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# Technology Impact 2002

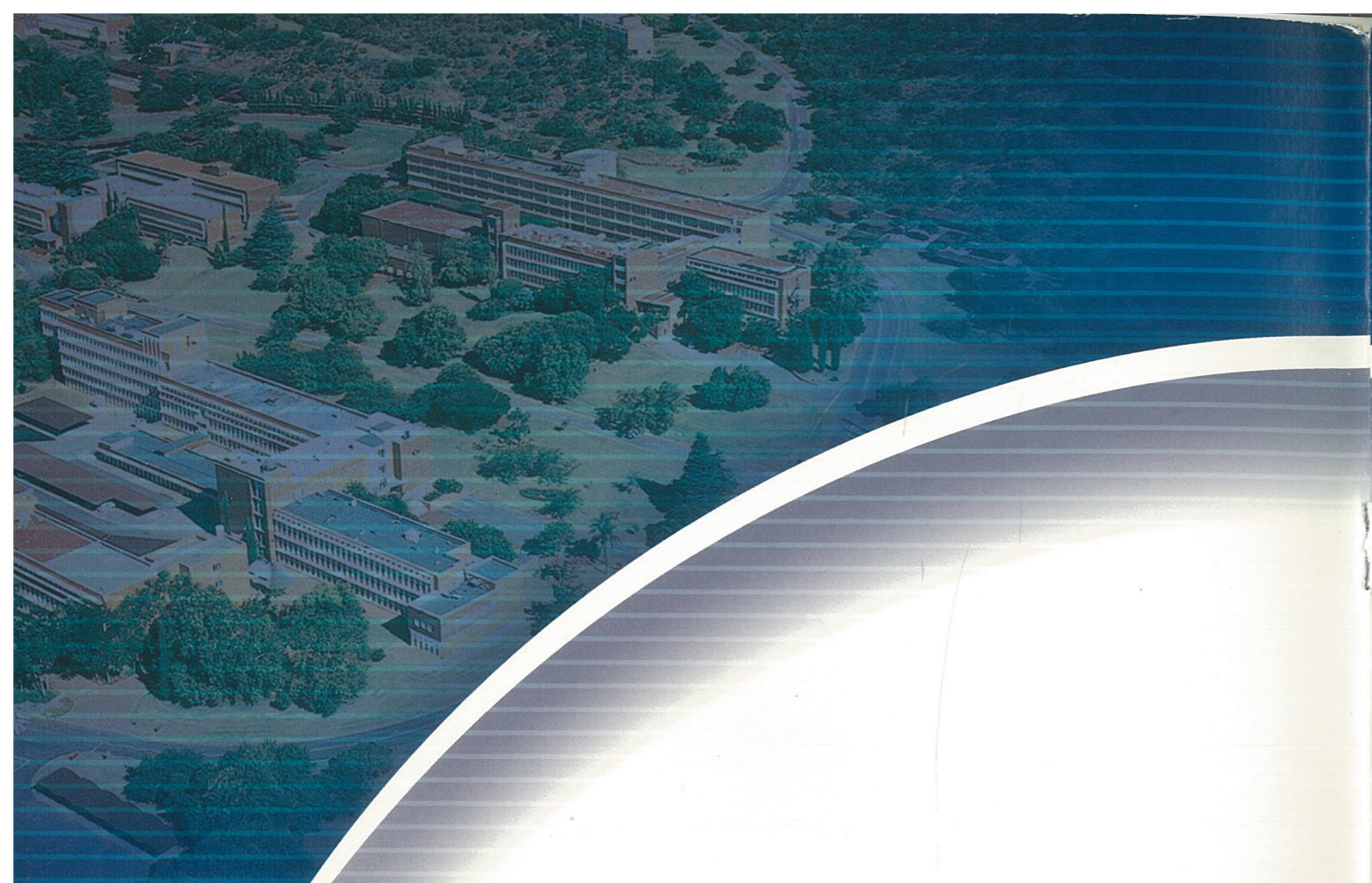
# 2002



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The CSIR is the largest scientific and technology research, development and implementation organisation in Africa. Constituted as a Science Council by an Act of Parliament, our organisation operates under the following mandate:

'In the national interest, the CSIR, through directed and multi-disciplinary research and technological innovation, should foster industrial and scientific development, either by itself, or in partnership with public and private sector institutions, to contribute to the improvement of the quality of life of the people in South Africa.'

# CSIR Technology Impact 2002



## page content

CSIR Technology Impact 2002

3	<b>Foreword</b> Dr Sibusiso Sibisi, CSIR President and CEO
5	<b>Sustainable Development</b> Introduction - Ms Tina Eboka, Director: Environmentek
5	• People
10	• Planet
13	• Prosperity
17	<b>Global Successes</b>
17	• International Introduction - Dr Reinie Biesenbach, Head - CSIR International Business Development
23	• Africa Introduction - Ms Berenice Lue Marais, Head - CSIR Africa Business Development
29	<b>Working with South African Business</b> Introduction - Dr Anthos Yannakou, Executive Vice President: Operations
33	<b>Our People</b>

# Foreword



**Dr Sibusiso Sibisi**  
*CSIR President and CEO*

In the world and in Africa, the centrality of science and technology in promoting and growing economies - the necessary preconditions for prosperity - is indisputable. As the largest scientific, technological, research and development organisation in Africa, the CSIR operates under a mandate to foster industrial and scientific development by engaging with both the public and the private sector in its efforts to improve the quality of life for all in South Africa.

Since joining the CSIR in January this year, I have had the privilege of interacting with each of our eight Business Units and specialised facilities. I have been amazed by the knowledge of our people, the world-class innovations taking place here, and the variety and range of applications of our research and technology endeavours.

In the connected world in which we live today, countries must find and focus on a competitive advantage to become and remain part of the 'global value chain'. Many developing countries are beginning to do so and are becoming strong world economies largely through technology. Likewise, South Africa needs to find its niche in the global value chain. CSIR innovation must always be more than having a good idea; we must put these ideas into the market in sustainable enterprises to strengthen our country's competitiveness.

Over the past year, our contribution to the country's National Imperatives of crime prevention, HIV/AIDS, human resource development, job creation, regional integration, rural development and urban renewal has remained a key priority in our operations. Measures of impact and relevance inform and shape our efforts, which, in many cases, are closely linked to the activities of a wide range of local, provincial and national government stakeholders.

Both as a scientist and as the President and CEO of the CSIR, I strongly believe we must mobilise our abundant collective

resources of human skills and science and technology to address poverty and underdevelopment in Africa, and place our continent on a path of sustainable growth and development.

The CSIR's commitment to this goal is the basis of our support for and our active participation in the New Partnership for Africa's Development (NEPAD). In this regard, we address key areas such as infrastructure, peace and security, manufacturing and information and communication technology, in many cases through existing or newly forged partnerships with both local and international bodies in the public and private sector.

It gives me great pleasure and pride to present this issue of Technology Impact, in which we demonstrate our commitment to making a difference by real-world solutions achieved through our knowledge and technology.

A handwritten signature in black ink, appearing to read 'Sibusiso Sibisi'.

*Dr Sibusiso Sibisi*  
*CSIR President and CEO*



# Sustainable Development



**Introduction by Tina Eboka**  
**Director: CSIR Water, Environment and Forestry Technology**

*The concept of sustainable development acknowledges the interconnectivity and interdependence of the social, the biophysical and economic systems - PEOPLE, the PLANET and PROSPERITY - and strives to achieve synergy between their diverse needs and interests.*

*In our quest to be relevant as a science council, the CSIR fully subscribes to the basic principle of balancing the needs and interests of the people, the planet and prosperity. This is done, however, within the framework of South Africa's national imperatives. These imperatives, which guide South Africa's sustainable development priorities, include rural development, urban renewal, crime prevention, combating HIV/AIDS, job creation, national human resource development and regional integration.*

*In striving to contribute to the improvement of the quality of life of all South Africans, the CSIR's commitment does not end with finding solutions for the current social, economic and environmental challenges facing our world. The projects featured in this section of Technology Impact 2002 illustrate that we also accept our responsibility towards future generations through direct and multidisciplinary research and development.*

*Balancing the needs and interests of the people, the planet and prosperity*

## PEOPLE

### **Code of Practice for effective border control**

The CSIR, in cooperation with a private firm of consultants, was contracted by the National Inter-Departmental Structure for Border Control to draw up a Code of Practice for ports of entry. The CSIR was primarily responsible for the codes of practice at land, air and post ports of entry, and in an advisory capacity on sea and rail borders. Finalised in October 2001, the code represents a milestone in border control and, when implemented, will improve the facilitation and protection of trade and immigration, collection of duties and prevention of crime, of which vehicle theft and contraband smuggling are key concerns.

### **Managing HIV/AIDS**

Following on the success of the Mthuisimpilo "Working for Health" project in Carletonville, the CSIR is participating in the major collaborative Powerbelt HIV/AIDS project. These projects are aimed at combating HIV/AIDS through community intervention, and also incorporate a number of social upliftment programmes. The principal approach is to target high-risk population groups such as sex workers or women at high risk, their clients, school children and residents of informal settlements surrounding mines. The programme includes the promotion of safer sex, distribution of condoms, upgrading of staff in hospitals and clinics, upgrading of traditional healers in syndromic training and the treatment of sexually transmitted diseases and HIV/AIDS, and facilitating access to medical services. The implementation of home-based care for terminally ill patients is also an important component.

President Mbeki with CSIR staff involved in the Tsilitwa project

### **CSIR designs contribute to safety of paratroopers**

Poor visibility associated with night landings can create hazardous conditions for paratroopers. The CSIR has made a significant contribution to the safety of paratroopers by developing drop-zone and landing-zone lights. Though small and simple, the lights are very effective and have a huge impact on the mission and safety of the paratrooper. A light has also been developed to address the risk paratroopers run of colliding with each other during night jumps because of poor visibility. Connected to the bridle of the parachute, this illumination device is switched on just before the paratroopers exit the aircraft and enables them to identify their individual locations, thus limiting the chance of a collision.

### **Promoting and commercialising South Africa's indigenous foods**

The CSIR's Indigenous Foods project, sponsored by the Department of Arts, Culture, Science and Technology (DACST), addresses the alleviation of poverty in rural areas by exploiting the rich abundance of indigenous foods in South Africa. The project aims to stimulate small to medium business enterprises, foster job creation and empower women to contribute to the economic and social development of the country. By focusing on the enhancement of the skills of the rural women in food preparation, and by adding value to the indigenous foods, the project facilitates the introduction of new foods to the market, thus creating sustainable jobs and improving the livelihoods of rural people.

A particularly significant feature of the project is that it provides a niche market for women, who in many cases are the breadwinners in rural communities. With several catering groups already operational in the Free State, KwaZulu-Natal and Limpopo, the CSIR intends to ultimately extend the project to all nine provinces. The Deputy Minister of DACST, Ms Brigitte Mabandla, described the Indigenous Foods project as a major milestone - not only in the upliftment of South Africa's rural communities, but also in the government's commitment to eradicate poverty throughout all communities in South Africa.

### **Tsilitwa community crosses the digital divide**

Progress by the CSIR-Tsilitwa partnership in bringing information and communications technologies (ICT) to this Eastern Cape community in the deep-rural mountainous Qumbu district was praised by President Mbeki during a visit to the community in October 2001. Applauding the community's vision and its sense of ownership of the project, he also commented on the milestones achieved and highlighted the manner in which ICT is profoundly changing the lives of the Tsilitwa community through improved health care and education, and sustainable economic development. The CSIR is the leading partner in this DACST Innovation Fund project.

### **Innovative air-cooler**

Providing effective cooling in the hot, deep mines of South Africa is critical to the safety of the workforce and productivity of the mining operation. Previous research into the necessity to re-cool ventilation air in ultra deep stopes concluded that there would be little benefit in introducing additional free water into a stope panel for cooling, and that any additional water used for this specific purpose should be contained in closed-circuit air coolers. As a result, the CSIR has developed and manufactured an in-stope air cooler and prototype. The air cooler represents a vast improvement over previous technology, featuring a significant increase in the cooler duty to mass ratio and a more compact design.

### **Justice Footprint Project**

The CSIR Crime Prevention Centre is leading a project team to conduct the right-sizing and development of a zero-based budget for the Department of Justice (DoJ). The project team operates as a consortium comprising the CSIR, Business Against Crime and Ernst and Young, as well as a consultant economist. The project is establishing a demand and supply analysis of the services of the DoJ and applying this on a Geographic Information System so as to redraw the "Justice Footprint" of South Africa to better deliver accessible and equitable justice in line with the departmental and constitutional mandate. The modelling process includes the investigation of innovations designed to improve service delivery and provide cost-effective alternatives to traditional solutions.



The CSIR team responsible for the development of an information system to assist in fighting illegal vehicle trafficking

### Combating illegal vehicle trafficking

The CSIR has developed an information system to assist in fighting illegal vehicle trafficking through providing timeous management information for the southern African regional vehicle clearance process. The system manages the entire process from new certificates dispatch to designated offices, actual certificate issuing to generation of audit reports. The information system was officially handed over to the Southern African Regional Police Chiefs Cooperation Organisation (SARPPCO) in February 2002. SARPPCO has 12 member countries: Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. In an effort to combat increasing cross-border and international vehicle theft, SARPPCO members agreed to standardise vehicle clearance certificate issuance. Specially designed certificates were originally developed by the CSIR some 18 months ago and successfully implemented in all member countries.

### Creating safer living environments

The CSIR has been active for a number of years in the field of crime prevention through environmental planning and design, focusing on the planning, design and management of the physical environment in order to reduce crime and create safer communities. Commissioned by the South African Police Service (SAPS), the CSIR has compiled two manuals aimed at improving local level crime prevention. A method has also been developed to facilitate people-driven environmental crime prevention. This entails a participatory workshoping process that allows community groups to become involved in identifying crime problems in their neighbourhoods and provides them with the opportunity to be actively involved in developing, and even implementing, appropriate responses.

