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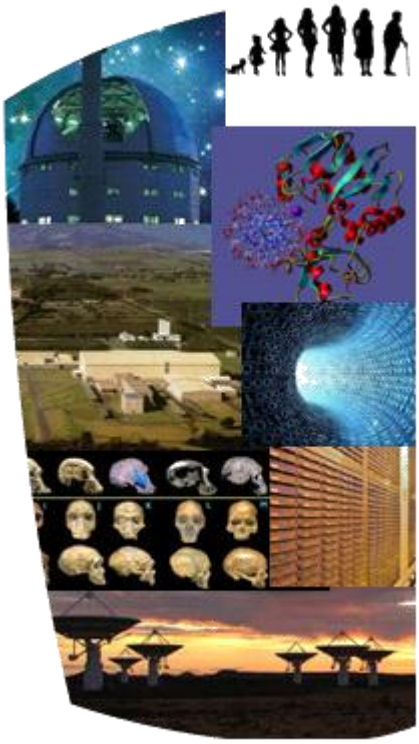
MoRI newsletter

MANAGEMENT OF RESEARCH INFRASTRUCTURE

"Any cutting-edge, technologically advanced contemporary society necessarily requires modern scientific infrastructure in order to support its economic development and provide for modern training environments. In addition, world-class and internationally comparable research infrastructure is a catalyst for attracting top-class postdoctoral fellows, scientists and researchers to the country, who are key drivers of innovation, economic development, and improvements in the quality of life.- Thomas auf der Heyde



A Research Infrastructure Roadmap

During 2013 an expert team developed a framework for a South African Research Infrastructure Roadmap (SARIR) on assignment from the Department of Science and Technology. This is only the beginning of a long road towards enabling the country to retain and extend its competitiveness in research, development and innovation. The framework was developed in consultation with a broad stakeholder base. The next steps involve detailed inter-departmental consultation in government to establish which of the recommended infrastructures should undergo further development in the form of detailed concept and technical cases.

This will inevitably require skills development in the planning and management of research infrastructure, as well as a culture shift towards sharing, collaboration and service. A funding stream will have to be developed to realise all the phases required before a final decision is taken on the establishment of the research infrastructure. Like in the case of ESFRI, the South African roadmap is deemed an ongoing process and it is foreseen that it will evolve with time. Read more about the SARIR in the interview with Dr Thomas auf der Heyde in this newsletter.

MoRI

MoRI is an independent platform creating a framework for understanding, planning, designing, managing and offering services related to the ***Management*** of Research Infrastructure (RI). It assists you, the RI owner, researcher, policy maker, administrator, funder and beneficiary to execute your tasks better, be more competitive or collaborative, provide better access to your RI, market and brand it better and to increase your impact on your client or user base. More at: www.technoscene.co.za/mori

Interview: A South African Research Infrastructure Roadmap

Thomas auf der Heyde

Why does South Africa need a national research infrastructure roadmap?

The development of world-class infrastructure is a necessary prerequisite for realising a successful transformation to a knowledge-based economy, a point that is also made in the DST's Ten-Year Innovation Plan. Without cutting-edge equipment little cutting-edge science and innovation is possible, and advanced training would also suffer. Consequently, research and development infrastructure plays a critical role across the entire innovation value chain. And because such infrastructure is expensive, we needed to develop a rational plan to guide our investments and our negotiations with Treasury around new infrastructure allocations.

How was the process of developing a framework for a roadmap conducted?

South Africa and the European Union (EU) have established a Trade, Development and Cooperation Agreement, under which the DST and the EU entered into a contract to develop a national research infrastructure roadmap for the country. With EU support, four experts, split equally between Europe and South Africa, were appointed to undertake the project. The expert group constituted Prof. John Wood (United Kingdom, as chair), Prof. Gonzalo Leon (Spain), Dr. Gerhard von Gruenewaldt and Dr. Anthon Botha (both from South Africa).

