-WA0003%20%284%29.mp4?dl=0>

Uitenhage Science School Engagement

Right Image: Nehemiah Latolla talks to scholars about the relevance of chemistry



Bottom Image: Nehemiah Latolla assists scholars in a trial IsiXhosa element naming exercise



Top Image: Dr Rubidge pointing out that all humans in the venue typically consist of 65% oxygen and 18% carbon

Uitenhage Science School Experiments



Left Image: Keshlin Govender and Dr Rubidge preparing a demonstration for scholars at the Nelson Mandela Bay Science and Technology Centre

Right Image: Dr Mohau Phiri assists Dr Rubidge in guiding a scholar in performing a reaction.



Left Image: Dr Rubidge discusses the influence of oxygen concentration on the rate of combustion of magnesium

Motherwell Science School Engagement

Top Right Image: Drs Hlanghoti, Rubidge and Phiri prepare to introduce the periodic table to scholars in Motherwell.



Left Image: Dr Hlanghoti opens the event with a discussion of the relevance of chemistry to our modern lifestyle.

Bottom Right Image: Scholars line up for some refreshments - gratitude to Asif Mohammed of Do4SA for donating the refreshments.



"Big Bang Theory" Lecture



Dr Martin Weigt (Maths & Applied Maths) gave a presentation of how the elements of the Periodic Table played a part in the creation of stars and the effect they have had on the "Big Bang Theory". This was another interesting look at the Periodic Table because Dr Weigt is not a Chemist but a Mathematician, this spoke volumes on the versatility of the Periodic Table. This event took place on the 1st of August at the New Science Building's Auditorium.

History-the present and the future of the Periodic Table

Dr Richard Betz took the audience through the history, the present and the future of the Periodic Table. The lecture started off with him giving a brief history of the Periodic Table from its inception, to the alterations and some of the opposing views it had over the years. This was presented through a slideshow with illustrations of the actual periodic table and its changes. His lecture was followed by a Q & A session. The event took place on the 29th of May at the New Science Building Auditorium, South Campus.

Collegiate School Science Engagement

The Chemistry Department hosted approximately 100 Grade 4 girls from Collegiate in June 2019. Prof Barton offered them the famous Chemistry Unplugged lecture, the brainchild of Prof McClelland. Mr Marchand and Mr Bashman, totally instrumental for this demonstration, very ably wowed the girls with explosions, colours, polymers, volcanoes, smells, dyes, fluorescence, and much more. This event has become somewhat of an annual one, and we expect to do very much the same in 2020!



Top Image: Mr Marchand in the process of making a silver mirror using silver nitrate, next to him is Mr Bashman and Prof Barton.

Bottom Image: The Collegiate girls were enthralled by the power of Chemistry!

INNOVATIVE WAYS OF RE-USING FOOD WASTE

SAAFost (South African Association for Food Science & Technology) approached Dr Nicole Vorster earlier in the year to be a speaker at one of the seminars of the PE branch held on the 31st May 2019. Nicole gave a talk entitled: INNOVATIVE WAYS OF RE-USING FOOD WASTE. She based it on some of her applied research on extracting bioactives from food waste to be used in the cosmetic and health industries. The event was well attended by members of SAAFost from around the Eastern Cape and she received very positive comments from the attendees who said that her talk was very interesting and they learned something new. It was held at Innovention and Nicole took the members on a tour of Innovention's facilities afterwards.

Top image: Nicole presenting her talk in the Seminar Room at Innovention



Bottom Image: Nicole showing the delegates the Formulation Lab at Innovention

Women in Science talk in Uitenhage

Dr Pulleng Moleko-Boyce is a postdoctoral research fellow in Chemistry Department. She was invited as a guest speaker by the Nelson Mandela Bay Science and Technology Centre (NMBST) to partake in the “Women in Science: Role modelling” lecture. The event was on the 31st of July 2019 in Uitenhage.



“The women in science event was a strategically planned programme to build enthusiasm and a passion for science, technology, engineering, mathematics (STEM) and innovation through fun and interactive engagement with learners. Learners ranging from grade 6 to grade 12 that were present, were given an opportunity to explore, experience and learn about STEM in an interactive and exciting way”

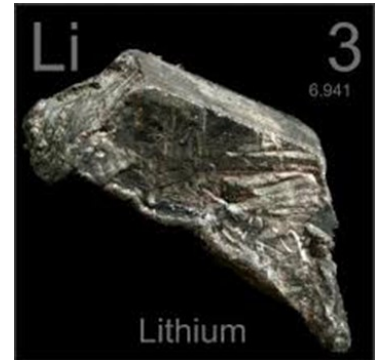
Some side photos

Right image: Dr Rubidge discussing the importance of science, chemistry in particular, to high school students.



