

National Research Foundation

The National Research Foundation (NRF) is the key public entity responsible for supporting the development of human resource capacity for research, technology and innovation in the fields of science and technology. Within the context of the National Research and Development (R&D) Strategy and NEPAD objectives, the NRF sees itself as a major player in the education and training of a new generation of scientists able to handle South African and African needs.

The NRF provides services and grants to support research and postgraduate research training, vital to the development of science and technology (S&T) in South Africa. It is the NRF's vision to be a key instrument in creating an innovative and knowledge-driven society where all citizens are empowered to contribute to a globally competitive and prosperous South Africa.

The four corporate core missions of the NRF are to develop and support:

- High-quality human resources in aggressively increasing quantities;
- The generation of high-quality knowledge in prioritised areas that are responsive to national and continental development needs;
- The utilisation of knowledge, technology transfer and innovation to ensure tangible benefits to society; and
- The provision of state-of-the-art research infrastructure that is essential to facilitating the development of high-quality human resources and knowledge.

Cross-cutting corporate strategic priorities include: redressing and ensuring equity in race and gender; adhering to quality; internationalising research; focusing on Africa; positioning the NRF within the National System of Innovation (NSI); and transformation.

Thrusts identified by the NRF for 2004 to 2007 include: positioning the NRF as knowledge organisation within the NSI; fostering diversity and transformation in the NSI; supporting big science activities; as well as driving organisational transformation and growth.

With a growth of 25% in its budget from R766 million in 2003/04 to an expected R956 million in 2004/05, the NRF is now becoming a major player in the NSI. This budget includes ring-fenced funds, the budget for the National Research Facilities and Centres of Excellence. It excludes funds for the Innovation Fund and THRIP.

South Africa's Square Kilometre Array (SKA) bid

The SKA is a US \$1 billion international project to create a radio telescope with a receiving surface of a million square metres, one hundred times larger than the biggest receiving surface now in existence. This huge surface will be composed of many small antennas, with peripheral antennas as far as 1 000 km from the

core. The signals received by these antennas will be combined to form a single, big, picture. This will require complex computing and information processing systems. The result will be an instrument capable of probing the secrets of the very early universe.

South Africa, with the NRF as the lead agency, is gearing up to bid to become a host country for the mammoth SKA radio telescope, the world's largest radio-telescope project under consideration by international science bodies. South Africa is proposing to host the core array of the SKA, or part of the peripheral array. A major drive is underway to promote the competitive advantage of South and southern Africa for capital-intensive big science initiatives among the international community of scientists. The decision on the siting of the SKA telescope will most likely be made in 2006, and the success of the Southern African Large Telescope (SALT) gives hope that South Africa will be favourably considered. The Northern Cape is considered to be one of the best potential locations for the SKA.

The South African SKA Steering Committee has submitted a preliminary bid proposal and the bidding process is expected to take two or three years to finalise. Construction will hopefully start in 2010 and the SKA should start operating in 2015.

Research and Innovation and Support Agency (RISA)

The NRF's RISA has a suite of funding programmes that are in line with South Africa's priorities and needs.

The Focus Area Programme

The Focus Area Programme's high-level research themes are:

- Challenge of Globalisation: Perspectives from the Global South
- Conservation and Management of Ecosystems and Biodiversity
- Distinct South African Research Opportunities
- Economic Growth and International Competitiveness
- Education and the Challenges for Change
- Indigenous Knowledge Systems
- Information and Communication Technology (ICT) and the Information Society in South Africa
- Sustainable Livelihoods and the Eradication of Poverty
- Unlocking the Future: Advancing and Strengthening Strategic Knowledge

Collectively these themes provide a broad framework for researchers across the spectrum of disciplines (the natural, social and human sciences, engineering and technology) to pursue their research interests taking into account the macro-environment as well as relevant national developments.

Research Capacity Development (RCD)

Institutional and RCD programmes focus on boosting historically black universities and universities of technology that are committed to the research process. In addition, the Thuthuka Programme supports individual researchers. It comprises Researchers in Training, Women in Research, and Research Development for Black Academics. All the NRF's RCD initiatives aim to boost the output of high-level black HR (both academics and research students at all higher education institutions); develop a postdoctoral research culture; strengthen weak, yet critically important disciplines; improve gender equity; and renew outdated research equipment.

Student Support

The NRF provides two complementary types of postgraduate student support, namely:

- free-standing bursaries, scholarships and fellowships
- grantholder-linked bursaries.

