

| TEBELLO NYOKONG |

TOP THREE AWARDS

- Lifetime Achievement Award from the National Research Foundation, 2013
- South African Chemical Institute Gold Medal, 2012
- A-rating from the NRF, 2013

DEFINING MOMENT

When she received equipment from the National Laser Centre on a long-term loan to allow her to do key research.

WHAT PEOPLE DO NOT KNOW

She enjoys having fun and a good laugh, and that everything isn't just hard work to her.



SUCCESS IS THE ONLY OPTION

Anything is possible, including succeeding against all odds. In fact, not doing so is simply not worth considering.

Armed with this attitude Tebello Nyokong has tenaciously tackled her career as a leading chemist specialising in nanotechnology and cancer research. She is the Department of Science and Technology – National Research Foundation (DST-NRF) Professor of Medicinal Chemistry and Nanotechnology and Distinguished Professor of Chemistry at Rhodes University's Department of Chemistry, and also Director of the DST/Mintek Nanotechnology Innovation Centre Sensors.

The work of this A-rated researcher has been recognised widely. In 2015, she was also called upon by the Secretary-General of the United Nations, Ban Ki-moon, to serve on his high-level panel to investigate a technology bank for least-developed countries.

It's with a decisiveness that anything is possible through science and nanotechnology in particular, that she keeps on exploring how nanotechnology can help fight cancer and even be used to restore cultural artefacts.

Early on in Nyokong's career, she quite deliberately decided to become a role model to others by working hard – and succeeding.

"Not being successful was never an option," says this eldest of three siblings. "I was representing generations to come. If I had failed, it would not be good for all of us."

Nyokong was born on 20 October 1951 in Lesotho's capital, Maseru. Her South African father worked in the building industry, while her mother from Lesotho was a homemaker.

Her parents held a good education in high regard. In fact, her father, who passed away while she was still studying towards her undergraduate degree, firmly believed it would one day lead to the end of apartheid.

"Don't ever stop," she fondly remembers her father's constant words of support. "He used to say that he doesn't care what I do, but that I had to be more educated than he was, and therefore at least pass Standard 6 (Grade 8)."

"I was brought up with the discipline of hard work," she reminisces about growing up in rural South Africa and Lesotho. As an aside, she adds: "I think the discipline necessary in the school system is no longer there."

Colleagues admire her grit and ability to solve challenging problems. Nyokong has always thrived on challenges, ever since she decided to change her high-school subjects from the arts to the sciences subjects. Some serious catch-up was called for to get to know the new study material in time to matriculate successfully. "The sciences challenged me," she remembers the influence of her change of course. "It was exactly where I had to be."

Years later, she wrote a letter back from the present to her 18-year old self. It highlighted that potential stumbling blocks such as poverty and the expectations of peers and society should never stand in the way of a person's dreams.

"But you are different. You have an independent mind. You believe you can be a wife and a mother and still be a breadwinner and contribute to society. And you will," reads the letter that was first published in 2011 by the American Science Club for Girls.

Teachers were a source of inspiration during those high-school years. The infectious enthusiasm of a young American teacher, a Dr Gray, for instance, persuaded Nyokong to study chemistry. "It wasn't that I knew what I was going to do with chemistry. In fact, I had no idea, no career guidance whatsoever. I just kept doing it, I just enjoyed doing it."

Therefore scholarships to study medicine or dentistry in Russia or Nigeria were passed up in favour of one from the Lesotho government to study chemistry. "People probably thought I was mad," she chuckles like one who has since proved her detractors wrong in more than one way.

In 1977, she received a BSc in chemistry and biology with a concurrent certificate in education from the University of Lesotho. In 1981, she completed the MSc at McMaster University in Ontario, which was followed in 1987 with a PhD in chemistry from the University of Western Ontario. Her postgraduate studies were funded by the Canadian International Development Agency (CIDA). In 1990, she also received a Fulbright Fellowship to conduct postdoctoral research in the Radiation Laboratory of the University of Notre Dame in the United States.

USING DYE TO CURE CANCER

By 2015, she had already published more than 530 scientific papers, and is renowned worldwide for her work to perfect so-called photo-dynamic therapy. It could potentially be an alternative to chemotherapy, without most of the side effects that this cancer treatment holds.