### Cultureware: enabling Digital Culture

Cultureware - a DACST Innovation Fund project with the CSIR as main partner - focuses on new media productions technology and processes (digital formats and exhibitions, documentaries and interactive stories) for South Africans, in particular historically

disadvantaged cultural groups. The mechanism supports a production process methodology, with guidelines and checklists in an Internet-accessible Digital Facility. The Cultureware system uses contemporary software development practices and technologies. The CSIR with consortium partners SA Tourism, WESGRO and the University of Fort Hare, completed a multimedia CD on San Mythology with the Northern Flagship Institute. Promoting San rock art from the National Cultural History Museum, the CD offers an interactive learner's adventure story and factual information for educators.

### Safety net improves support in mines

Close to 25% of fatal rockfall accidents involve less than 2 tons of hangingwall rock; this may be a larger percentage in the case of non-fatal injuries. The CSIR has designed a safety net to provide improved areal support in rockfall and rockburst-prone mines. The safety net has been shown to have strength in excess of 2 tons and supports up to 85% of the exposed hangingwall. Hung between four elongates, as close to the hangingwall as possible, the net is readily transportable, easy to install and reusable wherever temporary and/or permanent elongate support is used.



### Empowering mine employees through ICT

Information-capturing requirements have increased significantly in the mining industry, both from legal and operational viewpoints. Most of this information must be generated by the frontline supervisor for input into the mine's main information system. Software specially developed for the standard PDA (personal digital assistant) streamlines information capture, flow and interpretation, and reduces the workload on the mine supervisor. Other advantages include considerably faster communication of data collected, which can be critical in effective hazard control. A particular feature of the software is its platform independence. Since it is web-based, the data is easily transferable from the PDA, to the main mine information system and to the intra/internet.

### Database to assist in combating child abuse

The CSIR Crime Prevention Centre is leading a project team to perform a skills audit and develop a database of volunteers so as to empower them to contribute effectively and appropriately to the prevention of child abuse. The database will also include details of organisations accredited to recruit, train and manage volunteers in the sector. This project is being undertaken in partnership with the:

- Crime Resources Research Centre, supported by DACST
- National Plan of Action on the Rights of the Child
- Sexual Offences and Community Affairs component of the National Prosecuting Authority
- Social Crime Prevention component of the SAPS
- Department of Social Development.

### Integrated Mineworkers Compensation System developed for Department of Health

Partnering with black economic empowerment ICT company, Molepe Consulting, the CSIR is in final-phase development of an integrated mineworkers compensation system. It aims to improve efficiency and effectiveness of compensating mineworkers suffering from acute pulmonary complaints, or beneficiaries for death or disability compensation. The system rationalises and combines ICT systems of the Department of Health's National Centre for Occupational Health, the Medical Bureau for Occupational Disease and Compensation Commissioner for Occupational Disease, with benefits of faster claim turnaround time and better traceability, enhanced reliability and a single entry point. It eliminates manual system pitfalls, overcomes the obstacle of physical separation between users and offers greater security against fraud. The web-based system automates the process through electronic workflow and uses a unique combination of commercial technology and a re-usable platform based on Enhydra Open Source technology.

The CSIR Team responsible for developing an integrated mineworkers compensation system



### Support for labour-based road construction and contractor development

The CSIR is involved in a number of projects supporting labour-based road construction and contractor development, including a poverty relief project in the Eastern Cape, which will provide employment for approximately 800 people at the peak of the project. Two labour-based construction projects at Botrivier and Elandsbaai in the Western Cape involve the construction of streets using labour-based methods, incorporating an emulsion-treated base and bituminous seal. The CSIR is also closely involved in the Khubakhi programme, run by the Gauteng Department of Public Transport, Roads and Works. This programme is directed at the development of contracting enterprises owned, managed and controlled by emerging contractors. It promotes the holistic, progressive development of emerging contractors within an enabling environment, while still providing exposure to real construction-related issues.





### Boosting entrepreneurial activity in the North West Province

The North West Department of Economic Development and Tourism SMME Support Services has developed - in partnership with the CSIR - a provincial five-year Strategic SMME Plan. This strategic plan recognises that a network of Entrepreneurial Support Centres (ESC) will form an integral part of the empowerment and enabling environment for new and existing local entrepreneurs. These ESCs are empowerment incubators with support processes and networks aimed at (but not exclusively for) manufacturing SMMEs. Working in partnership with the North West Government, the CSIR has currently established a network of four ESCs in the various regions of the NW Province, with a fifth ESC focused on specific sector needs and advantages of the NW Province scheduled for implementation. Current ESCs are located in Mogwase (servicing the Greater Rustenburg region), Orkney (servicing SMMEs of the southern region), Ga-Rankuwa (servicing the eastern region) and Mafikeng (servicing the central region). The Bophirima region has elected to receive micro enterprise support. Two Community Production Centres implemented in partnership with the Mineworkers Development Agency service this region.

### Weaving magic with mohair

Unique mohair items and a continuously evolving product range for local and overseas markets characterise offerings from two Port Elizabeth-based mohair-weaving businesses, soon to be incubated at the CSIR. With 12 beneficiaries each, the Ubumbano group in the Red Location Township and the Gqebera group in Walmer Township function as an integral part of the broader community, as individual boards of trustees comprise representatives from the CSIR and the community, local councils, business partners and other role players. The incubation period ensures specialised training in weaving, business skills, heritage awareness, market orientation and quality assurance for these SMMEs to meet future market needs. For each group, a trained community facilitator provides leadership and project delivery; business skills training for these facilitators was sub-contracted to a local organisation, COMSEC. All 24 weavers attended a four-week weaving course by Khotso Weavers, a Port Elizabeth-based black SMME.

### Northern Province Special Craft Project benefits rural crafters

One hundred and forty-one rural crafters from seven different groups in the Northern Province are the recipients of a special craft project that has enhanced and added value to remarkable traditional skills. DACST facilitated the Northern Province Special Craft Project, funded by the Department of Environmental Affairs and Tourism (DEAT) Poverty Relief Fund. The special project concept relies on utilisation of local service providers and subcontractors, with the CSIR's Centre for Fibres, Textiles and Clothing the main implementation agent for the project. The process followed takes cognisance of skills level and current work within communities, and guides crafters to sustainable enterprise activity. Concepts such as quality control, exposure to South African markets and events participation are also introduced. To date, Bahloki Basketry (grasswork for interiors); IFA (contemporary Venda textiles); Makosha Messages (focused Tsonga design); Makulele Craft, Guesthouse and Exhibition Centre; Minceka White and Minceka Traditional (adaptations of traditional dress) Mtititi Magic (Tsonga textiles redefined); Ngove Nappa (innovative leather designs); Mdavazi (contemporary Tsonga jewellery) and Twananani Textiles (contemporary textile printing) have been established.

### Seeds for a better future

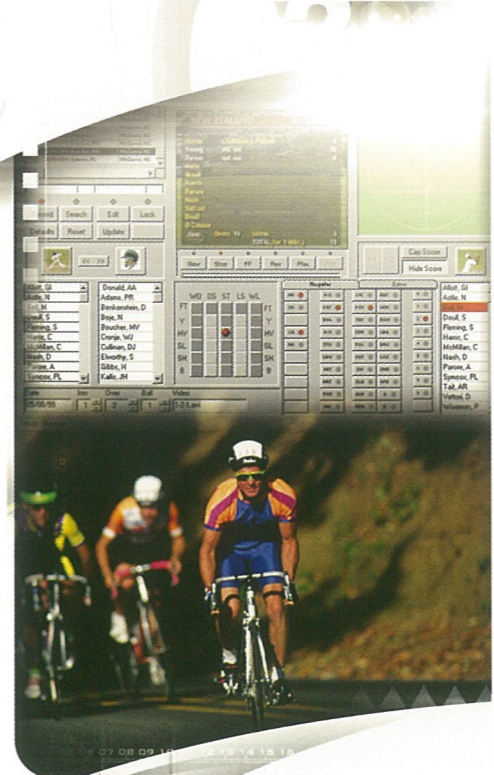
Successful cultivation of trees is dependent on timeous and ready availability of viable seed. An innovative CSIR project in the Mpumalanga and Limpopo Provinces is assisting rural communities to manage seed orchards. Training is important in the technology transfer to the communities: 16 people have benefited from a basic business skills course, presented by WiGG, which was subcontracted by the CSIR. To date, two Section 21 companies are registered: Soeknog Seed Project located in Bushbuckridge, Limpopo, and Phumulani Tree Seed Company at Mataffin in Mpumalanga. Inkhukhu Farmers Corporation cc, trading as Underberg Seed at Shongwe Mission near Schoemansdal, Mpumalanga, is also being supported by this project. This project has meant employment for 11 temporary labourers at Shongwe, while eight permanent positions are being filled. As seed orchards at Bushbuckridge and Mataffin progress, another three permanent posts and at least 20 more temporary labourers will be employed.

### Sports technology

In the highly competitive environment of international sport, where fractions of a second or millimetres can mean the difference between winning or losing, the CSIR Sports Technology Centre has carved a niche for itself by providing sport technology to enhance performance levels and improve competitiveness. The Centre recently used four strategically placed high-resolution digital cameras to help Jacques Freitag, the South African senior high-jump record holder, set a new Africa record. By analysing images of the jumping motion from different angles, weak points could be pinpointed and a programme devised to improve Freitag's performance.

In another exciting project, the CSIR used the worldwide GPS system in a breakthrough initiative this year to locate and track the position and velocity of the main cyclists during the 25th Cape Argus Cycle Tour as part of DStv's SuperSport broadcast of the race. The time difference between two competitors in the race could also be determined, using software specifically designed by the CSIR.

The CSIR has one of only two virtual reality laboratories in the world used to develop sports applications. The Head Mounted Display is a virtual reality helmet worn by a player or athlete to experience a simulated in-game situation. The technology is designed along the same lines as flight simulators used by pilots and is specifically intended to hone decision-making skills under pressure. The Centre also has a proven track record and software programmes specifically designed to analyse the strategies and tactics of sport, in particular, cricket, netball, hockey, soccer and rugby.



### PLANET

### Surveillance programme for Durban Unicity

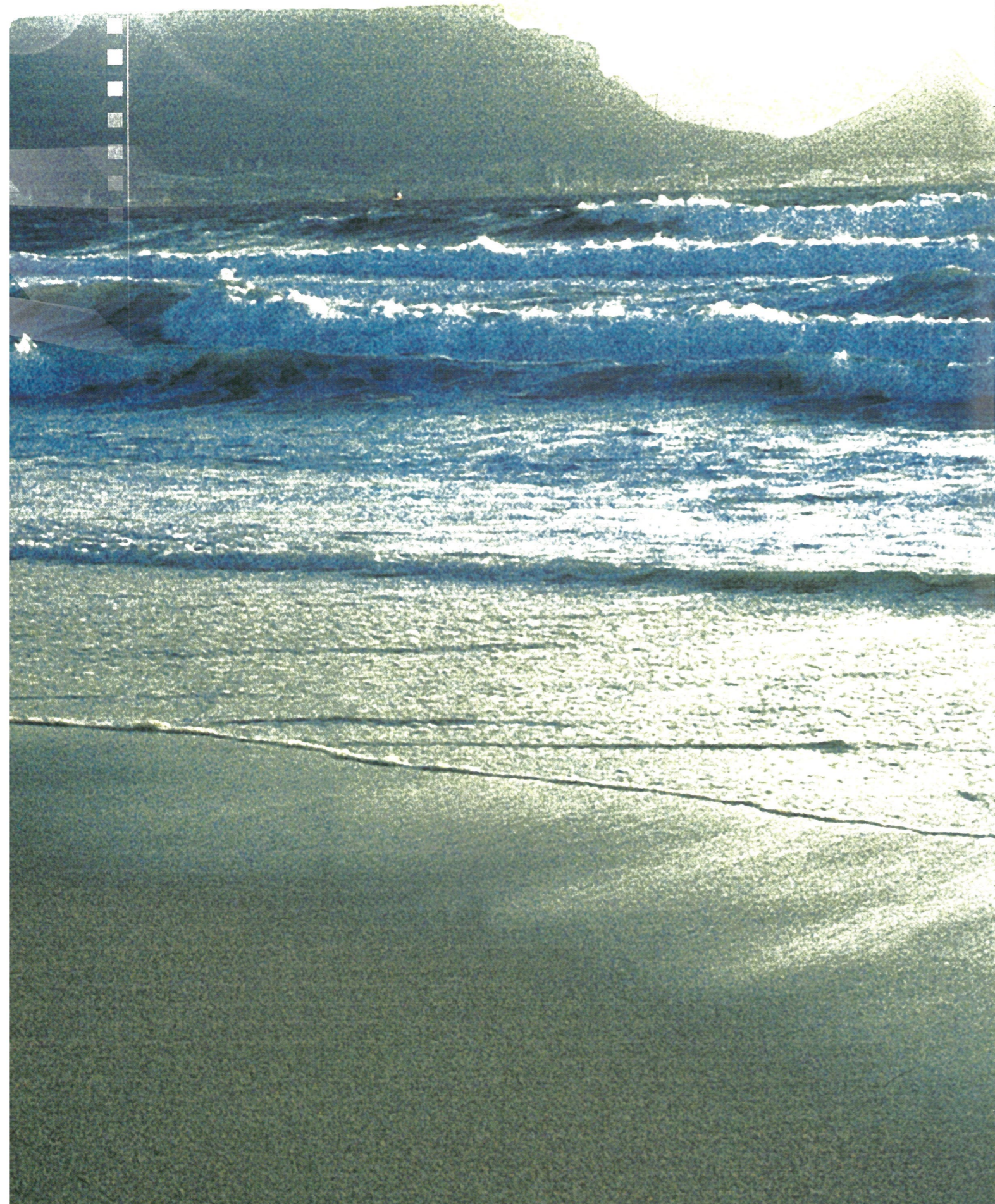
Since 1964, the CSIR has been commissioned by Durban's Medical Officer of Health to provide an independent surveillance of the sea and beaches in the City of Durban. The Durban Unicity, which now unifies municipalities between Tongaat River and Scottburgh, contains additional bathing beaches with potential as international tourist destinations. The CSIR developed a microbiological surveillance programme to provide decision support to Durban Unicity for the rational management of its beaches as safe recreational amenities. The surveys also provide baseline data for a beach amenity classification system and provide environmental information to assist Unicity beaches in the successful application of Blue Flag principles. This international incentive scheme encourages local authorities along the coast to manage their beaches in an environmentally responsible manner.