Two consultative workshops were scheduled, one in Gauteng and the other in the Western Cape. The first workshop in June 2013 was an open, multi-disciplinary session, including representatives from the humanities and social sciences, and industry. The second workshop, in October 2013, focussed on validating the outputs from the first workshop, and also brought on board decision-makers and funding agencies.

Inputs from these workshops were incorporated into a draft infrastructure roadmap framework, which was presented to the DST for approval in January 2014.

What is different in looking at national research infrastructure in the new way and the way the DST has supported expensive specialised equipment and national facilities in the past?

Until now, no coherent national research infrastructure for the renewal and placement of research equipment and infrastructure existed. Funds for research infrastructure were provided on an ad hoc basis by the National Research Foundation (NRF) strongly informed by bottom-up competitive processes. Around 80% of the research and infrastructure funded was placed in the higher education sector in a loosely coordinated manner to ensure some means of regional accessibility and capacity building.

Fiscal pressures and the need to be smarter about how we organise and fund our science system suggested a more coordinated approach is needed for expensive, large-scale research infrastructure, and we were aware of progress made in other countries around the development of national roadmaps.

So, while the national equipment programme will continue to reward the best and most competitive proposals, this will be complemented by a more strategic, top-down evaluation of investments required to support our key strategic priorities for research and development.

So, the key difference is that a more strategic approach is now being developed, that will complement the historic competitive process deciding on research equipment investments. This new approach allows us to plan expenditure in more rational manner, thereby decreasing duplication and improving efficiency and effectiveness of public sector investments. Such an investment plan is also likely to facilitate leveraging investment from the private sector.

Are our national facilities automatically on the roadmap?

No, they are not automatically on the roadmap, as their inclusion will depend on the strategic case to be made for specific new infrastructure projects at those facilities. However, baseline investment in necessary capital equipment maintenance and replacement is independent of the roadmap.

What research infrastructures are included on the roadmap?

It is important to stress that we do not yet have a roadmap - what we have is a (roadmap) framework that can serve as the basis for a national roadmap eventually, but quite a bit of further work is required. The report lists seventeen medium to large-scale research infrastructure needs across six scientific domains, namely: humans and society; health, biological and food security; earth and environment; materials and manufacturing, energy; and physical sciences and engineering. It is important to stress that by-and-large these needs are not the sort that could be addressed within the parameters of the National Equipment Programme.

What can the research community expect next?

In order to develop the roadmap, more detailed plans for and analyses of the identified infrastructures are required. These will be developed through extensive stakeholder consultations, and I expect we will seek support from the relevant experts across the six domains in developing those plans and analyses.

Dr Thomas auf der Heyde is Deputy Director-General: Human Capital and Knowledge Systems in the DST

The Stellenbosch University CT Scanner Facility

Featuring a new research infrastructure and its potential

Anton du Plessis

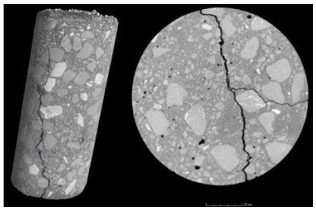
X-ray computed tomography (CT) has been used at mm-scale resolution in medical imaging since the 1970s (CAT scans), but few people realise that this technology is now available for research and industry at micron-scale resolution. The usage and popularity of X-ray micro-CT has recently increased considerably with the availability of laboratory high resolution micro-scale systems and the computing power to handle these data sets, also available in South Africa thanks to the National Research Foundation. In this article, the 2 year old Stellenbosch University CT Scanner facility is introduced, with some examples of the diverse applications and the development story of this facility.

Micro CT scanners are used to non-destructively analyse the insides of any object without physical sectioning (cutting). Samples are scanned and the insides are analysed in a virtual model on a computer. Applications are very diverse and growing, as the usage of the technology is increasing, but the largest applications in industry lie in analysing electronics and plastic and metal components for defects and porosity structure, analysing the 3D distribution of precious minerals in rock, and non-destructive testing of manufactured components for dimensional accuracy or tolerances, including internal features such as wall thicknesses.