Free-standing bursaries, scholarships and fellowships are awarded directly to students on a competitive basis, while grantholder-linked bursaries are granted to researchers within their NRF support package and may be awarded to students selected by the NRF grantholder. The NRF offers a limited number of travel grants for research abroad.

Knowledge Management

The NRF's Knowledge Management directorate includes Information and Strategy Advice (ISA), the Evaluation Centre and the IT department. Knowledge management, including records management, and expanding Communities of Practice (CoP) is high on the agenda of RISA. A coordinated and efficient knowledge management system that facilitates the achievement of RISA goals including optimal governing structures for maximum integration and synergy is its aim.

International Science Liaison (ISL)

International Science Liaison aims to forge and maintain strategic and intellectual alliances between individuals, institutions and organisations in the science research communities nationally and internationally to support the international competitiveness of the country.

PROGRAMMES MANAGED BY RISA AS SERVICE PROVIDER

The NRF has recognised management and administrative competencies that allow research development funders to use it as their preferred service provider.

Innovation Fund

The Innovation Fund (IF), a policy instrument of the DST, was created to promote: technological innovation; increased networking and cross-sectoral collaboration; and competitiveness, quality of life, environmental sustainability and the harnessing of information technology. The Innovation Fund's budget has

increased to R171 million in 2004/05. The NRF claims a management and administration fee from the allocated budget for support services rendered.

The Fund's strategic objectives include: creating a knowledge base in key technology and economic sectors; facilitating the exploitation and commercialisation of R&D results from the existing knowledge base; investing in technological innovations that will benefit South Africa and supporting historically disadvantaged individuals in terms of infrastructure, knowledge and technology transfer. The IF enables the expansion and migration of existing industries to new value-added areas and the establishment of R&D-intensive industries. It fosters the establishment and growth of technology-based small enterprises.

The strategic direction of the Fund identified a series of new funding initiatives that seek to enhance innovation in South Africa. They are:

- Technology missions: to support the development of long-term, high-risk, market-driven, enabling technology that will benefit an existing economic sector;
- Technology advancement programme: to promote innovation in new technology frontiers;
- Various competitive initiatives to promote entrepreneurship through the commercialisation of the innovative ideas of young entrepreneurs; and to promote R&D collaboration and entrepreneurship within the business and research community, emphasising networking among racial groups and across cultures;
- Innovation Fund Commercialisation Office (IFCO): to offer a comprehensive service with respect to patent applications and technology transfer for publicly funded research;
- Seed and start-up financing for the development of a product or prototype, proof of concept and initial marketing.

Technology for Human Resources for Industry Programme (THRIP)

The THRIP is a joint initiative between industry, research and educational institutions, and the Department of Trade and Industry (the dti). The Programme is managed by the NRF, advised by the THRIP Board and sponsored by the dti. The programme supports projects that address the technology and human resources needs of industry on a cost-sharing basis with industrial partners.

In 2004/05, THRIP will implement its new five-year strategic plan. In so doing, the programme will be better aligned with key strategies that government is using to guide research and development, increase competitiveness, grow the economy, create jobs, eradicate poverty and provide equity within South Africa.

THRIP is focusing on increasing participation by SMMEs (small, medium and micro enterprises) and BEE (black economic empowerment) entities. It is embarking on a vigorous advertising and marketing campaign targeted at industry in general, and specifically small and medium industries. Other key

performance areas that will be addressed are participation by historically disadvantaged institutions, and by black and women students.

The MTEF budget allocation for THRIP is R135 million for 2004/05. The NRF claims a management and administration fee from the allocated budget for support services rendered.

SCIENCE AND TECHNOLOGY AGREEMENTS COMMITTEE (STAC)

DST negotiates bilateral or multilateral agreements with international partners, drafting Framework Programmes of Action (which detail priority setting, conditions and criteria) and funding levels for each agreement. The NRF manages the agreements which serve to develop scientific relations between the research communities of the inter-governmental signatories. 2004 will see the launch of at least four new inter-governmental agreements (with Switzerland, Iran, Algeria and the UK), bringing to 18 the number of agreements managed by the NRF on behalf of DST. An independent evaluation of STAC-related activities will be conducted during 2004/05. The STAC budget for 2004/05 increased to R23,9 million.