### CSIR/WITS joint venture supports Mining, Minerals and Sustainable Development

A joint venture between the CSIR and the University of the Witwatersrand has been formed to lead, manage and coordinate the southern African component of Mining, Minerals and Sustainable Development (MMSD), an international project aimed at identifying how the mining and minerals sector can best contribute to the global transition to sustainable development. Through broad stakeholder engagement, MMSD southern Africa has identified five main focus areas for research:

- small-scale mining;
- HIV/AIDS and mining;
- mining and society (and issues of local development);
- managing mineral wealth; and
- mining and the environment.

MMSD southern Africa will not only provide input into the global MMSD process, but will also identify practical ways in which the southern African minerals sector can contribute to the region's sustainable development goals.

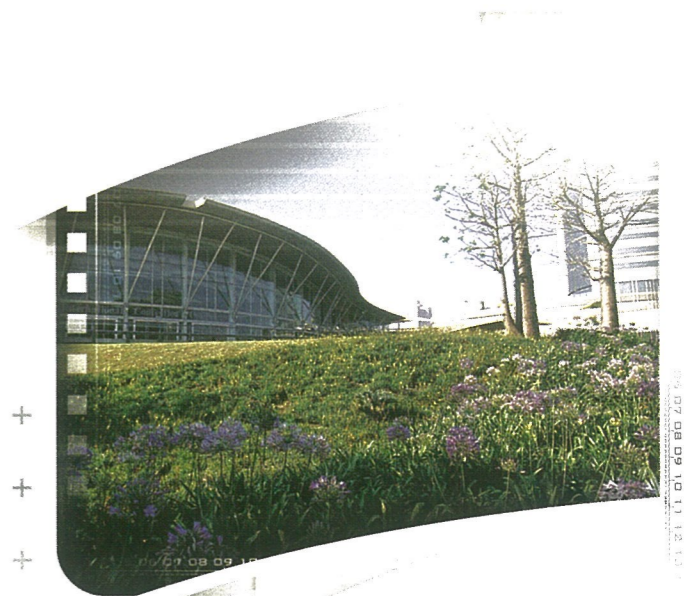


### **State-of-the-Coast Report contributes to development of Coastal Zone Strategy for Cape Town**

The CSIR was contracted by the City of Cape Town to produce a State-of-the-Coast Report to assist in the formulation of a Coastal Zone Strategy. The report describes the state of the coast in terms of five themes: coastal processes and dynamics; marine water quality; terrestrial ecosystems and biodiversity; human use and infrastructure; and economic potential. The report also includes a description of the areas where the economic value of the coastal zone is being under-utilised or decreased. The information contained in the report provides a basis to inform the next stage of sectoral planning, which is the development of a Coastal Zone Strategy for the City of Cape Town.

### **Conservation plan for Greater Addo Elephant National Park**

The CSIR, in cooperation with the University of Port Elizabeth, developed the conservation plan for one of the most exciting conservation projects currently underway in Africa, the expansion of the Addo Elephant National Park in the Eastern Cape into the Greater Addo Elephant National Park, a biodiversity and tourism flagship. The proposed expansion of the park focuses on the unsurpassed ecological diversity of the region and will incorporate six of South Africa's seven terrestrial biomes, ranging from arid and semi-arid Karoo areas to coastal forests, dune systems and a large marine-protected area proposed in Algoa Bay. The aim of the integrated conservation plan and implementation recommendations is to support the medium-term decision-making processes of South African National Parks.



*The Green Buildings for Africa Programme aims to mitigate the environmental impact of buildings*

### **Total solutions to waste problems**

The CSIR Centre for Integrated Waste Management provides appropriate, innovative and integrated solutions to waste management. Recent successes in this field include:

- a project for the Malawian government to assess local waste management systems for immunisation waste;
- product development from waste materials, such as the use of hemp waste from the textiles industry for building products, recycling of building rubble and the re-use of waste materials and by-products in road construction;
- a study to investigate the possibility of producing ethanol and biofuel from agricultural wastes;
- Coaltech 2020, a collaborative initiative between mining houses, Eskom, labour, government, universities and various research and funding organisations, which aims to quantify properties of typical wastes from coal mining and processing;
- a UNESCO project to assess the environmental impacts of industrial waste on receiving environments in Swaziland; and
- the Green Buildings for Africa programme, a voluntary commercial mechanism for the property industry to mitigate the environmental impact of buildings.

### **Environmental Impact Assessment (EIA) assists in proposed expansion of aluminium smelter**

When the Hillside Aluminium Smelter, a wholly owned subsidiary of Billiton plc in Richards Bay, recently proposed expansion of its current operations, the company appointed the CSIR to undertake an EIA to determine the environmental and social acceptability of the proposed expansion. The EIA process aimed to ensure that the concerns of stakeholders were addressed in detail through technical studies. Through these efforts a number of concerns regarding the proposed development were raised, which were addressed through technical studies dealing with air quality, water quality, socio-economics, macro-economics, traffic and transportation, waste management, noise and aesthetics. On review of the project findings, the KwaZulu-Natal Department of Agriculture and Environmental Affairs approved the environmental go-ahead of the development.

## PROSPERITY

### Community-based liquorice extraction

A successful community-based liquorice extraction plant has been established at Dysseisdorp in the Western Cape, using CSIR technology. The plant has become a self-sustaining profitable company, which will directly benefit the community in which it is located. Long-term purchase contracts are in place for the full production capacity of the extraction business. The company extracts liquorice concentrate from the roots of the naturalised liquorice plant (*Glycyrrhiza glabra*) occurring along the banks of the Oliphants River. The CSIR developed the technology for this extraction, compliant with international standards, and was involved in establishing the infrastructure in Dysseisdorp to successfully conduct this business.



CSIR President and CEO, Dr Sibusiso Sibisi, with Dr Ben Ngubane

### A feast of ICT offerings for Minister Ngubane

Minister of Arts, Culture, Science and Technology, Dr Ben Ngubane, visited the CSIR during August 2001 to view a number of its ICT projects and initiatives. The CSIR projects showcased during the visit illuminated its work on rural connectivity in Africa, the digital packaging of cultureware and future technologies that will shape the ICT industry in this region.

### Battlefield Electronic Aid

The CSIR has developed a Battlefield Electronic Aid to assist section or platoon leaders in applying complex engineering formulae on the battlefield with skill, speed and accuracy. The project entailed programming a number of demolition formulae used by the SA Engineer Corps (SAEC) into a Personnel Digital Assistant. These formulae were converted into Embedded Visual Basic programmes and condensed from twelve steps into four: task, dimensions, explosive required and application. In addition to a programme showing explosive pressures to assist in determining safety distances, documents and programmes relevant to the SAEC were also included.

### CSIR-developed portal supports product developers and inventors

The CSIR's National Product Development Centre (NPDC), supported by DACST, has developed a South African product development portal to assist local product developers and inventors. The cost-effective and efficient development of new products is an essential requirement for global competitiveness and the growth of the South African manufacturing industry. The web-based, interactive tool, at [www.productdevelopment.co.za](http://www.productdevelopment.co.za), provides information on the full new-product development process. Direct access to expertise and resources supporting competitive product development is complemented by topical and relevant content. It also offers a password-protected collaboration platform for service providers subscribing to the national resource network. Enhanced by easy navigation and effective search functionality, the portal contains links to local and international resources.

### Building houses with earth blocks

Following a number of sponsored CSIR research projects to investigate the upgrading of traditional building methods, using handmade earth blocks, Agrément South Africa granted an Open Certificate to the Bitumen Emulsion Stabilised Adobe (BESA) Building System. Agrément Open Certificates relate to non-proprietary and indigenous technologies, which are normally compatible with the developmental needs of South Africa. These technologies make use of local skills, labour and resources and depend on a labour-intensive construction process. The CSIR projects, funded by AusAID and the British High Commission's Development Section, also culminated in the publication of a book, 'Building Houses with Earth Blocks'. This publication will help rural communities to upgrade their traditional housing at the least possible cost and without the need for retraining.



### First high-resolution satellite imagery received in South Africa

The first directly acquired high-resolution satellite imagery over southern Africa was received at the CSIR Satellite Applications Centre from the EROS satellite from mid-2001. With a resolution of 1.8m, significantly more detail about the surface of the African continent is now being captured by satellite and made available commercially in near-real time to the local market. Eros data have since been used for the compilation of accurate street maps for African cities; disaster monitoring; insurance verifications and urban development planning.

All Eros images received are added to an online database from where electronic browsing and purchasing are possible. By virtue of so-called oversampling techniques during acquisition and processing, the resolution of imagery from EROS can be improved to 1m, if required.

### Helping South Africa's municipalities to plan for the future

As the national department responsible for providing guidance and support for municipal planning, the Department of Provincial and Local Government (DPLG) identified the need for an information system to assist municipalities with Integrated Development Planning. Supported by CSIR technology and funding from the British Department of International Development, the DPLG subsequently developed a system known as PIMSS.NET, which aims to provide municipalities with the required support for planning, budgeting and performance management. The CSIR was responsible for national implementation of the system, which entailed installation and training at more than 25 district municipalities countrywide. PIMSS.NET has been well received by users and feedback has indicated that the system is both user-friendly and useful. The CSIR team is already working on future enhancements to the system.



Detail of Port Elizabeth harbour, South Africa, captured by Eros. Such imagery is useful for planning, mapping and management activities

### Spearheading the growth of the local biotechnology industry

A joint initiative between the CSIR, the Innovation Hub (a partnership between the CSIR, the University of Pretoria and the Gauteng provincial government) and AfricaBio has led to the establishment of the eGoli Bio-incubator, which aims to stimulate the economic development of the biotechnology industry in South Africa. It will serve as a 'nesting place' for start-up ventures, and will be located at Pinelands in Johannesburg, with funding through the Godisa Programme. The goal will be to support at least 20 tenants and eventually provide employment for about 60 people. The bio-incubator will support the development of new technology-based firms through the use of shared facilities, the provision of core training in business management, assistance in the preparation of the business plan and access to information.





The CSIR's Imbiza Multi-purpose Fine Chemicals Plant - a turning point for the local fine chemicals industry

construction in the developing world. A discussion document has been published, identifying barriers to sustainable construction such as the lack of capacity in the construction sector, an uncertain economic environment, lack of accurate data, poverty and low urban investment, lack of integrated research and entrenched colonial codes and standards. The document also suggests a range of actions to address these issues, aimed at the research community, national and local government, the construction industry, non-governmental organisations and the public.

### Facilitating SMME development

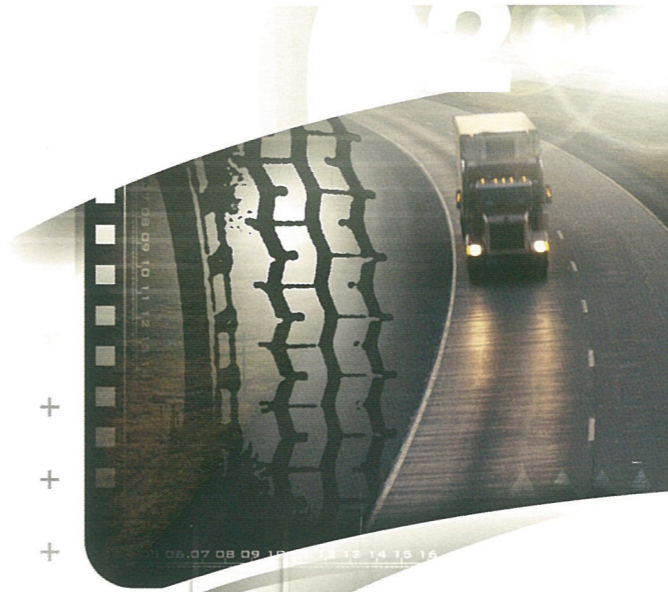
The CSIR has put together a Development Process to assist SMMEs which account for approximately 60% of all employment in South Africa and contribute 40% to national output. SMMEs are often the vehicle by which entrepreneurs from all socio-economic levels gain access to economic opportunities. Particular aspects addressed are establishment of sustainable manufacturing enterprises; implementation of a range of competitiveness improvement services to enterprises; and implementation of national SMME support programmes. The SMME Development Process model forms an integral part of the CSIR's overall job creation drive and can be applied to any innovation by the experienced team at the CSIR Enterprise Development Centre. Several SMMEs have participated in this process and are now established in the mainstream economy.

### Expansion at Imbiza Multi-purpose Fine Chemicals Plant

The CSIR's Imbiza Multi-purpose Fine Chemicals Plant has undergone major enhancements with the installation of vibrating plate extraction columns (VIPEX™) and a range of high-pressure gas-liquid (SAFOX™) reactors employing highly efficient gas and liquid loop circulation technology. The plant was acquired by the CSIR last year and represented a major turning point for the South African fine chemicals industry. Potential local manufacturers of fine chemicals previously had no option but to contact overseas toll producers to obtain quantities of trial product for market testing and regulatory approval. The absence of such a local toll facility has been a major stumbling block in the development of a fine chemicals industry.

### Sustainable construction in developing countries

The CSIR is closely involved in Agenda 21 for Sustainable Construction in Developing Countries, a project commissioned by the International Council for Research and Innovation in Building and Construction and the United Nations Environment Programme's International Environmental Technology Centre, to identify the key issues and challenges facing sustainable



### Integrated freight and logistics database

The CSIR and the Road Freight Association have joined forces to produce a web-based, integrated freight and logistics product to support the transportation industry in southern Africa. Known as Iflo, the site contains the following:

- freight information and decision support, forecasts and fleet management;
- logistical tools, local and international expert analysis, leading-edge research and technical articles; and
- online subscription, brokerage, tools and notice board.

