



Email: enquiries@nstf.org.za | Tel: +27 12 841 3987



National Science and
Technology Forum

Media Release

S.E.T. for socio-economic growth

Welcome the entrepreneur researchers

Career paths for researchers – where to in a changing world?

#careers #researchers #graduates #PhD #students

The movie begins. You see a person in a white coat in a laboratory, peering at complicated machinery. The idea of a researcher, living and working behind closed doors away, is so ingrained that it's a Hollywood stereotype. But (suspenseful pause here) the world has changed and these stereotypes are breaking apart.

There is no longer a standard career path for researchers. Disciplines are overlapping, convergence is occurring, and solutions are viewed holistically. New fields of work are also emerging.

So, what is research now? What is available for researchers? To investigate these questions, the [National Science and Technology Forum](#) (NSTF) held an NSTF Discussion Forum from 2-3 December 2019 in Gauteng. The topic was '[Career paths for researchers – where to in a changing world?](#)'

The NSTF provides neutral collaborative platforms where issues and sectors meet

- One of the National Science and Technology Forum (NSTF) functions is to hold [discussion forums](#), bringing the private and public sector together to address important issues and engage with government policy.
- Feedback from these [discussion forums](#) is given to stakeholders
- Recommendations are put forward to government as part of the [SET community's](#) (science, engineering and technology) efforts to make input into SET-related policies and implementation.

Move to complexity and broad science

Change is a constant, says Dr Lucienne Abrahams, Director and Senior Lecturer: Learning Information Networking Knowledge (LINK) Centre, University of the Witwatersrand (Wits). She spoke on '[The 21st century research enterprise and research skills](#)'. She says that technology and digital issues are only part of what has changed the landscape for researchers.

What *has* changed significantly is that researchers need to know broad science. Abrahams says it's not just about focusing on one's own field or niche. This move from linearity to complexity needs to be embraced. She sees 21st century science as the evolution of knowledge.

Identity and participation dictates research direction

As scientific and technology endeavours expand out of old silos, research needs to reflect this. It's especially true around inclusion and exclusion within research and its outputs. Producing the 21st century scientist moves beyond strengthening and improving the teacher base. Abrahams notes that attention needs to be paid to developing more women in science.

Ms Ndoni Mcunu, CEO of Black Women in Science, spoke on '[Issues of identity](#)'. (Working in Applied Environmental Science, she is currently a PhD candidate at Wits.) Global and local statistics show that women are still in the minority when it comes to pursuing PhDs.

Pointedly, Mcunu asks: 'Who is telling the narrative if females aren't there?' A diverse population of researchers produces diverse research – different backgrounds, histories, and experiences change how we view and solve a problem.

What does it take to be a scientist?

Mcunu says that when South African women scientists were asked what skills they need, the top five themes were:

- Business development
- Social and time management
- Scientific writing
- Grant writing
- Public speaking

Research skills were listed below these priorities.

What does SA expect from its researchers?

Mr Mmboneni Muofhe, Deputy Director-General: Technology Innovation, Department of Science and Innovation, pointed to a number of areas when speaking on [SA's expectations of its researchers](#):

- Research needs to be relevant, particularly from a funding point of view.
- There needs to be inclusivity and transformation in the research community.
- Excellence is not negotiable. Research needs to be objective and not determined by which government is in place.

Scope of NRF funding

So how does that translate into funding? Dr Mbulelo Ncango, Director: Human and Infrastructure Capacity Development, National Research Foundation (NRF), presented on '[NRF's support of postgraduate students and postdoctoral fellows](#)'.

Part of the NRF's Transformation Framework is changing the equity profiles for postgraduate students and researchers. Bursary allocations will be looking at: need; continuity (ie uninterrupted funding); representation in terms of race, gender, disability and nationality; retaining exceptional academic achievers to doctoral level; and prioritising full-time studies.