Scarce Skills Development Fund

In order to address a shortage of skills required for national development and competitiveness, the government passed the Skills Development Act (Act No. 97 of 1998) as a framework for realising this objective. The Department of Labour (DoL), in conjunction with DoE and DST, has been mandated with the responsibility of ensuring training in scarce skills, both in higher education and other training institutions, especially in science and technology. In order to deliver on this objective, DoL recommends the allocation of resources from the National Skills Fund (NSF) for bursaries and scholarships. The NRF as a national agency with a mandate to support the development of high-level skills at postgraduate level has become the implementing agency for DoL for the provision and support of scarce skills at postgraduate levels in science and technology.

Biodiversity Programmes

The NRF has been requested by the DST to manage two initiatives linked to the biodiversity science thrust of the National R&D Strategy, namely the South African Biodiversity Initiative (SABI) and the South African Bioinformatics Facility (SABIF). (Budget allocation for SABI 2004/05 is R1,5 million and for SABIF some R1,7 million.)

South African National Antarctic Programme (SANAP)

Negotiations between DST and the Department of Environmental Affairs and Tourism (DEAT) are under way and the NRF will in all probability be responsible for managing at least the research component of this programme (estimated budget of R4 million per annum).

INDIGENOUS KNOWLEDGE SYSTEMS (IKS)

Similar to STAC, the NRF receives a ring-fenced grant for IKS from DST in support of research and human resource development in the field of indigenous knowledge. IKS has been identified as a Focus Area within RISA and all IKS activities have been integrated in the RISA activities. RISA does, however, report separately to DST on the outputs and outcomes of this programme. The programme will be reviewed by the DST in 2004/05. The ring-fenced IKS grant from DST amounts to R10 million annually.

Additional initiatives:

- Centres of Excellence (CoEs): The NRF has taken on management responsibility for CoEs. DST has entrusted the NRF with establishing these centres to stimulate research, generate high-quality human resource development and to make meaningful impact on key national and international research and development issues. (Additional resources of R24 million per annum.)
- Centres of Excellence in Industrial Research and Development (CEIRD): The dti has recognised the need for greater innovation and skills development and will fund centres that focus on national priorities and sectors for which the dti is the primary custodian. Managed by the NRF, CEIRD will maximise co-operation and synergies with other relevant NRF programmes. (Additional resources of R24 million per annum.)
- Chairs of Entrepreneurship and Enterprise Development (CEED): Following international trends of funding endowed chairs at Higher Education Institutions to provide leadership and guidance in a specialist field, the dti has decided to support endowed CEEDs. (Additional resources of R20 million per annum.)
- Postgraduate bursaries for the disabled: Made possible through a grant of R5 million per annum by the DoL from the National Skills Fund.
- MASTT: The dti has asked the NRF to manage the Mathematics and Science Teachers' Training programme to enhance the teaching skills of science and mathematics educators. A budget of R20 million has been allocated for this initiative for the 2004/05 financial year.

South African Agency for Science and Technology (SAASTA)

Success in achieving the objectives of the NRF is critically dependent on an understanding by, and acceptance within, the broader society of the importance of science and technology (S&T) for the nation's advancement. SAASTA has an important role to play in this regard, since the public communication and advancement of S&T are at the core of the SAASTA mandate. The incorporation of SAASTA identifies the NRF as a key player in the promotion of mathematics and science education in the pre-tertiary sector, placing a significant responsibility on the NRF, especially in terms of its key core mission of human resource development. Operationally, there is an opportunity for enhanced integration of science outreach activities at the various National Research Facilities of the NRF, and for closer collaboration in terms of encouraging grantholders, bursars and industry partners to become more actively involved in

science communication and advancement. In order to pursue these objectives effectively, NRF corporate communication and public relations activities are located within SAASTA.

Programme expansion in SAASTA is only possible through increased funding via partnerships. Already, project funding has been secured for the Public Understanding of Biotechnology Programme. For 2004/05 R10,8 million has been allocated to SAASTA from the parliamentary core grant. Additional income is expected to be generated through contracts.

National research facilities

National Research Facilities are important elements of the research infrastructure of the country. Recent developments also require the creation of multi-locational networks of institutions that collaboratively contribute to the provision of an urgently needed research infrastructure and are accessible to the research community on a competitive basis.

Currently the following National Facilities are managed under the mandate of the NRF:

- South African Astronomical Observatory (SAAO);
- Hartebeesthoek Radio Astronomy Observatory (HartRAO);
- Hermanus Magnetic Observatory (HMO);
- South African Institute for Aquatic Biodiversity (SAIAB);
- iThemba Laboratory for Accelerator Based Sciences (iThemba LABS);
- Pretoria National Zoological Gardens (NZG); and
- South African Environmental Observation Network (SAEON) (not as yet declared a national research facility).