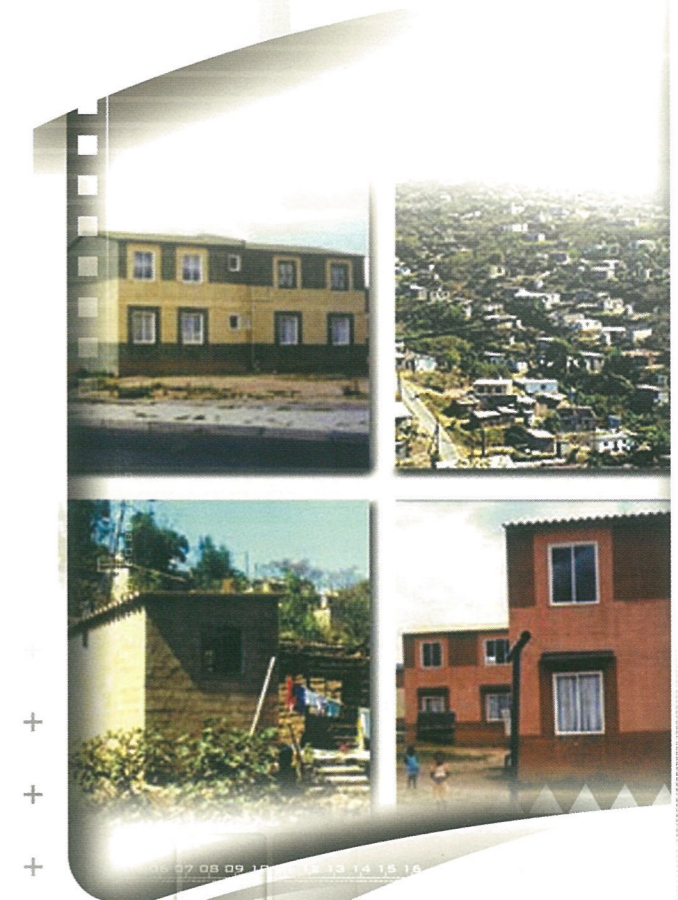
Iflo consists of two distinct parts, the first being information-sharing, based on an annual subscription fee. The second part consists of an e-commerce-enabled catalogue, from which clients can purchase papers, products, forecasts and tools developed by the CSIR's experts in the freight industry. Funds generated through this initiative are re-invested by the CSIR in market-driven research and the development of freight products for the industry.

### LobSight improves accuracy of indirect weapons

The CSIR has designed a sight for the 40 mm Automatic Grenade Launcher (AGL), using the commercial-off-the-shelf (COTS) equipment concept, to assist soldiers during indirect aiming. With a range of up to 2 km, the AGL can be used on targets that are not visible. With its advanced technology, fast time-to-market and fair cost, the integration of COTS equipment has improved the procurement of military electronics hardware and software. The advantage of a computerised sight system is that it could help in reducing both human errors and training time spent on difficult co-ordinate calculations.

### IDEA assists provinces in housing planning process

The CSIR, in association with the National Department of Housing, has developed an information CD called IDEA (Information on Development and Economic Activity) as a user-friendly and adaptable tool. IDEA can be applied at all levels of government to facilitate informed decisions on funding allocations and the location of housing projects according to integration and sustainability principles. The focus of IDEA is in line with renewed government commitment to economic growth, job creation, increased infrastructure provision and looking after the poor.



### Facilitating funding guarantees for SMMEs

A contract between the CSIR, the Department of Trade and Industry (DTI) and Khula Enterprise Finance Ltd for implementation of the Khula Technology Transfer Guarantee Fund has reaffirmed the CSIR's role in providing assistance to SMMEs. DTI agency Khula guarantees financial institution funding for SMMEs. The CSIR evaluates technology requirements of applicant SMMEs, which are crucial to the business plan submitted during fund applications. Drawing on its expertise in evaluation techniques and its wide range of technical capabilities, the CSIR has promoted and refined a sound, flexible application process to ensure fair and realistic evaluation of technology needs, applied in conjunction with personal interviews. Each applicant whose technology is approved receives CSIR certification, which is a requirement for Khula to guarantee the loan.

# Global Successes



## Introduction by Dr Reinie Biesenbach Head: CSIR International Business Development

The year under consideration has been both exciting and dramatic. The tragic events of September 11th had a direct, adverse impact on the CSIR's international initiatives. Some ventures had to be postponed and may require passage of time before they can be revitalised. In addition, the dramatic fall in the value of the Rand against the Dollar made our international activities more costly, yet at the same time more attractive to foreign customers.

International business development remains a critically important element of the CSIR's growth strategy. Our international activities should be seen in the context of the globalisation of R&D and the need to have relevant international networks to optimise the CSIR's impact on South Africa. Sustainable real growth in external sales, locally, regionally and internationally, ensures the organisation's relevance and impact in South Africa and the region. This enables the CSIR to support sustainable development and economic growth in the context of national priorities and to contribute to the African Renaissance.

The CSIR's fastest growing source of income is from the international sector (including Africa), with five-year compound growth in this sector reaching 24,2% in March 2001. During the year under consideration, the CSIR posted foreign sales of R91,6m, representing an increase of almost 45% over the previous year.

## Building INTERNATIONAL networks and alliances

### International links

The CSIR has established formal relations with, inter alia, TNO (Netherlands), CNRS (France), IRIS (Sweden), NIST (USA), DTI (Denmark) and the Fraunhofer Gesellschaft (Germany). Links have also been established with CSIRO (Australia) and SRI International in California.

The CSIR's portfolio of relationships with leading multi-national corporations (MNCs) is constantly being enhanced. MNCs are the primary players in the world's most dynamic industries today and the driving force behind the global economy; 51 out of the 100 largest economies in the world are MNCs. CSIR partners include Boeing, Saab, Volvo, DaimlerChrysler, Shell, Rolls-Royce, the French aerospace company Snecma, and Siemens.



## Strengthening China/SA relations in metrology

In line with the government initiative to strengthen trade relations with China, the National Metrology Laboratory (NML) signed an MOU with China's National Institute of Metrology in December 2001. The MOU provides a mechanism for scientific and technical cooperation in metrology between the institutes, to jointly promote and improve their measurement capabilities in metrology. The MOU also makes provision for the exchange of scientists for collaborative visits, cooperation projects aimed at the development of reference standards and comparisons of national standards.

## Rolls Royce Corporation chooses CSIR Centre of Excellence

The CSIR's Engineering Design Business Area has become a designated Rolls-Royce Corporation (RRC) preferred Centre of Excellence. The CSIR team is undertaking structural analysis of the T56 Series III turbine engine, following on the successful conclusion of a joint project between the RRC, the CSIR, the South African Air Force, the United States Navy and the National Research Council in Canada. The project entails recalculating the life limit on the hot end of the turbine engine. The CSIR portion of the work has required generation of 2D and 3D CAD models of the entire turbine, followed by finite-element stress analysis under several typical duty cycles. These results were provided to RRC, who performed low-cycle fatigue life calculations, based on thermal and stress results, combined with the results of its extensive materials characterisation programme.

## Development of zinc alloy for automotive applications

Existing alloys for automotive under-bonnet components are reaching their high temperature strength limit as a result of increasing operating temperatures and competition from other materials such as plastics and aluminium. To address this problem, the CSIR is currently developing a more creep-resistant zinc alloy. The first phase has involved the generation of experimental data to determine the effects of different alloying elements on creep strength. Thirty-six alloys have so far been die-cast to produce thin test specimens for mechanical property evaluations. Data generated will subsequently be used to design an improved alloy. The project is funded through the US-based International Lead Zinc Research Organisation and involves a network of local and international partners.



### Protection against land-mine blasts

Encounters with self-forming fragment TMRP-6 mines in the Balkans led to the development of a composite armour plate to protect the hull of mine-resistant vehicles. The patent of the plate, known as the TMRP-6 kit, is owned by Mechem and the CSIR has the rights to manufacture and install the kit. This unique anti-mine device will be fitted by the CSIR to the hull of the Scarab armoured scout and liaison vehicle that will be shipped to South Africa by Alvis for blast trails. All CSIR tests on the TMRP-6 kit are conducted according to international military standards. In addition to tests on the Scarab itself, a mannequin is fitted to monitor the potential blast effect on the human occupant inside the vehicle. Eight of the fifteen Cougar vehicles currently operational in the Balkans will also be fitted with the TMRP-6 kit.



### Global Road Safety Partnership

The CSIR is closely involved in the Global Road Safety Partnership (GRSP), which aims to establish a partnership between business, civil society and government organisations dedicated to the sustainable reduction of road accidents, fatalities and injuries in developing and transition countries. Apart from implementing new demonstration projects, the strategy of the GRSP entails the sharing of lessons learned from ongoing projects and demonstrating that partnerships can be replicated and scaled up to regional and national levels. Participants include Drive Alive, DaimlerChrysler, the Association of Motorcycle Importers, the National Association of Automobile Manufacturers of SA, the Automobile Association of SA, 3M, the Rand Afrikaans University, United Distillers and Vintners, Shell, SA Breweries, the Medical Research Council and the KwaZulu-Natal Department of Transport.

### Agreement to house Russian satellite imagery

The CSIR Satellite Applications Centre signed an agreement with the Russian Aviation and Space Agency, Rosaviakosmos, to market and sell images obtained from Russian remote sensing satellites to the southern African market. The CSIR is now an official distributor of Russian remote sensing data captured over South Africa and a number of other countries in southern and central Africa.

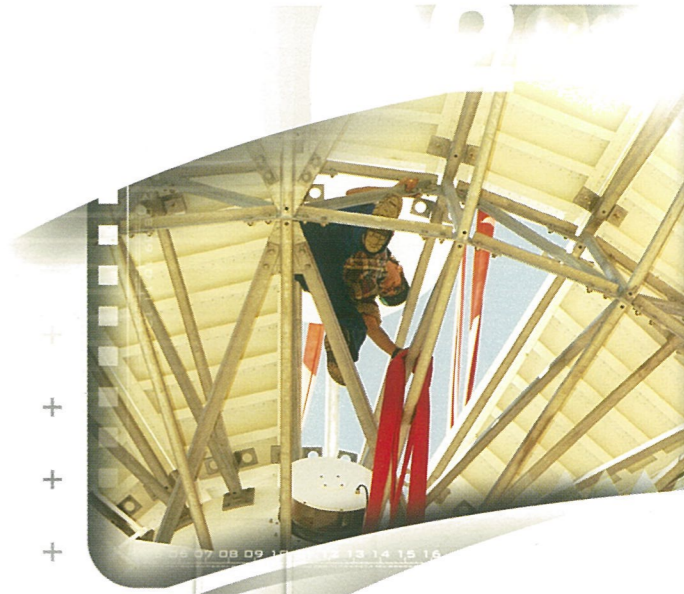


TMRP-6 kit top plate and bottom of hull, depicting minimal damage

### Supporting the global space industry from South Africa

Several new contracts marked the progress of the CSIR Satellite Applications Centre in becoming a preferred partner for the world's leading satellite manufacturers and operators in supplying Telemetry, Tracking and Command services over the region.

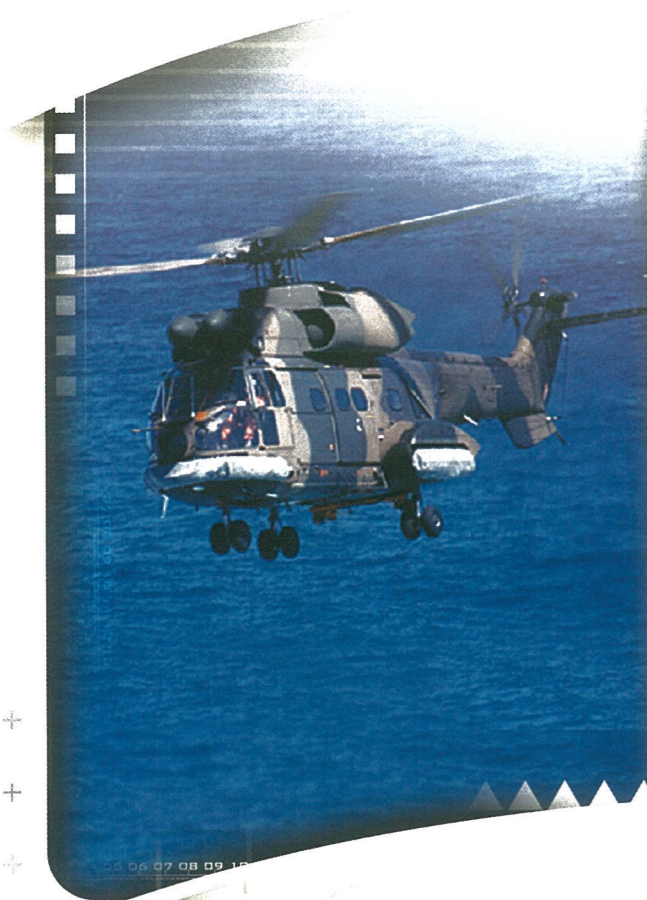
- Having successfully competed internationally for the support of the Spaceway satellite constellation under contract to US-based Boeing Satellite Systems, work began on the Spaceway Satellite Tracking Station during the year. The new 13 metre Ka-band antenna system puts the CSIR at the cutting edge of satellite support capability worldwide. The Spaceway I launch is scheduled for the last quarter of 2002 with the rest of the constellation following in subsequent years. Boeing Space and Communications also announced that the CSIR had been contracted to support the company's Delta IV launches.



- In a first contract with US-based technology giant, Lockheed Martin, it was announced that the CSIR was to render satellite ground support for the NASA Solar Radiation and Climate Explorer (SORCE) mission and Space Infrared Telescope Facility (SIRTF) mission. The CSIR will be a critical station specifically in the support of SIRTF spacecraft, as the station will augment NASA's Deep Space Network, comprising Canberra (Australia), Goldstone (USA) and Madrid (Spain).

- Other developments include the completion of a satellite monitoring station for Paris-based satellite operator, Eutelsat, and a new L-band antenna in support of an experiment onboard the French satellite, Stentor, to validate new real time and autonomous orbit determination techniques for geostationary satellites.





### *Improving accessibility for people with disabilities*

The CSIR is taking the lead in an international research project funded by the British Aid Agency, DFID, to assess the access needs of people with various disabilities. The project, taking place in South Africa, India, Malawi, Mozambique and Mexico, will identify best practices from Europe, Latin America, India and southern Africa to produce guidelines for reducing mobility barriers. These guidelines will ultimately be used to inform governments, international funding organisations, planners and engineers of low-cost methods for improving accessibility for people with mobility difficulties in developing countries. The CSIR is the technical leader of the project, with the Transport Research Laboratory of the UK responsible for overall project management. Collaborators include the Eduardo Mondlane University in Mozambique, the University of Malawi, Malawi against Physical Disabilities, the Central Institute of Road Transport in India, and Access Exchange International, USA.