Left image: Harold Marchant and Prof Benita Barton supporting a polyurethane foam reaction for the grade fours.

2019 was known as the year of the Periodic Table with a number of presentations and initiatives within the department that highlighted its importance within society and the historical development towards the final layout as we know. There are obviously a number elements that had attracted a fair amount of attention in terms of their significance and contribution to the furthering of technology and their benefit to mankind. The one element that attracted a fair amount of attention this year would be the element lithium (Li). It is number three on the periodic table and a rather light-weight in its class. It has come into the spotlight with the announcement of the Nobel Prize for Chemistry in 2019 to John Goodenough, Stanley Whittingham and Akira Yoshimo for their contribution towards the development of the Li-ion battery. Lithium has many uses in the field of alloys, glass manufacturing and even in medicine where it is used to treat mental disorders.



In 2019 the uYilo group at the NMU continued to give support to the emerging South African EV market in terms of policy development, technology demonstration and funding small scale EV related projects. Besides the continued collaboration with Nissan South Africa in evaluating their passenger vehicle “Leaf”, the group are involved in a number of demonstration projects. This includes the electrification of the All-Terrain Vehicles (ATV) that is used by the campus horticulture department. Another demonstration was the launch of the electrification of a Tuk-Tuk that is currently being used by the Mandela Bay Development Agency (MBDA). Further details of the story can be read on the news block news.co.za/article/mandela-bay-development-agency-electrifies-local-service-delivery and details of other related EV projects and initiatives by the uYilo group can be found on their web page uyilo.org.za/



During the year, the uYilo group was privileged to have the Minister of Higher Education, Blade Nzimande and the Director General Dr Phil Mjwara from the Department of Science and Innovation (DSI) visiting the NMU to acknowledge the work and to meet the students and their research activity. This allowed the group to receive national recognition for the work they are doing and to recognize the support given by the eNtsa engagement unit of the University for its role in small business and industry development.

Image: Minister of Higher Education, Blade Nzimande and some uYilo staff members.



uYilo again hosted another successful “Batteries and Electric Vehicles Conference 2019” that was held from the 31st of October to the 1st of November. There were a number of local and international speakers that highlighted the technological paradigm shift that many are experiencing in terms of introducing EVs into society. This is not only in terms of the distances a vehicle can travel before re-charging, but also in terms of electrical and charge point requirements, the safety aspects of a high voltage pack and the introduction of autonomous vehicle systems. As part of this development, the importance of developing a local footprint of Li-ion battery know-how and its manufacturing capabilities was highlighted. This includes the effects of having to eventually recycle such a large battery pack in order to ensure the full impact of a circular economy of the particular technology.



Computing and Data Science Forum

Data analysis has become a pivotal tool in all areas of chemistry to gain insight and evaluate performance in order to make informed decisions. Raw data is often unwieldy and has to be processed and visualized. Chemists can choose among a plethora of indicators such as greenness or costs to judge aspects of their chemical processes. Many different applications of data science in process chemistry have been reported in order to judge aspects of chemical processes, ranging from process mass intensity (PMI) prediction, process greenness evaluation, process safety evaluation, scoring of potential regulatory starting materials, definition of a good manufacturing process, and evaluation of the entire process based on a score.

It is envisaged that discussions from the Computing and Data Science Forum would guide the Faculty Teaching and Learning Committee (FTLC) in the development of scientific computing curriculum.

A computing tool that offers complete suite of tools for analytical, physical, organic, and inorganic chemistry, including high-powered data analysis, interactive visualization and automatic reporting all in one system is currently being envisaged for the department and Faculty as a whole.



Participants at the recently held computational and data science forum held on the 18th September 2019

Data analysis tools such as MATLAB and WOLFRAM have been suggested as tools to be considered for chemistry;

MATLAB: https://www.mathworks.com/academia/courseware/teaching-chemistry-with-matlab.html?s_tid=srchtitle

WOLFRAM: <https://www.wolfram.com/solutions/industry/chemistry/>

Computing and Data Science Forum

Computing and data sciences forum (conveyed by Dr Adeniyi Ogunlaja and chaired by Prof Muronga) is aimed at bringing together stakeholders such as academics, students, and IT specialists together to share the experiences in computational sciences – challenges and best practices. The forum will be able to contribute to published research articles and also advise Faculty Teaching and Learning Committee (FTLC) - computing sciences curricula (scientific computing and data science). Other core discussion would be to;