Together with her students and collaborators she makes molecules called phthalocyanines that can target cancer cells. These molecules are the same as the dyes that give the typical blue colour to a pair of jeans. Researchers recognised the possible medical and pharmaceutical value of these molecules after discovering that they shared the same structure as molecules found in blood. The dye molecules are inert and harmless by themselves, but can be activated when exposed to a red laser beam.

The bureaucracy involved in among others running drug tests on humans has torpedoed Nyokong's dream of ever seeing her lab work being translated into real help for cancer patients. However, work on the technique continues, in the hope that a technology transfer company will one day see this take off.

This Adjunct Professor of chemistry at the University of Tromsø in Norway counts scientists from Japan, the UK, Germany, the US, Belgium, Canada, Russia, Switzerland, Romania, China and France among her collaborators. She regularly works with the CSIR's Biophotonics Group, Mintek and local academics from among others the University of Johannesburg (UJ).

Together with a Romanian colleague she recently started dabbling with these techniques to help restore old books and artefacts. So far they have developed an ultrathin layer to cover ancient pages, and in the process preserve them by halting their typical yellow discoloration.

"One never knows, perhaps it could be the saving grace of Timbuktu," is the hope.

Nyokong was introduced to the topic of photo-dynamic therapy while studying in Canada, and still collaborates with colleagues there.

Although she enjoyed the science and work she was exposed to, she describes her Canadian years as "a character-building experience".

"Being in Canada made me, actually," she stresses. It challenged and drained her, more so because she initially had to leave her two young children behind. "Support of an extended family was wonderful, but it doesn't remove the heart of the mother," she said in one of many documentaries about her life. She also experienced first-hand how her continent was "patronised and put down". This has made her fiercely patriotic ever since. In a documentary on South African icons in 2014, she admits with her typical dry wit that she might have been quite something to get used to by the Canadians too. "To see a little black African woman say that, 'Ja, ja, I know chemistry, and I love it,' was to them quite a cultural shock."

Upon returning to the continent, she first lectured at the University of Lesotho. Her passion for research led her to Rhodes University's Department of Chemistry in 1992. Here she, together with others, supported maths and science clubs at local schools, and helped to provide them with laboratory equipment that was no longer used at the university.

At the time not many African academics had yet found their place in local academic institutions, and she initially struggled to be accepted by colleagues outside the lecture theatres as well.

"If I have to give a title to my biography one day, it will be *Living between Two Worlds*," Nyokong admits. "I did not belong to the black or the white community."

Her tenacity paid off. In 1998, she became an Associate Professor of physical-inorganic chemistry, with a full professorship following in 2001 and her research chair in 2007. Now she is a Fellow of the African Academy of Sciences, the Royal Society of Chemistry, The World Academy of Sciences (TWAS), the Royal Society of South Africa, as well as the Academy of Science of South Africa.

A turning point in her career came when she received equipment from the National Laser Centre (NLC) in 2002.

Nyokong still remembers the late evening phone call from an administrator requesting a proposal for equipment by the following morning. Pronto. She burnt the midnight oil and submitted the proposal – and received R3 million worth of equipment on a long-term loan.

“It has since made everything possible,” she recognises.

NEW AFRICAN WOMAN

Nyokong was inducted into Lesotho's Hall of Fame in 2010. In 2006, the *Financial Mail* included her on their list of top-100 influential people in South Africa, and in 2012, she made it onto *IT News Africa's* list of Africa's ten most influential women in science and technology. She's one of 12 people “who

will change the world” according to the National Centre for Research on Human Evolution in Burgos.

This fierce advocate for women scientists knows the difficulties that a career in research can entail. It's therefore recognitions she received based purely on her science, rather than on her gender, that she values most.

As she nears retirement age, it's towards her students that Nyokong focuses her efforts all the more. “I am perhaps sometimes too passionately involved with my students,” comes the admission.

By 2015, 40 PhD students had already come out of her fold, as well as 28 MSc students, 23 postdoctoral fellows and numerous Honours students.

“To have a PhD makes you a leader, and you have to be ready for it,” Nyokong believes. “The country needs leaders, not people who cannot think and are not disciplined.”

That's why she embraces visits to her laboratory by collaborators and dignitaries such as the Minister of Science and Technology or the Public Protector. These visits become opportunities through which she can groom and shape her students into researchers who are able to talk about their work to all and sundry. She holds the ability to communicate science in high regard, and as integral to the making of a successful researcher.

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[Online] Available at: DOI <http://dx.doi.org/10.17159/assaf.2016/0012>

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