### *CSIR infrared stealth technology up to international standards*

In the last two decades, up to 90% of military aircraft losses could be attributed to infrared missiles. The CSIR has developed a Passive Infrared Suppression System (PIRSS), which greatly reduces the likelihood of missile lock-on, improves the performance of active countermeasures such as flares and curtails missile tracking rate ability. Thales, one of the largest military technology companies in the world, has contracted the CSIR to supply the French Ministry of Defence with a first-generation PIRSS for evaluation. Although the CSIR's PIRSS technology is already in the third generation of development with much enhanced performance, Thales opted to acquire a first-generation system due to its 'off-the-shelf' availability.



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# Global Successes



*Contributing to growth and development in AFRICA*

## **Introduction by Berenice Lue Marais Head: CSIR Africa Business Development**

The CSIR Africa Business Development Unit leads and facilitates the CSIR's drive into Africa, utilising a three-pronged approach through its network of alliances, international development financing, and CSIR regional projects aimed at meeting identified needs through specific competences.

The New Partnership for Africa's Development (NEPAD) presents a significant opportunity for the CSIR to make a contribution to the development of Africa, and the CSIR has a key role to play in supporting the NEPAD process. As re-emphasized recently by the NEPAD, Africa's place in the world economy is largely defined by its natural resources endowment, i.e. minerals and agriculture. As a result, Africa's fate is linked to commodity prices and other political factors (such as competing interests among mining and commodity importers) associated with natural resources. However, natural resource endowment is not a sufficient basis for growth unless it is linked to the development of process technologies and their diffusion in the economy. African countries must mobilize scientific and technical knowledge available and apply it to the conversion and use of the continent's biological resources. Advances in biotechnology provide an opportunity for African countries to target the use of their biological resources in priority sectors such as agriculture and medicine. Mining and manufacturing provide further opportunities for beneficiation. Strengthening Africa's infrastructure and institutional capacity presents a key challenge for Africa, without which sustainable growth cannot take place. Building the capacities of the science and technology infrastructure along with skills development, technology transfer and targeted research and development projects is an enabler without which Africa cannot succeed.

The CSIR is well positioned to provide services to Africa in support of the African Renaissance and its delivery programme, the NEPAD. The combination of its scientific and technical expertise, its understanding of the African continent and its developing strategic relationship network with key African private, public, and development assistance sectors make the organisation an ideal partner to contribute to Africa's economic development through interventions, primarily aimed at the environment, ICT, infrastructural services and manufacturing. The CSIR is also contributing in other important areas emphasised by NEPAD, such as HIV/AIDS, health, peace and security and agriculture.

CSIR projects covered in Technology Impact 2002 illustrate the range of solutions provided to clients in the private and public sector: from policy, planning and monitoring actions to services and products for governments, supporting donors and private sector companies, linkages with donor organisations, capacity-building and technology transfer and SADC-related activities.

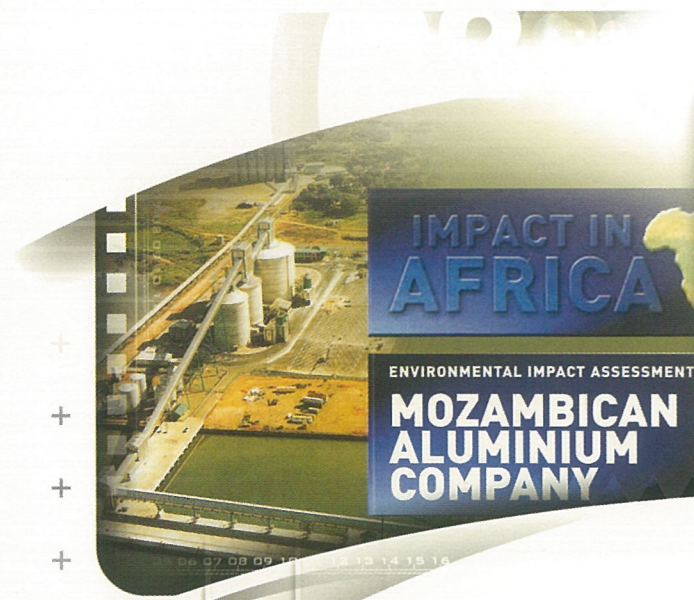


### *The CSIR works closely with international development agencies, such as:*

- World Bank (WB)
- European Union (EU)
- Danish Development Assistance (Danida)
- Danish Co-operation for Environment and Development (DANCED)
- Swedish International Development Cooperation Agency (SIDA)
- Norwegian Agency for Development Co-operation (NORAD)
- US Agency for International Development (USAID)
- German Technical Cooperation (GTZ)
- Japan International Cooperation Agency (JICA)

### *Strength through partnerships*

- The Industrial Development Corporation of South Africa and the CSIR have established a cooperation framework in areas of mutual interest, more specifically in the field of technical assistance applied to the development of projects in line with national, regional and the NEPAD priorities.
- An agreement between the CSIR and the Development Bank of Southern Africa facilitates cooperation between the two organisations in the field of technical assistance applied to the development of projects in the southern Africa region.
- The CSIR manages the Africa Regional Focal Point (RFP) of WAITRO (World Association of Industrial and Technological Research Organisations), an independent, international non-governmental network of 200 corporate research and technology organisations. The Africa RFP has 45 member organisations, representing 22 countries. Members are typically autonomous organisations with a brief to support industry, SMMEs and government with applied research and technology solutions. This initiative strengthens the Science and Technology base in Africa and is supported by DACST.

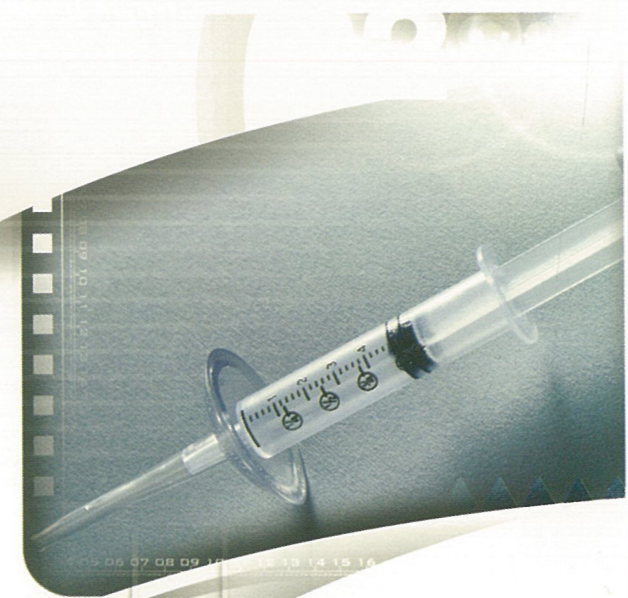


### **Environmental impact assessment for Mozambican Aluminium Company**

Mozal, the Mozambican Aluminium Company, is presently developing the second phase of a two-phase aluminium smelter project. The CSIR successfully completed a number of EIAs for the Mozal Aluminium Smelter and the associated Mozal Matola Port Terminal developments. The EIAs formed integral parts of the feasibility studies for both Phase 1 and 2 of the aluminium smelter and port terminal developments. The CSIR's assessments included extensive public consultation and assessment of aspects related to the regional economy, air pollution emissions, storm water release, traffic, noise, vehicle emissions, dredging operations and social impacts. The Mozal aluminium smelter project won the International Project Management Institute's prestigious 2001 Project of the Year award.

### **Developing safe waste disposal practices in Malawi**

Safe health care waste disposal is becoming a reality in Malawi, where the CSIR is assisting the local Ministry of Health and Population and the Bill and Melinda Gates Children's Vaccine Program in utilising appropriate technology, backed by training and equipment. Reusable syringes for immunisation pose an unacceptable risk of cross-infection. For this reason, the World Health Organisation and United Nations Children's Fund recommend modern disposable syringes. This project builds local capacity in safe collection and disposal of infectious sharp waste and will be replicated in other countries with per capita earnings below \$1000 per annum. The CSIR's track record in safe disposal of medical waste is based on field and laboratory assessments, and design of small-scale low-cost incinerators for under-served areas.



### **Jobs for Africa from sustainable food processing enterprises**

A unique CSIR project aimed at strengthening African food processing has made significant strides in Ghana, Senegal and South Africa, with a number of possibilities being investigated in Botswana and Mozambique. This USAID-funded project addresses job creation through the establishment and support of viable small enterprises based on processing agricultural produce. The project aims to source and provide marketing and technical knowledge to transform these enterprises into sustainable business operations. In South Africa, a sweet-making concern in Mpumalanga and a juice-making co-operative in the North Western Province are currently entering the commercialisation phase. In Senegal, the potential of indigenous juices for commercial export is being evaluated, while in Ghana, the CSIR is working with the local branch of an international non-governmental organisation on a tomato-processing project to produce concentrate from excess tomato production.

### **Joint research on low-volume roads in SADC**

A number of the most successful joint ventures resulting from the 1999 Memorandum of Understanding between the CSIR and the UK-based Transport Research Laboratory (TRL) have involved research on low-volume roads. More than 75% of South Africa's roads can be classified as low-volume roads, while an even higher percentage of roads within other SADC countries fall into this category. Joint CSIR-TRL projects during the past two years included the development of guidelines on environmental effects on low-volume road design and a series of SADC workshops on guidelines for the design, construction and maintenance of low-volume roads. In Botswana, a series of guidelines was produced to document donor-assisted low-volume roads research and development carried out in the country over the last two decades. Guidelines on materials location, technical audits and pavement evaluation have also been developed as part of this programme.

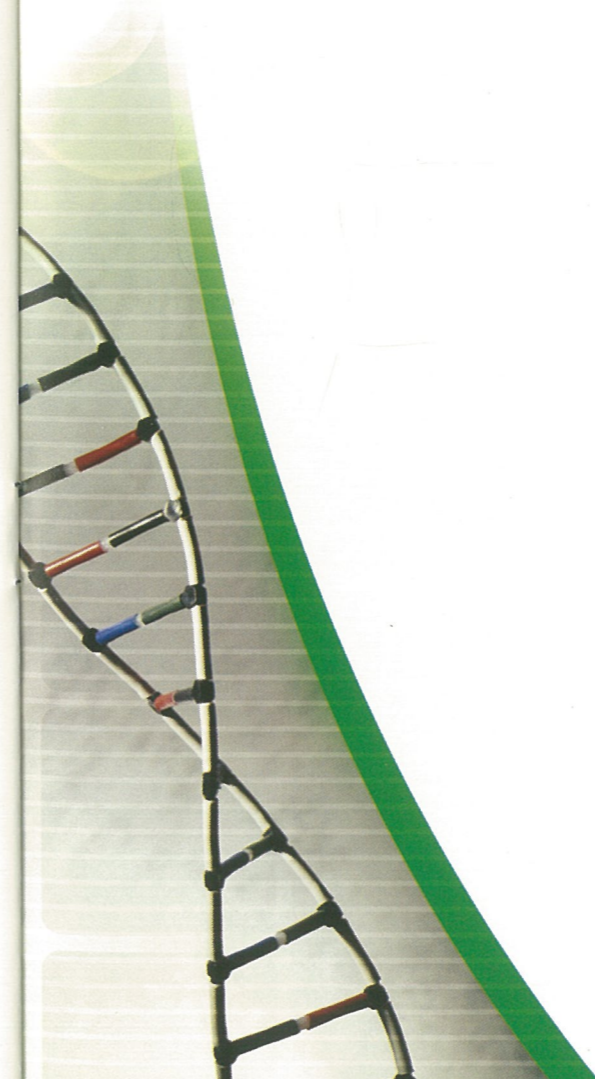
### **Making an impact in Africa through metrology**

- The National Metrology Laboratory (NML) continues to host the SADC Cooperation in Measurement Traceability regional coordinator activity and participates in the SADC Standardisation, Quality Assurance, Accreditation and Metrology (SQAM) programme. This programme is an essential component of the technical regulatory framework for the effective implementation of the SADC free trading bloc.
- The NML was awarded an international tender by the United Nations Industrial Development Organisation for the design and construction of a mobile metrology laboratory for Mozambique. The Automotive Industry Development Centre (AIDC), a Blue IQ initiative, has been appointed by the NML as the main partner in the project.
- The NML, in partnership with the South African Bureau of Standards and UNIDO, assisted in the establishment of Mass and Volume Laboratories in Maputo.

- An MOU with the Kenya Bureau of Standards (KEBS), signed in July 2001, provides a mechanism for scientific and technical cooperation in metrology to augment NML and KEBS measurement capabilities in physics and chemistry.
- The NML has been involved with other groups inside and outside the CSIR in the quality module management of the UNIDO Integrated Programme for Ethiopia. Activities focused on strengthening the operation of QSAE - quality, standardization and metrology - through a business plan and bolstering its metrology department through a needs analysis, strategy development and training.
- Since 2001, both Kenya and Ethiopia has been using the NML as the source of traceability for the national measuring standards of the respective countries.
- As a member of SADC MET, the NML was involved in signing an MOU in August 2001 to launch a joint metrology education initiative. Improving metrology education in the SADC region will be undertaken through the establishment of the SADC Resource Centre for Metrology Education (SRCME). The SRCME will develop metrology skills to support test and measurement systems in the SADC member countries.
- The NML is a key partner in the Centre for Skills Coordination, Calibration, Measurement & Testing - South Africa, an initiative of the National Laboratory Association in support of metrology training.

### **Establishment of the African Centre for Gene Technologies**

The African Centre for Gene Technologies (ACGT) is a non-exclusive initiative started by the CSIR and the University of Pretoria to create a world-class platform in gene technologies, focusing on proteomics and genomics. The Centre's vision is to establish a national centre of excellence in biotechnology to meet the needs of the developing biotechnology industry. The ACGT will provide an integrated platform to undertake projects from conception to commercialisation in the fields of gene and protein structural analysis and bioinformatics, using techniques such as DNA micro-array technology, advanced mass spectrometry and molecular simulation. Outputs of the ACGT will include students trained in the most modern gene technologies, top quality research publications, international patents with commercialisation appeal and biotechnology start-up companies.