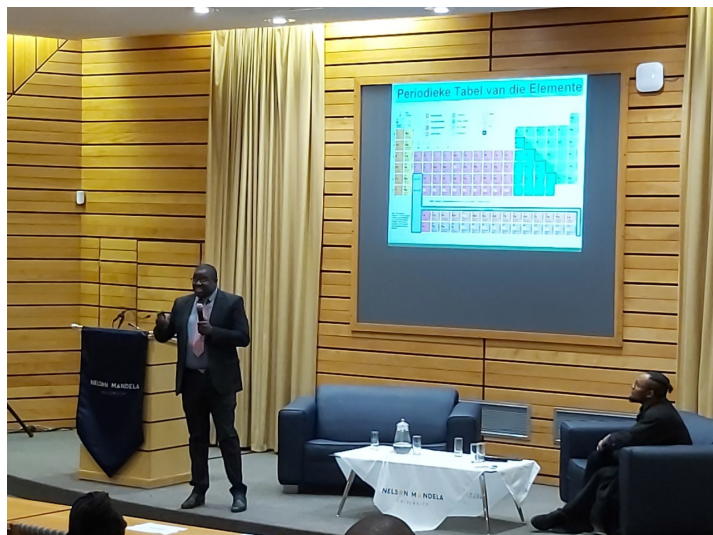
- Determine impact of computing and data science on the current curriculum and postgraduate training;
- Identify open source for computing and data storage- program whose source code is made available for use and are freely available (program database);
- Solve computing problems;
- Discuss opportunities of training postgraduate students in research;
- Provide platforms for sharing research ideas and computing tools (both interdisciplinary and transdisciplinary related) such as hardware and software sharing, easy to use visualization tools, new computational ways of presenting data.



“Computational and data science forum will be dedicated to providing discussion of all things related to science computing with the highest degree of integrity and respectability. It is a free, safe and conducive space that the faculty is creating to share computing ideas. It will be a platform to share ideas about current and advanced tools for solving complex scientific problems.”

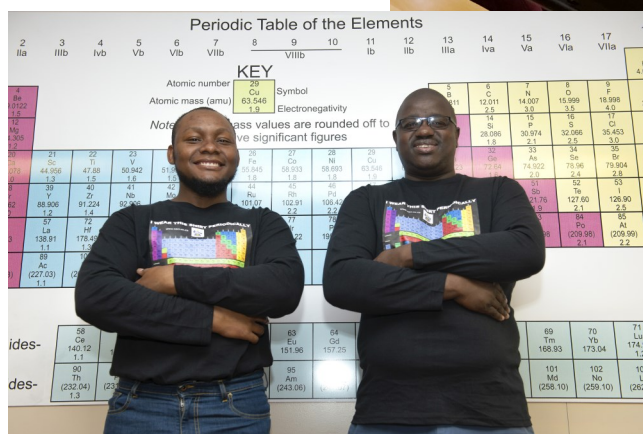
Renaming of the Periodic Table of the Elements into isiXhosa and Afrikaans

Compelled by the 150th anniversary of the Periodic Table of the Elements and the International Year of Indigenous Languages, the Department of Chemistry embarked on a journey of renaming these elements in the indigenous languages. This was done to meet the students where he or she is and produces innovative thinking around the humanising pedagogy and science.



Centering the journey around the anchors of naming the elements in isiXhosa and Afrikaans as these are the Eastern Cape indigenous language. When looking at the Periodic Table of Elements in Afrikaans and isiXhosa, at first glance the former appears to be completely translated while the latter would reveal little to no work done. However, we want to problematise and probe the direct translation that is largely

apparent in the Afrikaans names of the elements. The team hopes to achieve this through engaging the university and wider community to produce contextualised names for these elements.



The team includes Nehemiah Latolla, Richard Betz, Gletwyn Rubidge, Mohau Phiri, Anita Noah, Zandile Kondowe, Buyiswa Hlangothi and Zenixole Tshentu.

In conclusion, 2019 has been a productive year in which there has been considerable promotion of the periodic table and specific reactions of key elements. Staff, students, teachers and scholars all had opportunities to learn from this initiative. As part of the drive to promote the periodic table, selected sessions were held in which scholars were asked to suggest indigenous names for elements with the chief focus on isiXhosa. A few trial sessions were tested and scholars engaged enthusiastically in the naming process. This naming project will continue into 2020 once the department has obtained ethical clearance to perform a formal study in the naming exercise. In 2020 the department will extend the work on chemical education through expansion and formalization the teacher training program. Additionally, the sustainability of engagement will be addressed through collaborations with the Education Department of the University, and though seeking external funding.

-Dr G. Rubidge

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