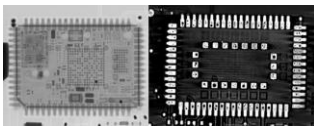
The facility operates as a service facility with a price structure lower for academic usage than for commercial users, but everyone is welcome and even international scan work is done at the facility. Samples are sent by courier and scans and 3D analyses are carried out with the data returned to the client. Local users are accommodated with CT scan sessions or batches of scans are done according to the research requirements. Research usage is high, resulting in a number of publications already completed even though the facility is still less than 2 years old, and many are in the pipeline from the many diverse academic users. These include Forestry, Food Science, Horticulture, Chemical Engineering, Mechanical Engineering and Geology and Earth Sciences, to name only the largest users.

The growth and success of this relatively new facility is due to the efforts and positive contributions of many people, support from academics at the local universities, the NRF and of course some commercial clients. In order to make the technology accessible, it operates as part of the Central Analytical Facilities of the university. Since few people realise the capabilities of this technology and the availability of it locally, making it known was a major drive thus far, with word of mouth being the best marketing channel, by ensuring top quality results for all clients as far as possible. A regularly updated website with many examples and a regular newsletter has contributed to a wider audience and user base.

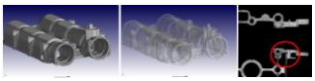
Thanks to the support and success thus far, a new equipment grant was approved for expansion of this facility into the submicron resolution scale, which will open up even more amazing opportunities for researchers to investigate their samples in full 3D at resolutions down to 500 nm. Coupled to this will be expanded computing and analysis facilities for students and researchers to analyse their data sets and make their scientific breakthroughs sooner. For more information on the facility please see the regularly updated website www.sun.ac.za/ctscanner or contact the unit manager Dr Anton du Plessis anton2@sun.ac.za.



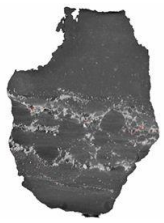
Concrete core with porosity and cracks



Electronic component inspection



Defect analysis of an automotive part with a close-up slice view of a defect



Witwatersrand gold distribution in high grade ore sample

Dr Anton du Plessis is a Staff Scientist in the Central Analytical Facility at University of Stellenbosch and responsible for the CT Scanner

SAEON: The South African Environmental Observation Network

Johan Pauw

Featuring a networked research infrastructure

A 5-year process of consultation driven by the Foundation for Research Development of the research community and relevant government departments culminated in the establishment of the South African Environmental Observation Network in 2002. Since then SAEON has been managed by the National Research Foundation and financially supported by the Department of Science and Technology. Today SAEON is a key component of the department's Global Change Grand Challenge and was allocated R 21.8 million core funding for the 2013/14 financial year.

The network is configured as six geographically distributed nodes that are coordinated and serviced by a national office whilst collaborating with many academic and scientific institutions. The nodes have established terrestrial, freshwater, coastal and marine sites and deployed instrument arrays along climatic gradients, coastal biogeographic transitional zones and across large marine ecosystems to progress long-term ecological monitoring and research programmes. Atmospheric and marine physical conditions are monitored within the context of specific environmental observation systems as drivers and indicators of directional change. The data is compared with directional changes in biodiversity such as biome shifts, ecosystem integrity and species distribution and abundance, with directional changes in ecosystem functioning such as primary and secondary production, bio-geochemical cycling, disturbance regimes, and hydrological functioning, and with oceanographic behaviour including, coastal upwelling, algal blooms and ocean currents. The data is openly accessible and used in modelling, research publications, post-graduate education, policy advice, international reports and outreach activities.

Science managers at the nodes offer permanent research platforms to collaborators and coordinate node-based field scientists and technicians. A broad range of scientific disciplines are involved but which is partly addressed by collaborators.

A shortage is experienced in the availability of technicians skilled in instrument handling and maintenance, as well as in environmental data management.