### **From beach erosion to waterfront development**

Bar Beach at Victoria Island in Lagos, Nigeria, has been subjected to erosion and consequential landward regression of the shoreline since the early part of the 20th century. The CSIR was one of a number of organisations contracted by the Lagos State Government to undertake a preliminary feasibility study to determine the viability of restoring Bar Beach. The CSIR was involved in the following aspects of the pre-feasibility study:

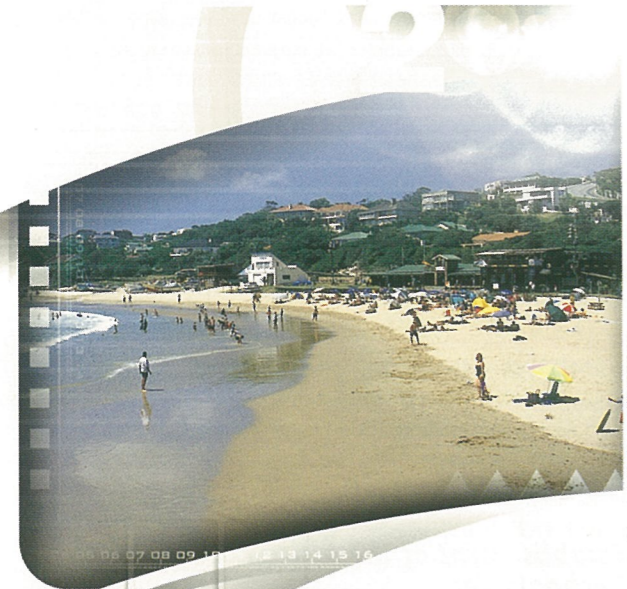
- a marine field data collection exercise;
- a shoreline modelling study;
- two-dimensional hydrodynamic and sediment transport modelling; and
- an integrated assessment of the coastal engineering.

The pre-feasibility study resulted in the proposal of an innovative solution for the restoration of Bar Beach. The problem is approached from a commercial perspective, whereby land was reclaimed and made available as real estate for the development of a waterfront and future tourism gateway to Lagos and Nigeria.



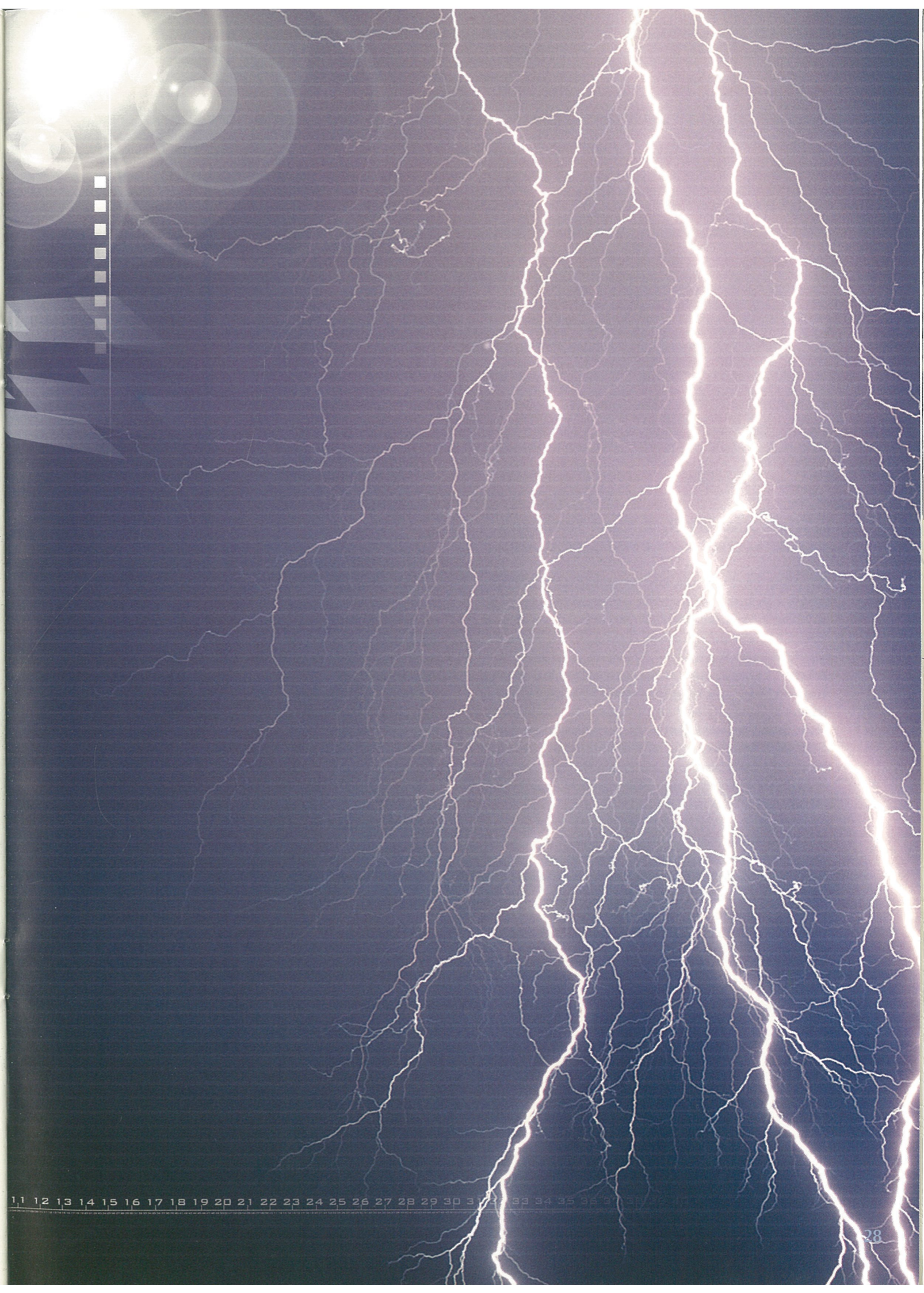
### **Botswana's First National Communications Report on Climate Change**

The CSIR was contracted by the government of Botswana, through the United Nations Development Programme (UNDP) office in Gabarone, to assist in the preparation of Botswana's First National Communications Report on Climate Change. Working in close collaboration with researchers and government officials in Botswana and UNDP officials, the project team focused on capacity building among Botswana researchers for future updates and preparation of national communications reports. The project involved the review of various published documents and reports on climate change and studies. Findings from these reports and studies, together with other data sources on national conditions and inputs from government officials and researchers, were used to prepare the report.

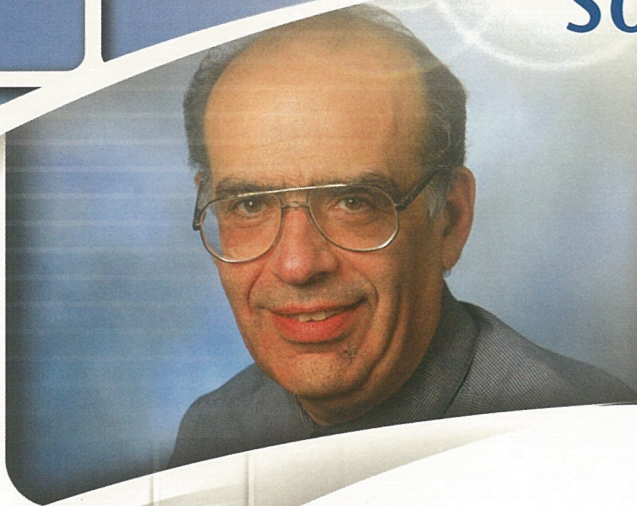


### **CSIR participates in European Union food technology projects for Africa**

The CSIR is participating in two European Union Commission projects concerned with the development of a new drying technique to produce high quality shelf-stable fruits, and the development of technologies for the production of nutritionally balanced, high-quality fermented food products using cassava, soybean and palm oil. The CSIR's new drying technique will offer African countries the possibility to produce dried fruits of high quality for commercialisation in international markets. Improving the traditional technology of products utilising cassava, soybeans and palm oil aims to increase nutritional quality and product standardisation, prolong shelf-life and broaden distribution and marketing possibilities. Apart from contributing to the health and well-being of consumers, the projects will also offer opportunities for employment creation in several communities.



# Working with South African Business



## Introduction by Dr Anthos Yannakou Executive Vice President: Operations

The CSIR is actively involved in providing technologies which improve innovation, competitiveness and sustainability in the South African business sector.

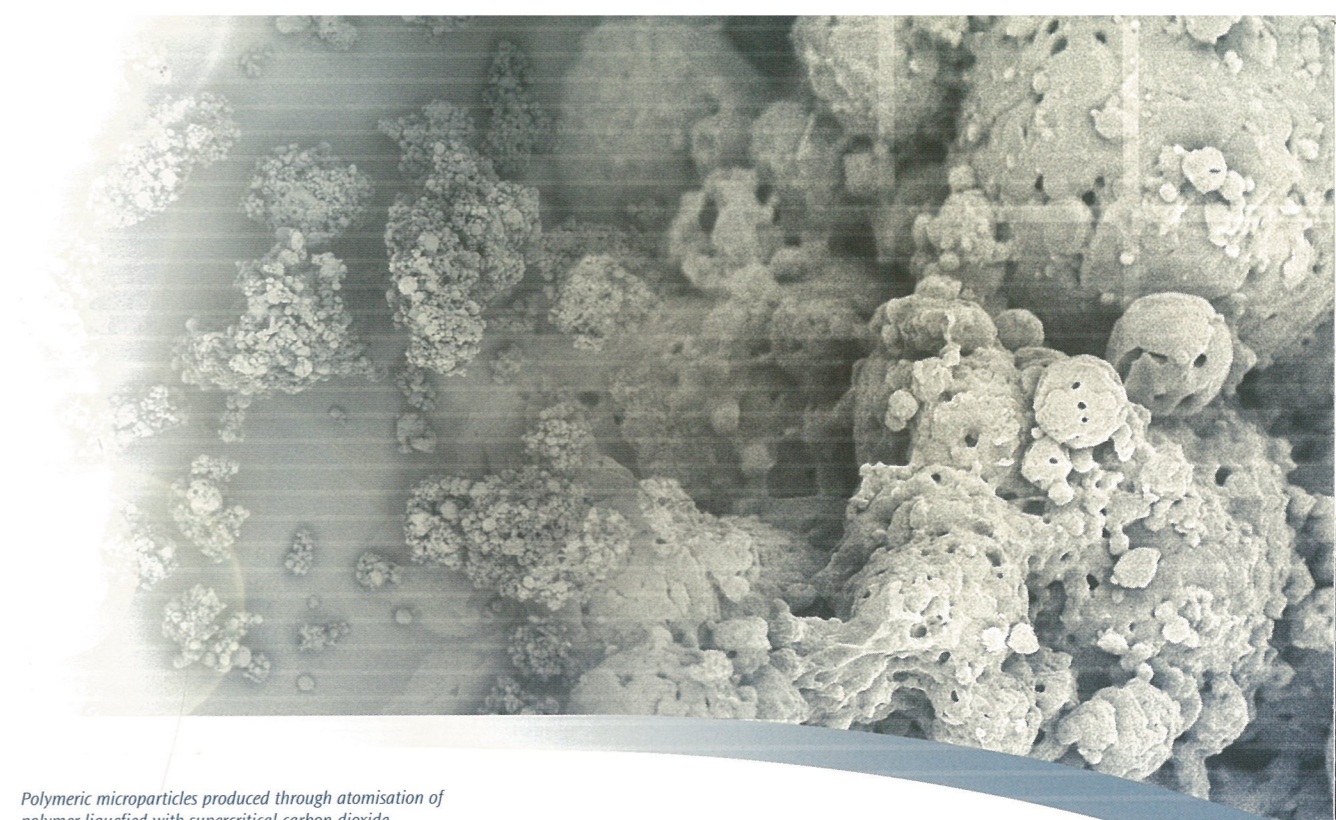
The CSIR earns nearly half its income in South African markets, including the automotive, chemical, construction, information and communications technology, mining and defence markets. Clients range from SMMEs to South African-based multinationals. The CSIR also provides technologies to broader industry-based bodies such as the fishing industry, and contributes to safety issues in the mining industry (via SIMRAC).

The South African business sector is served by the CSIR in partnership-mode, either directly or through government-supported research structures and programmes. Examples include the National Product Development Centre supported by DACST, based in CSIR Manufacturing and Materials Technology, and the collaborative DEEPMINE research project.

A limited number of examples of CSIR activities in partnering the South African business sector can be viewed on the following pages.

## Assisting the textile pipeline in achieving global competitiveness

The textile industry in the SADC region requires a centre of excellence providing technical expertise and state-of-the-art equipment to assist it to become globally competitive and sustainable. The CSIR's National Fibre Centre is a joint initiative between the DTI, the CSIR and the National Plant Fibre Cluster. Its objectives include support for beneficiation of plant fibres, also in rural communities, and promoting the capacity of the South African man-made fibre industry. The development of niche products such as non-woven, high-performance textiles and technical and industrial textiles also offers excellent market opportunities for the industry sector. Utilisation of byproducts to augment industrialisation; training; quality testing; electronic information systems; and research and development are current deliverables from the National Fibre Centre.