Other focus areas include encouraging students to get their PhDs at a younger age and predominantly choosing fields and disciplines that align with national priorities.

The NRF now matches its postgraduate funding with comparable funding and scholarships from organisations such as the CSIR (Council for Scientific and Industrial Research) and the South African Medical Research Council. However, the increase in targeted NRF funding does mean significantly less students will be funded compared to previous years. For more on NRF funding opportunities, go to <https://nrfs submission.nrf.ac.za>.

Institutional perspectives – considering systems

With all the changes occurring, including increasing multi-disciplinary research, there needs to be institutional change and collaborations across organisations and sectors of the economy and society.

A useful model of innovation and collaboration is the 'Triple Helix'. This can be understood as the dynamics of the relationships between three core groups, namely government (public sector), industry, and academia. However, there can be more than three, including civil society, the media, and the environment. The aim is to foster economic and social development.

Using the systems thinking approach

Mr Bernd Oellerman, Director: Regional Industrial Development, The Department of Trade and Industry (the dti) presented on '[What does a systems approach tell us about TH collaboration?](#)'. He says there is confusion around defining a system and he positions it as: "A group or combination of interrelated, interdependent, or interacting elements or components forming a collective and complex whole, that share a common purpose and which work together in a certain way." Systems Theory is "about the whole and the parts and their relationships", explains Oellerman.

'[Introduction to Systems Thinking](#)' by Daniel Aronson helps to make this even clearer. Where traditionally analysis breaks a concept into parts to be studied, systems thinking "focuses on how the thing being studied interacts with the other constituents of the system".

"This means that instead of isolating smaller and smaller parts of the system being studied, systems thinking works by expanding its view to take into account larger and larger numbers of interactions as an issue is being studied. This results in sometimes strikingly different conclusions than those generated by traditional forms of analysis, especially when what is being studied is dynamically complex or has a great deal of feedback from other sources, internal or external."

The intermediary

Oellerman says that South Africa and many other countries don't yet grasp the nature of a complex and collective whole. Further challenges include entities focusing on differences and individual agendas rather than commonalities.

Part of the reason why systems fail is that we don't recognise what each component does and there isn't a shared purpose and aim. Oellerman says we need to spend

About the Triple Helix Association

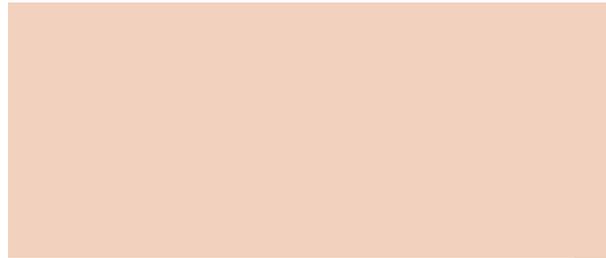
The Triple Helix Association (THA) is an international not-for-profit, non-governmental association with scientific purpose and a global reach. The THA aims to advance scientific knowledge and operational capacity to ignite and manage University-Industry-Government interactions (Triple Helix) to foster research, innovation, entrepreneurship, and regional sustainable development.

See the [presentation](#) by Ms Maria Laura Fornaci, Executive Director: THA. See also the [presentation](#) around considering a THA Chapter in SA with the NSTF.

What do regulating bodies do?

Ms Jessica Grobler, Registrations Manager: SA Council for Natural Scientific Professions (SACNASP) presented on: '[Multi-disciplinarity in Science as we enter the Fourth Industrial Revolution](#)'. From clearly defined disciplines, the boundaries are now blurred. This drives an ongoing question as to where everyone fits? How does one register scientists when lines are so blurred and the current fields of practice don't reflect the reality of work? What does that mean for regulating professionals?

more time aligning and understanding people, and understand we are part of a greater system. He recommends intermediaries that pull all of this together, and can translate your work to others.