The long-term ethos of SAEON's research places it in a unique position to provide reliable data and information for decision and policy-making, for example the management of Marine Protected Areas, estuaries, rivers, rangelands and biosphere reserves. SAEON data has contributed to the South African Risk and Vulnerability Atlas which assists government, industry and developers with environmental information. SAEON is currently also leading the development of a bio-energy atlas to guide the promotion, or not, of a bio-energy industry in South Africa. A SAEON publication 'Observations on environmental change in South Africa' was followed up by a policy brief 'Combat change with change' and these publications have been used as source documentation for government reports and planning.

The next ten years of SAEON will be characterised by an exponential surge in the availability of data. Consequently SAEON will have to increase the available data storage space and data management capacity. With time, SAEON's data will become irreplaceable in science, planning and policy-making and therefore invaluable for sustainable development in South Africa. More about SAEON at: www.saeon.ac.za

Main Picture from "The SAEON Story, 2007 – 2011"

With acknowledgement to Amy Weeber, SAEON Intern, (Photograph courtesy of Dr Grant Pitcher)

With acknowledgement to Colin Tucker, Masters student, Stellenbosch University

Johan Pauw is Managing Director of SAEON, a National Facility under the National Research Foundation (NRF)

RI Events: ICRI 2014

Anthon Botha

Research infrastructure has become an international debate. The European Union has initiated discussions at a global level with an International Conference on Research Infrastructure, ICRI 2012, held in March 2012 in Copenhagen, Denmark. The next event is in April 2014 in Athens, Greece. Attendance of these conferences is on invitation only.

ICRI 2012

The ICRI 2012 conference focused on the role global research infrastructures are playing in addressing challenges that the whole world is facing. Special attention was given to climate change, energy, health and the need for e-infrastructures.

A global exchange of views took place on decision making and prioritisation, governance, management, cost containment and access policies based on excellence. Discussions further highlighted the need for a global network of policy makers. Recognition was given to the fact that data is the currency of science and technology, and that global research infrastructure requires a common and unique currency.

The growing role of international cooperation in research infrastructure supports the notion of brain circulation by opening the doors on a global scale. Growing the involvement of industry in this knowledge exchange is a world-wide priority. The success of establishing and running global research infrastructure depends on the involvement of talented people from everywhere and requires skills that do not readily exist today. The development of the right training programmes is seen as a crucial success factor.

More information about the outcomes of ICRI 2012 is available at: https://www.ereg.me/ehome/31679/conclusions/

ICRI 2014

The focus of ICRI 2014 is on how global infrastructures can respond to the grand challenges that the world is facing today, on lessons learnt and on deciding future priorities and directions. It will further reflect on the needs and challenges that arise during the development and operation of global research infrastructures at national, regional, continental and global level. The main characteristics of global research infrastructures will be discussed and challenges and drivers will be identified for collaboration at an international level.

The programme includes plenary sessions on:

- Research infrastructure for global challenges
- Governance of research infrastructures
- Innovation potential of research infrastructures
- Big data management

Thematic sessions include:

- Environment (focus on Marine RI)
- Palaeoanthropology and Cultural Heritage
- Food Security
- e-Infrastructures

More information about the conference is available at: http://www.icri2014.eu/

Significance of ICRI to South Africa and Africa

A large delegation of South Africans attended ICRI 2012 and will do so again with ICRI 2014. Not only has the SKA project placed South Africa on the world map as a planner, host and leader in global infrastructure, but the participation of South Africans as thought leaders in many of the discussions has given a strong recognition to the role the country plays in its thinking about and potential for global research infrastructure.

The catalytic role the South African government and the European Union are playing in involving Africa on a continental scale in the research infrastructure debate has emerged in many policy discussions and events to promote partnerships in research infrastructure.

The development of a South African Research Infrastructure Roadmap has also caught the attention of the international community, making the country a respected participant in international debates about global research infrastructure.

With the revision of the Consolidated Plan of Action and in adopting a long range strategic approach for science, technology and innovation on the continent, the unique offerings Africa has for hosting global research infrastructure based on its geographical or knowledge advantages, provide for positioning the continent as a serious and attractive player in the international context.

Dr Anthon Botha is the Managing Director of TechnoScene (Pty) Ltd and initiator of MoRI