Polymeric microparticles produced through atomisation of polymer liquefied with supercritical carbon dioxide

## Micro-encapsulation technology

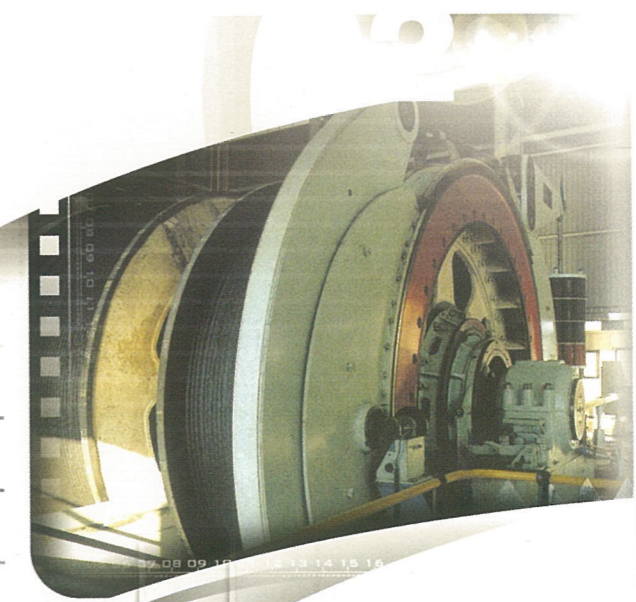
Cooperation between the CSIR and the Industrial Development Corporation (IDC) has been boosted by an agreement on exploiting a CSIR-developed micro-encapsulation technology. The agreement entails the immediate establishment of a new, jointly owned South African company, Ellipsoid (Pty) Ltd, as the exclusive licensee responsible for commercialisation of the technology. The CSIR and IDC hold equal shares in the company. The micro-encapsulation technology involves coating of sensitive materials with a polymer barrier layer to provide protection against UV radiation, light, oxygen and heat. The unique mild processing conditions are environmentally friendly and make encapsulation of very sensitive materials, such as vaccines, possible. Potential applications include vaccine protection for improved shelf life without refrigeration and oral vaccines. Discovered drugs that are unstable can be manufactured and encapsulated for drug delivery.

## Guidelines to evaluate bridge deck joints

The CSIR manages the Technical Agency of Agrément South Africa, an internationally acknowledged, independent centre that provides assurance to specifiers and users of the fitness-for-purpose of non-standardised construction products. When the South African National Roads Agency and Agrément South Africa required a method for the evaluation of bridge deck joints (both new and existing) before installation, to indicate their suitability and fitness-for-purpose for specific uses, the CSIR was contracted as part of a project team to investigate the problem. The team developed guidelines to evaluate bridge deck joints for Agrément certification, and the first applications for certification are already being processed.

## DEEPMINE

The considerable challenges of mining at ultra-depths requires co-operation between the key stakeholders in the mining industry to establish the technological and human resources platform for mining safely and productively. DEEPMINE, a unique collaborative research programme between mining companies, research institutions, universities, labour and government, was concluded with the final year devoted to transfer of the knowledge and technology developed through the programme. Mechanisms such as summary reports, guideline handbooks and DEEPMINE schools facilitated access to information and understanding of the complex system interaction in a deep-level mine. Consultancy reviews, where DEEPMINE specialists applied knowledge to specific real problems on mines, were also included. These mechanisms enabled industry practitioners to apply the knowledge to their current work situation.





## Aardwolf

Accurate knowledge and understanding of the geological environment are crucial for safe and productive mining. The geophysical technique, borehole radar, has been shown to provide accurate mapping of geological conditions for several months of mining on both gold-bearing and platinum reefs. The CSIR has designed a borehole radar system specifically for South African geological and underground mining conditions. Dubbed the Aardwolf borehole radar, the system has been tested on surface and has successfully demarcated South Africa's principal orebodies, the Ventersdorp Contact Reef and the Carbon Leader Reef on Witwatersrand gold mines, and the Merensky and UG2 reefs on Bushveld platinum mines.

## CSIR mine-clearing technologies make a difference

The CSIR was commissioned to conduct basic research on the effects of explosives and mines on targets and to develop countermeasures. These studies were expanded to include the detection of explosive devices, illegal weapons and contraband. As a result, several successful concepts of mine-protected vehicles such as the Hyena, Buffel and Casspir were transformed into unique world-first products for operational use by security forces. The CSIR and its operational partners used these technologies in an integrated approach with mine-protected vehicles and MEDDS vapour detection, followed by using specially trained dogs, to detect the presence of explosives. The CSIR has established a technology base on mine detection and clearance, and continues to use research and development to enhance clearance operations in partnership with commercial entities.

## Mining portal

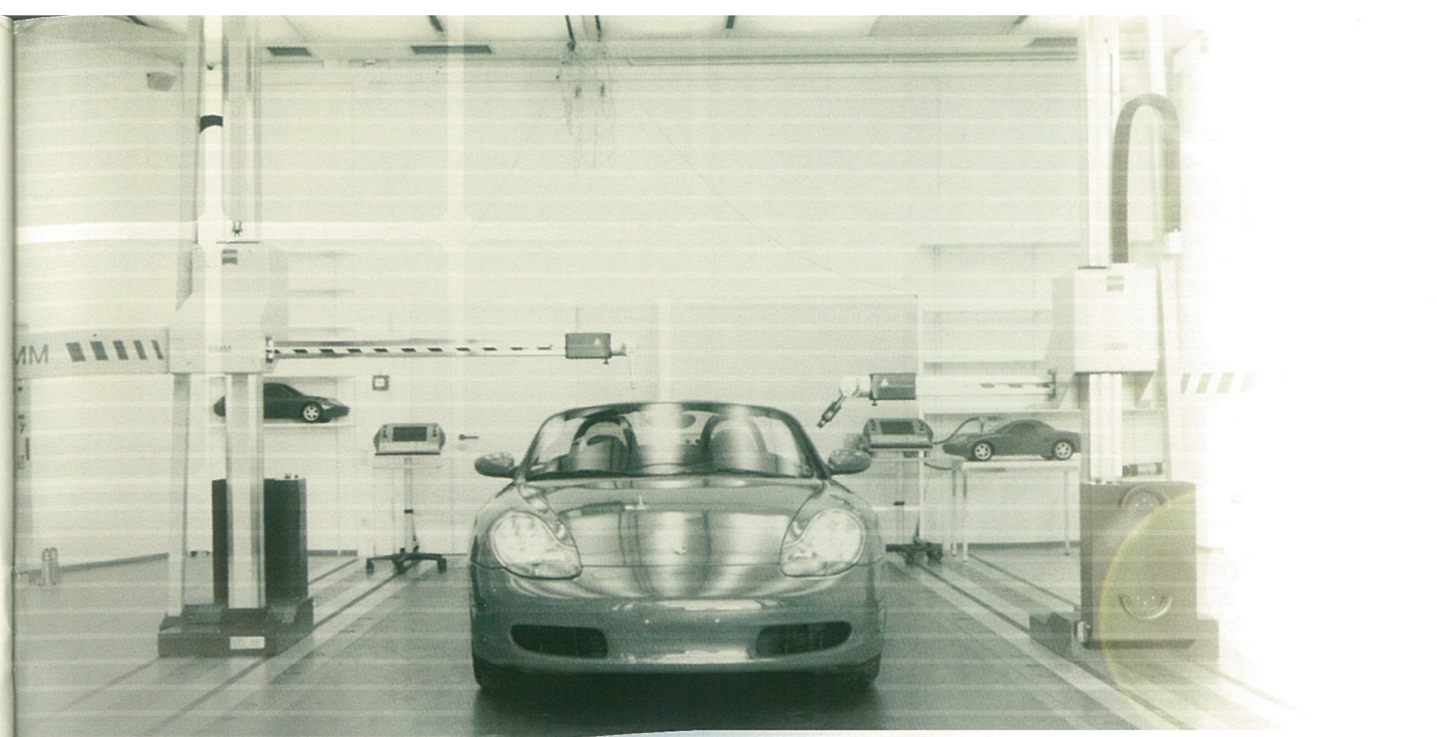
The CSIR has developed a multi-media mining portal specifically for the South African mining industry. The portal includes three main sections:

- a public domain section addressing social responsibility issues with a focus on support for the small-scale mining industry targeted at satisfying the social responsibility-initiatives of the major mining houses and the stated policy of the Department of Minerals and Energy (DME);
- a mining information section, available to sponsors and subscribers, which presents a collation of South Africa-specific mining information; and
- a potential DME-specific section to fulfil the DME objectives of empowering its inspectorate.

The material on the portal is compiled from research conducted by the CSIR as well as contributions from the DME, SIMRAC, DEEPMINE, Coaltech, Futuremine and collaborators.

## CSIR provides technology for SA Navy's wet-end sonar requirements

Utilising its design and development capabilities, the CSIR's Sonar group produced specialised large sonar arrays for existing and newly acquired Corvettes and submarines of the South African Navy. This local support to the South African Navy for design, production and maintenance of all its wet-end sonars (immersed in water) was carried out in collaboration with well-known European sonar systems houses, Thales Underwater Systems of France for the Corvettes and STN Atlas Electronik of Germany for the submarines. Recent audits by these foreign partners have found the CSIR's designs, production methods, laboratories, general infrastructure, documentation, quality procedures and level of expertise, to be of the highest standards. A team of CSIR experts in the field of sonar wet-end received training in France and Germany as part of the technology transfer agreement to provide comprehensive technological support to the South African Navy.



## Umlazi benefits from community-driven approach to safety

The CSIR's Safe Communities Project is aimed at creating safer environments and behaviours in order to reduce and minimise the impact of injuries. Following the success of the CSIR's Billiton-funded Safe Communities Project in the Northern Cape, BP South Africa approached the organisation to run a similar project in Umlazi, KwaZulu-Natal. Umlazi was identified by the eThekweni Municipality as one of the local communities with the gravest safety problems. Working closely with the eThekweni Municipality, the Department of Transport (DoT) and BP South Africa, the CSIR trained various stakeholders in the Safe Communities approach to address the safety situation.

## Developing design capacity at secondary schools

In collaboration with the CSIR's National Product Development Centre (NPDC), Tri-CAD (Pty) Ltd has trained more than 660 secondary school learners in computer-aided design (CAD) technology and techniques over the past two years. The project enjoys financial support from DACST and the Automotive Industry Development Centre (AIDC). Endorsed by the NPDC, Tri-CAD started the project in 1999 with assistance from regional examiners for technical studies, involving Grade 10 to 12 learners from 24 Gauteng schools from all levels of society. Currently, learners progress from two-dimensional (2D) design during the first year to three-dimensional (3D) design in their second year. The NPDC is developing a module for a third year of training in solid modelling, enabling learners to design in solids through the full design cycle. The programme, which is endorsed by the Minister of Education, Prof Kader Asmal, is currently being rolled out throughout Gauteng.

## A toolmaking solution for South Africa

During an industry workshop, held in March 2002, a CSIR-NPDC/AIDC alliance was mandated to lead a consortium of representatives, across the value chain, in implementing a South African toolmaking solution. The project is steered by a Stakeholders Forum, born from the workshop, which is representative of the CSIR, AIDC, the National Association of Automotive Component and Allied Manufacturers and several industry companies. As part of the DACST contract with the NPDC, the initiative is vital to both the automotive and other manufacturing industries. The skills development part of the project is supported by the Manufacturing, Engineering & Related Services Education and Training Authority, while the proposed delivery network in the mould-making industry had an initial positive response from DTI.



# Our People



As a knowledge-intensive technology organisation operating internationally, the CSIR faces the challenge of delivering world-class products and services. In these endeavours, we do not work alone but rely strongly on partners and alliances. Collaboration, teamwork, a high regard for diversity and a drive towards continuous improvement are the attributes of our people, which underpin our most successful projects.

Our 2539 people and their knowledge are vital to our success. As our most valuable asset, we apply knowledge in client interactions and in developing innovative technology solutions, while cultivating agility and flexibility to stay attuned to market needs and contributing to national priorities.

The increase in numbers of professional staff at the CSIR reflects an alignment with market demands by business units. As a measure of this trend, the percentage of Doctorates increased from 7,2% to 7,3% of total staff. Honours graduates grew from 8,0% to 8,3%, and similarly, Bachelors' degrees moved from 15,09% to 15,8%. Masters' degrees remained unchanged at 12,5%. Currently the CSIR has 692 post-graduate qualified staff (PhD and MSc), 1076 graduates and over 122 Technikon qualified staff.

The CSIR has made significant progress in changing our demographic representivity and investing in people development in recent years. We maintain a responsible balance between achieving transformation across all dimensions of the organisation and achieving its business targets through growing our people and our business.

Focused recruitment strives to attract appropriate and sometimes scarce competencies to meet the demands of our business and underpin the new policy climate in South Africa. Bursary and internship programmes identify quality potential and new staff, address historical imbalances and increase interaction with tertiary education institutions (TEIs). In the past three years, 80 bursars have gone through the CSIR's doors and close to R12 million has been spent on developing their potential. Of the students that have benefited from the CSIR's bursary scheme, 75% have been black, in

*Collaboration, teamwork, a high regard for diversity and a drive towards continuous improvement are the attributes of our people which underpin our most successful projects*

keeping with the organisation's strategic priority of transformation and in line with the country's challenges in this area.

Through fast-tracking, mentoring and training (both within the organisation and through TEIs), the CSIR caters for career development and promotes participation and learning.

## CSIR as a Learning Organisation

The CSIR is increasingly involved in identifying and addressing people development needs across the organisation. The CSIR Innovation, Leadership and Learning Academy (CiLLA) provides strategic leadership and support in training and development within the broad context of the CSIR mandate and acts as a mechanism for the promotion of innovation in the broader South African community.

Recently appointed as Director of CiLLA, Awie Vlok is clear about the importance of people at the CSIR and in South Africa, 'I believe that all business is people business. Considering the rapidly changing global and regional landscape in which the CSIR has to fulfil its mandate, the knowledge, skills and attitudes of our people is often the only differentiating factor.' He continues, 'I am passionate about people development and success dynamics of organisations. I strongly believe in the potential of South Africa to become one of the winning nations of the world.' His new position presents the ultimate opportunity for blending his extensive portfolio of interests and experiences together in support of the CSIR, its people and our stakeholder community. His vision is for CiLLA to be acknowledged as a leading facilitator of learning and development for the CSIR and similar organisations.

CiLLA's current focus is mostly on providing learning events to enhance the business and life skills of knowledge workers. However, CiLLA is taking on a broader role in partnering and alliancing, where these activities support innovation, leadership and learning as well as adopting an external strategic role in the context of the CSIR mandate and the knowledge worker community.



CiLLA Director Awie Vlok

During the past year, CiLLA hosted 24 events for 741 learners, with participant ratings consistently in the 80% plus bracket. CiLLA also provided access for hundreds of people to international events such as the World Wide Lessons in Leadership Series and hosted the SA Lecturing Tour of Prof Rosabeth Moss Kanter, world expert in change management.