Another system perspective

Dr Mthandeni Langa who works in Computational Intelligence at the University of Johannesburg (UJ) has developed an [Integrative Framework for Adaptive Industrial Systems Optimisation](#). This provides another perspective on how different agents can work together to solve a problem.

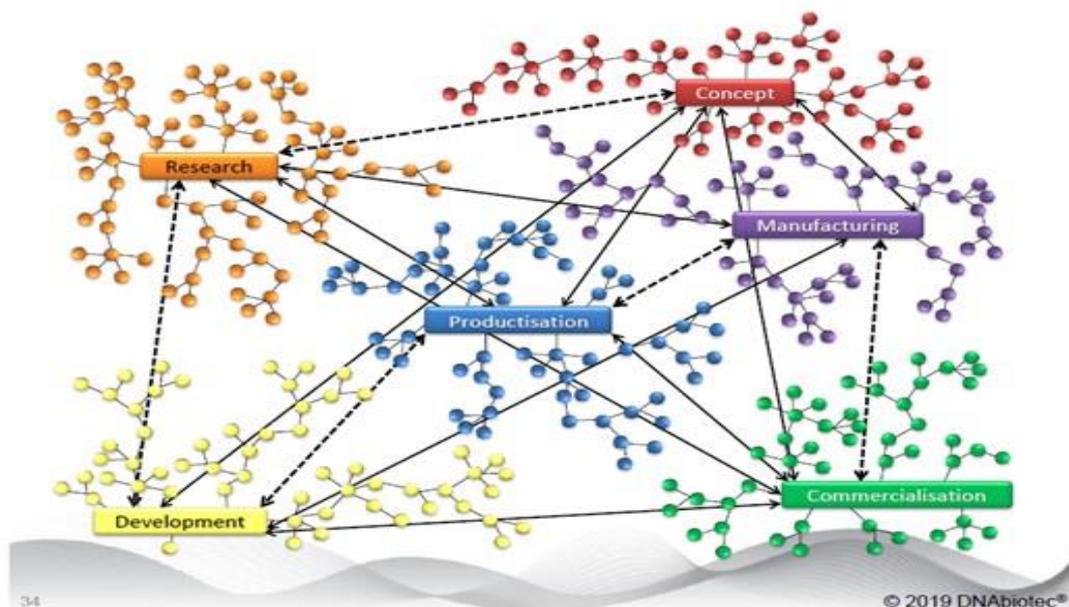
Creating your own path in the innovation network

Academia and business have traditionally been seen as two very different mindsets, says Dr Antonel Olckers, CEO of DNAbiotec. She spoke on: [‘Researchers vs entrepreneurs – who drives innovation?’](#).

Olckers notes that after solving a problem, academia would expect to write a paper on it. Research is positioned as generating knowledge, publishing papers, and interacting with the public sector when needed. Academia sees itself as driving innovation.

However, when business solves a problem the next step is action – doing what is needed. The entrepreneur in the private sector focuses on profit, by creating products and services. Business interacts with other sectors but not usually academia. The private sector believes it drives innovation.

Olckers says that this has created an ‘us vs them’ mentality and an innovation chasm, with each sector misunderstanding the other’s role. She believes it makes innovation more effective to see the roles of academia and industry in context of the entire innovation network. The innovation network has many nodes, with each node connected to the others. In addition, each node in itself has multiple complex tasks and aspects connected to it.



Olickers sees a merging of mindsets. For innovation that grows the economy, South Africa needs entrepreneurial researchers and researcher entrepreneurs. It also means researchers and entrepreneurs working together.

The entrepreneurial researcher cultivates an entrepreneurial mindset that looks for opportunities, does research that feeds into innovation, and applied research that leads to products and services. At the same time, the researcher entrepreneur cultivates a research mindset, conducts business with a 'scientific method' approach, and works within the innovation network.