These facilities are clustered in terms of the area of knowledge production or of the national need being serviced, namely: Astro/Space/Geo sciences; Biodiversity/Conservation; and the Nuclear sciences.

The alignment of this clustering with the science themes identified in South Africa's National R&D Strategy such as the Southern Oceans, Islands and Antarctic; Bio-resources/sciences; Astronomy and Earth Observation, is evident. National Research Facilities are therefore positioned to make an impact on the national research and innovation agenda.

SAAO and Southern African Large Telescope (SALT)

SAAO is the National Research Facility for optical/infrared astronomy in South Africa. Its prime function is to further fundamental research in astronomy and astrophysics at a national and international level through the provision and utilisation of a world-class astronomical facility. The SAAO's research excellence is underpinned by strong technical competencies in certain niche areas. The SAAO contributes to the future development of South Africa through the creation and dissemination of knowledge; human resource development; provision of

research infrastructure; and providing an interface between science and society. It maintains a number of telescopes at Sutherland in the Northern Cape, where the Southern African Large Telescope (SALT) is being built as a collaborative project between the NRF and several international partners.

Current challenges at SAAO include: the transition from the SALT construction phase to the SALT operations phase; restructuring SAAO for the SALT era; reorientation of SAAO scientific activities towards SALT science and empowering the SA user community to utilise SALT efficiently by 2005. The SAAO will focus on developing the future SAAO/SALT user community in southern Africa and ensure the sustainable delivery of collateral benefits of SALT.

The astronomical commissioning of SALT will be accomplished with the instrument Salticam, which SAAO has been contracted to build. This instrument will be completed in 2004. During 2004/05 the urgent restructuring of SAAO Sutherland will take place to facilitate the SALT commissioning phase.

Marked growth is expected in the number of postgraduate students at SAAO. The flagship National Astrophysics and Space Science Programme (NASSP), run by a consortium of eight South African universities and three National Research Facilities, will graduate its first class of MSc students in mid-2004. As the postgraduate student enrolment in astronomy in the universities increases, student training at SAAO will increase in importance.

HartRAO

Hartebeesthoek Radio Astronomy Observatory (HartRAO) is the National Research Facility for research and training in radio astronomy and space geodesy in South Africa. It provides facilities for South African and foreign scientists to participate in research using the facilities at HartRAO. The radio telescope is available either as a single, independent instrument or in global networks of radio telescopes using the technique of very long baseline interferometry (VLBI). HartRAO is one of only five permanent fundamental space geodesy stations worldwide. It participates internationally in geodetic VLBI, satellite laser ranging (SLR) and Global Positioning System (GPS) research.

In the near term HartRAO will develop and expand existing programmes and diversify these programmes so that a multitude of projects (student and international) can be supported. The development and support which the SKA bid should receive are to be incorporated in existing and new programmes to provide an integrated process and fully encompassing support for the Square Kilometre Array (SKA). In the longer term, HartRAO has to realise the compromising and limiting practicability of using an ex-NASA deep space tracking facility for the modern demands of Radio Astronomy and Space Geodesy. A new radio telescope, moon and satellite laser ranger will have to be established in future, to meet NRF core missions and priorities. The SKA provides the opportunity for such a facility for radio astronomy. A new Space

Geodetic facility will provide continued and much expanded utilities for space geodesy, atmosphere and earth sciences.

Hermanus Magnetic Observatory (HMO)

The HMO functions as part of the worldwide network of magnetic observatories. Its core function is to monitor and model variations of the Earth's magnetic field. It is primarily the HMO's scientific achievements, critical location, and unique facilities that make it indispensable in the global network of magnetic observatories. Besides its core function of providing geomagnetic field information, the scope of the HMO's activities include fundamental and applied space physics research, and the provision of geomagnetic field-related services on a commercial basis. HMO is growing its efforts in human resource development, especially the science outreach programmes for school educators and learners, and postgraduate student training and research capacity-building.

The international and local geophysics communities have expressed significant interest in the rapid decrease of the geomagnetic field in the southern African region, suggesting that a reverse dynamo may be developing below South Africa. The HMO and the GeoForschungsZentrum (GFZ), Potsdam, Germany, have submitted a proposal for a collaborative project, called Inkaba ye Africa, to study this phenomenon using satellite and ground-based data.