Prof Moss Kanter reached over 2000 people through 13 presentations to audiences in Pretoria, Midrand, Johannesburg and Cape Town, which included sessions with leading business schools, executive teams, academic institutions and specialist groups.

She was most complementary about the CSIR and its role in society. In the Sunday Independent of 21 April 2002, she said,

*'I came to South Africa for the first time at the invitation of the CSIR, which arranged for me to lecture to executives on leadership for global competitiveness and skills for innovation and change. I was impressed by the world-class ideas and technology at the CSIR ... and that it is playing a major role in economic development.'*



Prof Moss Kanter with the CSIR's Dr Sibisi, Dr Magau and Dr Yannakou

## Scientific excellence at the CSIR Contribution by Dr Bob Scholes, CSIR Fellow

Technical excellence can never be taken for granted. It is a topic which requires, and is given, attention and management at the highest levels within the CSIR since it is a necessary condition for the fulfilment of our mandate.

There is a healthy level of self-criticism within the CSIR regarding technical quality, which relates partly to the changing role of Science Councils. The scientific landscape of South Africa has changed dramatically since the founding of the CSIR in 1946. It is to some degree a measure of the success of the CSIR that it is no longer the only game in town. In the relatively complex institutional environment of the 21st century, with its opportunities to access services globally, the nation no longer needs the CSIR to be active in every field of research endeavour. However, in those areas where the CSIR is active, the client and the stakeholder have a right to expect the work to satisfy the internationally accepted norms of scientific good practice. To ensure its survival in a global knowledge marketplace, the CSIR has to exceed this minimum standard. It can only do this by focusing on those areas where it can deliver a superior product. In other areas, its strategy is to partner with leading groups, or simply to know who they are.

The CSIR has initiated a system of monitoring the health of its technical core. This information is benchmarked against leading comparable organisations around the world, and is published in the annual report. Ultimately, the CSIR measures its excellence in terms of its impact on the well-being of South Africans. It takes many years, however, to translate investments in science and technology into impacts, and clearly more proximal measures are needed. The CSIR monitors the skills profile of its technical staff, the rate of gain or loss at various expertise levels, the gender, race and age profile, and the expressed levels of job satisfaction. It also monitors short-term outputs, such as scientific papers, and longer term outputs, such as patents. It continuously polls its clients and stakeholders for their perceptions about the quality of work done at the CSIR, and takes remedial action where problems are raised.

The preliminary findings of this self-imposed process of rigorous scrutiny are that:

- The CSIR has a smaller fraction of highly qualified individuals than the global norm for leading R&D organisations.
- This fraction is not declining, and is gradually changing to be more representative of all population groups.
- The output per researcher is within the norms for similar organisations and is stable or rising. It is exceptional in the context of a developing country.
- There are many areas within the CSIR that are globally competitive, and some that are world leaders in their field.

### **Managing knowledge in the CSIR - it's all about relationships Contribution by Roy Page-Shipp, Director: Strategy Support**

One of the CSIR's strategies is the accelerated evolution of the organisation to a knowledge intensive technology organisation. We define knowledge as the Capacity for Informed Action - that is what we have, what we create and what we improve. Our role in society is to improve our clients' Capacity for Informed Action.

Whereas most organisations have recently become more conscious of the value of knowledge, the CSIR has always regarded knowledge as central to both input and output. The flow of knowledge represents the 'production line' of the CSIR. To manage knowledge we need to think more strategically about those management aspects that affect this 'production line' which actually passes through the minds of our people, or our knowledge workers, as we call them.

The CSIR has a share in our knowledge workers' outputs via the employer-employee relationship. For best use of their knowledge, this relationship must be sound. For effective knowledge sharing and to get the best possible inputs to a project, we also need good interpersonal relationships among our staff. Usually the best results are achieved when our relationship with a client promotes knowledge sharing. Knowledge management at the CSIR is all about relationships!

It also means that the principal outcome of the investment of the Parliamentary Grant is in the form of an increase in the 'Capacity for Informed Action' of our staff - or their 'within and between minds' knowledge. We are focusing our Technology Managers on the importance of this investment and their role in securing it for the CSIR.

The efforts of CSIR staff in certain areas to secure and share this elusive thing called knowledge are bearing fruit and we now have a series of excellent case studies to use in promoting the desired behaviours.

### **Some individual and collective achievements at the CSIR over the past year:**

**Dr Ray Durrheim**, manager of the CSIR DEEPMINE Collaborative Research Programme, was a winner of the annual Salomon Award for the best paper by a member of the South African Institute of Rock Engineering. He was awarded the prize together with his co-author, Professor Alexander Linkov of the Institute for Problems of Mechanical Engineering and All-Russian Institute for Rock Mechanics and Mining Surveying (VNIMI), St Petersburg.

The 2001 DaimlerChrysler Environmental Leadership Award was awarded to the CSIR/DaimlerChrysler Sisal Fibre Project Team, which included CSIR's **Boyse Pillay**, **Bert Meyer** and **Arrie Krüger**, and team members from DaimlerChrysler AG and DaimlerChrysler SA.

**Dr Franz Hengstberger** was appointed as the first African member of the prestigious International Committee of Weights and Measures (Comité International des Poids et Mesures or CIPM) by international ballot during September 2001. He was also elected Vice-President of the International Commission on Illumination (CIE).

**Dennis Macozoma** was awarded the International Council for Research and Innovation in Construction (CIB) Fellowship for his report on the secondary construction materials market in the USA. His report covered the management of construction and development waste as well as building deconstruction, which is a new technique based on the old practice of dismantling buildings to enable waste materials salvage for reuse and recycling.

**Dr Pete Ashton** was invited by Oxford University to present one of the eight Linacre Lectures for 2002 under the theme "Water and Environment". The Linacre Lectures, sponsored by Linacre College, are a prestigious annual series on environmental issues and have been prominent in the Oxford calendar of events since 1990.

**Antony Cooper** served as Convenor for Working Group 2, Geospatial Data Models and Operators, of the International Organization for Standardization's Technical Committee (ISO/TC) 211 for Geographic

Information/Geomatics. He is the sole nominee for the Convenorship of the new ISO/TC 211 Working Group 7, Information Communities. The South African Head of Delegation at several ISO/TC 211 Plenary meetings, he was the first South African on ISO/TC 211's list of experts. He is the Vice-Chair for Africa and the Middle East of the Commission for Spatial Data Standards of the International Cartographic Association (ICA). Since 1999, he has co-chaired the ICA's Working Group on Incremental Updating and Versioning.

In cooperation with the Chinese Metrology Association, NML Manager **François Denner** was appointed Vice Chairman of the Developing Country Measurement Technology and Product Information Network, an initiative funded by the Chinese Government to act as a business and technology exchange platform for industries of developing countries.

The CSIR's **Dr Eino Vuorinen** and **Prof. Walter Focke** of the University of Pretoria (UP) have developed and patented a revolutionary corrosion protecting lining specifically for use in the pressure vessel industry, especially household applications. The polyethylene-based material was designed with an adhesive polymer and has successfully passed tests used to determine the adhesion properties.

**Veronica Rammala** received the DESS Postgraduate Diploma in Remote Sensing, which is delivered jointly by the Universities of Paris and Toulouse.

**Lisa Cavé** won the award for best overall poster at the 10th International Symposium of Water Rock Interactions held in Sardinia, Italy.

**Grant Cambridge** has been certified a Project Management Professional by the Project Management Institute (PMI), the world's leading non-profit project management professional association.

**Dr Namane Magau** was voted Human Resources Practitioner of the Year by the Institute of People Management (IPM).

**Dr Heather MacKay** was one of 14 recipients of the Women in Water Awards launched by the Department of Water Affairs and Forestry. These awards are made in recognition of the contribution made by women to the water management industry in South Africa. Dr Mackay received the award for developing the procedures and guidelines for Reserve Determination as required by the National Water Act.

The **Foreign Missile Exploitation Team** won the prestigious Armscor Chairman's Award for a project aimed at supporting humanitarian involvement by the SANDF in Southern Africa.

**Kevin Wall** was elected President of the South African Institution of Civil Engineering for 2001.

The CSIR's **Dr Wynand Steyn** and **Dr Alex Visser** from the University of Pretoria, won the award for the best paper presented at the 20th South African Transport Conference (SATC) in July. The paper

is "Considerations of pavement roughness effects on vehicle-pavement interaction".

**Sadi Motsuenyane** (now Luka) received a National Science and Technology Forum (NSTF) award in the individual award category. Through activities other than research and innovation in the past two years which contributed to the empowerment of local knowledge and skills, and a better understanding of the role and relevance of technology in sustainable development.

**Engeli Beukman** and **Richard Beān** were closely involved in the Peoples Bank/Sunday Times Awards for Technology Achievement process, through interviews with SME entrants and assistance to participants for the adjudication process. The inaugural award ceremony of the Peoples Bank/Sunday Times Awards for Technology Achievement was combined with the annual Technology Top 100 awards and the President's Awards for Export Achievement on 28 November 2001.

**Brett Johnson** received the Plastics Institute of Southern Africa (PISA) Top Student Award for studies in B.Tech. at Pretoria Technikon.

**Khosi Xulu** was the recipient of the S2A3 Bronze Medal for the best M.Tech. dissertation in 2001.

**Zakithi Msimang** was elected by the Minister of Trade and Industry to serve on the Trade Metrology Board.

For the second year in a row, **Bharath Belle**, **Jan du Plessis** and **Kobus van Zyl** won the South African Colliery Manager's Association (SACMA) prize for the best coal-related paper.

**Dr Willie du Preez** was elected as chairperson of the 2002 Rapid Product Development Association of South Africa's Management Committee.

**Philip Haupt** serves on the Engine Conditioning Monitoring Standards Committee of the Society for Automotive Engineering: Aerospace Section.

**Dr Michael Thomas** is a committee member of the Powder Metallurgy Association of South Africa. He also serves as the Treasurer of the Southern African Thermal Analysis Society.

**Hans Ittmann** was elected President of the Operations Research Society of South Africa in September 2001, for a term of two years. This is the second time that he is serving the society in this capacity, having been president in the mid 1980's.

**Dr Rodney Milford** was appointed to the Construction Industry Development Board by the Minister of Public Works.

Organisation-wide **ISO 14001** certification was awarded to the CSIR at the end of 2001. The CSIR is now officially recognised as fulfilling its mandate of building a better world through science and technology, while protecting the environment and minimising harm to the world around it.



Roy Page-Shipp - Director: Strategy Support



CSIR Executive 2001/2002

Standing left to right: **Mr Neo Moikangoa** Executive Vice President Policy and Technology for Development, **Dr Sibusiso Sibisi** President and CEO

Seated left to right: **Mr Albert Jordaan** Executive Vice President Finance and Commercialisation, **Dr Anthos Yannakou** Executive Vice President Operations

**Dr Namane Magau** Executive Vice President Human Resources

Far right: **Dr Adi Paterson** Executive Vice President and CIO (Seconded to DACST)

## Our Vision

To be the best in technology, leadership and partnering, and - through our people - fight poverty, build global competitiveness and make an enduring difference in people's lives.

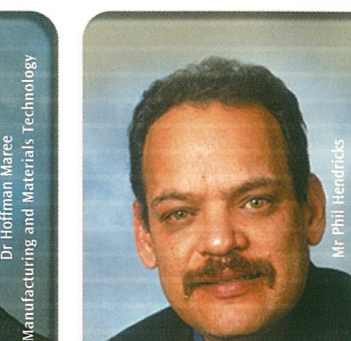
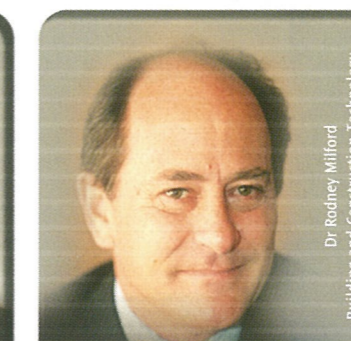
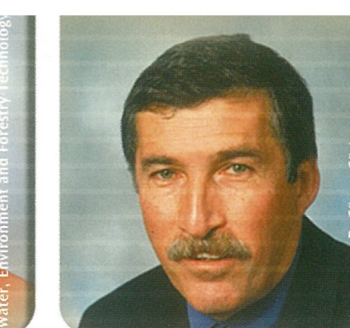
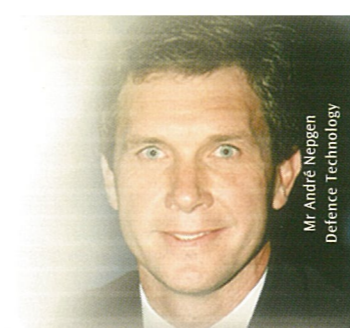
## Our Mission

As a uniquely South African organisation, the CSIR is committed to innovation. We exist to support sustainable development and economic growth in the context of national priorities and global challenges. We create value for our clients, partners and stakeholders by providing technology solutions and information, establishing ventures and licensing intellectual property.

## Our Identity

The CSIR Logo consists of four triangles plus our name. Three triangles are made up of lines, while the fourth is solid. The three triangles with lines represent the cornerstone disciplines in the modern world: Physics, Chemistry and Mathematics. They are all joined together, and combine to underpin the fourth triangle - representing the CSIR itself. Pointing to the left, the arrows are a symbolic representation of a look back at the past, at the origins of all that science and technology have accomplished in history. And, more importantly, as the heads of arrows pointing upwards and to the right, it points into the future, the future that the CSIR is striving to create.

This simultaneous view of the future and the past is a key part of creativity, which supports innovation of the calibre for which the CSIR is known.



## CSIR Business Unit Directors

### Our Values - ESPRIT

#### CSIR people...

- ... have a passion for **E**xcellence
- ... live **S**ervice, striving to anticipate, meet and exceed the needs of our clients and stakeholders
- ... recognise that it is **P**eople who make things happen - and work towards others' growth and development
- ... strive always for **R**elevance - finding solutions to real needs, making a difference - national priorities are our priorities
- ... are committed to **I**nnovation - our lifeblood: from idea generation through to practical implementation
- ... always with unshakeable in**T**egrity



To learn more about the CSIR and its activities, please visit our website at

<http://www.csir.co.za>

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