Researchers breaking the mould

Developing a business model around mobile labs for water testing

Dr Kousar Banu Hoorzook is a biotechnologist and a Research Coordinator: Process, Energy & Environment Technology Station (PEETS), UJ. She spoke about her own journey of research and commercialisation. After developing a faster molecular biology test for E. coli bacteria in drinking water, she has spent a long time trying to bring this to market. She is currently discussing a business model with UJ where mobile labs for water testing can be sold or rented. Hoorzook spoke on ['Career path as a researcher - where to in a changing world?'](#).

Supporting students running a business while studying

Mr Muimeleli Mutangwa is the Executive Director for the Centre for Emerging Researchers NPC. He is currently a PhD candidate. Mutangwa's experience of postgraduate studies has been challenging – including trying to bring his innovations to market.

Mutangwa formulated a mathematical model as part of his master's degree in sustainable process engineering. It was internationally recognised and had media exposure in South Africa. Yet follow up with manufacturing companies went nowhere and he wasn't able to get enough NRF funding.

To sustain himself during his studies, he washed fellow students' sneakers and developed a special cleaner for this. The cleaner went on to win awards and Mutangwa now has a retail business. This is something he is doing while studying.

He says that universities in Malaysia are running models where students are supported in running a business while doing their studies. South Africa has the potential to do this.

Mutangwa presented on ['The importance of mentorship of postgraduates and early career researchers, and how to ensure that it happens'](#). He says that many postgraduate students want to be able to implement ideas not just publish papers. They need various kinds of support: financial, technical and mentorship. The latter is key to linking studies and individual ambitions with the business world and career development. How does the research fit into real-time goals? How does one network?

Creating new knowledge needs to go further than just improving the knowledge of the student and lecturer. It needs to link to economic growth and this means developing new markets, offering new benefits, and building a knowledge economy. Mutangwa emphasises the need for a Technology Transfer Office at universities for transferring research output to industry and commercialisation.

What else needs to change?

Following are further perspectives:

- There is a clear need for skills beyond the technical. These include communication skills, complex problem solving, critical thinking, education around entrepreneurship and finances, understanding legal and ethical frameworks, and developing 'soft' skills

- (such as creativity, people management, emotional intelligence, decision making, negotiation, and cross-cultural competency). Graduates need to be market ready.
- Postgraduates also need to understand there are skills they pick up during their studies, such as tools of analysis. Postgraduates need to be able to integrate knowledge and to adapt.
 - It's essential that there is more awareness building of all that government offers regarding the entrepreneurship ecosystem, particularly to students.
 - In a number of areas, such as a PhD in Chemistry working in nanotechnology and breast cancer, there aren't available jobs in South Africa that need that type of qualification. The multinational companies are doing their R&D outside the country. South Africa hasn't developed these markets and researchers have a better chance of working overseas.
 - See the '[Status of postgraduate research training in engineering in South Africa – a consensus study](#)' by Prof Beatrys Lacquet, Wits, for recommendations in the specific area of engineering.

Speakers can be contacted through the spokesperson, [Ms Jansie Niehaus](#). [Video clips](#) with the [full presentations](#) can be found on the [NSTF website](#).

Spokesperson: Ms Jansie Niehaus (Executive Director: NSTF)

SPEAKERS THAT ADDRESSED THE FORUM CAN BE CONTACTED THROUGH THE SPOKESPERSON.

About the NSTF

The National Science and Technology Forum (NSTF) established in 1995, is a broadly-representative stakeholder body for all SET and innovation organisations in South Africa, which seeks to influence policy formulation and delivery.

The NSTF [Awards](#) are unique in SA, recognising the outstanding contributions of individuals and groups to Science, Engineering and Technology (SET) and innovation.

The science bursaries page <http://www.nstf.org.za/bursary/> provides information on bursaries and bursary providers for science, engineering and related studies.

For more information

www.nstf.org.za

E-mail: media@nstf.org.za

Tel: [+27 12 841 3987](tel:+27128413987)

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