The new Interactive Science Centre at HMO will be completed in 2004 and its opening is planned as part of the 10 years of democracy celebrations.

South African Institute for Aquatic Biodiversity (SAIAB)

SAIAB serves as a research hub for aquatic biodiversity in southern Africa by housing and developing the National Fish Collection and associated resource collections as research tools and sources of aquatic biodiversity data. It also generates knowledge on aquatic biodiversity through interactive and collaborative scientific research, and disseminates scientific knowledge at all levels.

SAIAB is focusing on developing human resource capacity and skills to handle the research demands arising from the global biodiversity crisis and, in particular, the national biodiversity legislation. It is developing an effective aquatic biodiversity information centre that connects the generation and development of aquatic biodiversity knowledge products by SAIAB to the demands of the user community and public.

SAIAB is currently developing an aquatic biodiversity information "hub" or centre, to ensure the development and provision of knowledge products and databases from SAIAB activities. Ongoing research and collection-based projects include the African Coelacanth Ecosystems Programme (ACEP), SADC aquatic biodiversity contract projects and new research initiatives include a freshwater biodiversity conservation programme and Southern Ocean fish diversity project.

iThemba Laboratory for Accelerator Based Sciences (iThemba LABS)

iThemba LABS provides modern research facilities to users in science, medicine and industry. iThemba LABS has established itself as a major commercial centre for radiation medicine and is forging strategic partnerships with the private and public sectors to leverage capital, skills and the expertise required for an initiative of this magnitude.

By establishing a major oncology centre, iThemba is creating more space for training in physics and radiation sciences. The Major Radiation Medicine Centre (MRMC), as the proposed oncology centre is known, was endorsed by leading international oncologists during a visit to iThemba LABS. The MRMC will become the centrepiece of cancer control in southern Africa and an internationally recognised centre of excellence in cancer treatment, research and training. iThemba LABS will invest in equipment for therapy, while initial 'seed money' funding of R10 million is required for the MRMC project.

iThemba LABS focuses on providing scientifically and medically useful radiation through the acceleration of charged particles using the Separated Sector Cyclotron, the Van De Graaff Accelerator and other appropriate technologies. It is the primary centre of expertise in radiation medicine and nuclear science and technologies in South Africa.

Current challenges include sourcing the skills and human resources required to meet the international needs for high-quality radioisotopes and developing the training programmes at iThemba LABS which are essential both for transforming the South African S&T workforce and for growing the skills required to build a successful economy in which there are sufficient resources to eradicate poverty.

iThemba LABS is recruiting patients, from especially Africa, for the current Proton/Neutron Therapy facilities to increase patient throughput and to develop a prototype recruitment model for the MRMC.

Pretoria National Zoological Gardens

The Pretoria National Zoological Gardens (NZG) was declared a national research facility in April 2004. The transfer of the Pretoria National Zoological Gardens to the NRF aims to strengthen the funding of the zoo's scientific research functions and enhance its ability to do excellent research in the conservation of South Africa's biodiversity. The zoo will redefine and reposition itself as one of the leaders in breeding and research of endangered species. This will enhance its position as a globally competitive institution and further the goals of the South African Government to improve public understanding of science and technology.

The Pretoria Zoo, as it is popularly known, is the only zoo in South Africa with national status and is rated as one of the top zoos in the world, attracting

hundreds and thousands of local and international visitors annually. The facility extends over an area of about 80 ha. It has breeding centres in Mokopane in Limpopo and Lichtenburg in the North West, where especially endangered animal species are bred.

South African Environmental Observation Network (SAEON)

Although not yet a declared national facility, SAEON is being developed as a South African observation and research network that provides the understanding, based on long-term information that is needed to address the sustainable management of natural resources and habitat over a range of eco-regions and land users.

SAEON is a research facility that establishes and maintains nodes (environmental observatories, field stations or sites) linked by an information management network to serve as research and education platforms for long-term studies of ecosystems that will provide for incremental advances in our understanding of ecosystems and our ability to detect, predict and react to environmental change. SAEON will bring better cohesion between research programmes nationally and internationally and will ensure that LTER data is archived and accessible as a national asset for generations to come

Current activities at SAEON include: the launching the first node in the Lowveld; the implementation of an innovative information management system, an innovative education outreach and communication strategy; as well as programmes to demonstrate SAEON's relevance to funders and stakeholders.

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