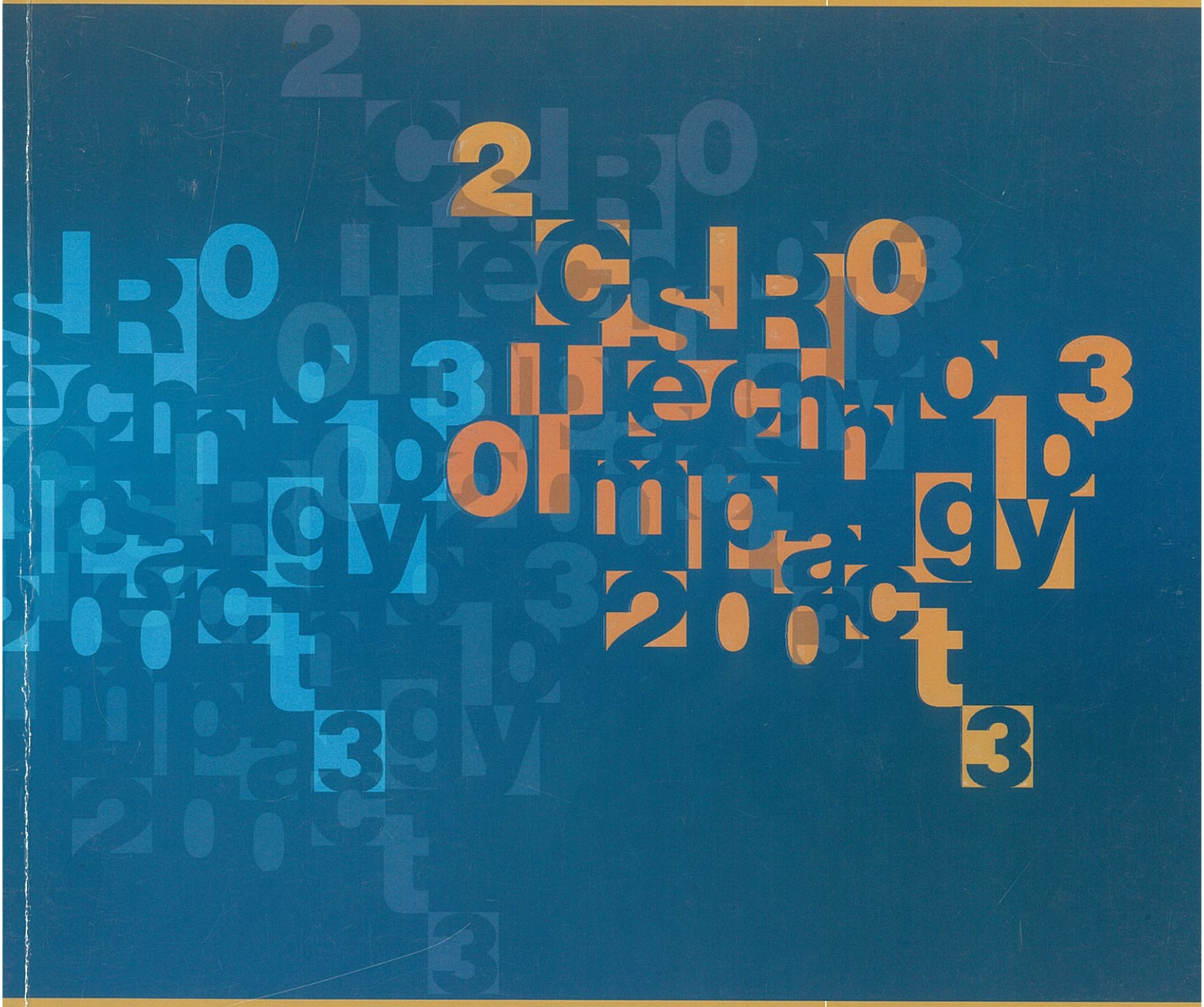
TECHNOLOGY IMPACT 2003



CSIR
Your Technology Partner

CSIR 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 of South Africa.

CSIR VALUES

In everything we do, excellence is the hallmark. The solutions we provide are based on the best thinking, unwavering integrity and a culture of innovation fuelled by the inventiveness and initiative of our people. At the CSIR, we resonate with the diversity of this continent, respond to its opportunities and challenges, and serve it with our combined ingenuity, now and into the future.

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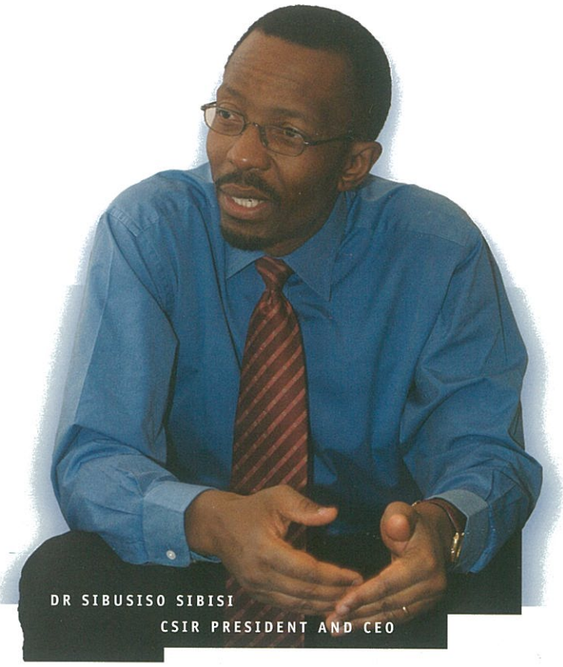
ISBN 0-7988-5549-5

FOREWORD



DR SIBUSISO SIBISI
CSIR PRESIDENT AND CEO

During my first year at the CSIR I have become acutely conscious of a renewed sense of urgency and commitment in our national efforts to establish science and technology (S&T) as a crucial contributor to South Africa's economic growth and an improved quality of life for our people. In closely aligning CSIR strategy with the national strategies at the heart of this effort (i.e. the National Research and Development (R & D) Strategy, the Integrated Manufacturing Strategy and the Biotechnology Strategy, amongst others), some of our key initiatives have been given new impetus, in particular our focus on the process of innovation and the consolidation of science, engineering and technological (SET) excellence.

In the context of the CSIR's mandate, innovation is seen as the process by which new knowledge is created and applied to exploit, and potentially create, new markets. Since this process requires well-trained, effective scientists, engineers and technologists, the CSIR is committed to a human resource development approach that supports and encourages SET excellence. At the same time, we are making progress in our efforts to make the CSIR representative of gender and race diversity, across all employment levels.

As illustrated in this publication, an increasing percentage of our activities are taking place in partnership mode. During the past year we continued to work closely with multinational corporations such as Shell Global Solutions, Siemens, The Boeing Company, Volvo Aerospace Corporation and the Rolls-Royce Corporation. Local partners include government, industry, tertiary education institutions and other science councils.

As the largest scientific, technological, research and development organisation in Africa, the CSIR has a crucial role to play in the New Partnership for Africa's Development (NEPAD). A strategic framework has been established to coordinate our support for this important initiative.

Technological core competences form the basis of the CSIR's long-term sustainability and relate to the unique ability to acquire, develop and transfer technology within a number of specific market-related themes. Largely similar to the technology missions of the National R&D strategy, we have defined our technological core competences as manufacturing/materials, information and communications technology (ICT), environment, infrastructure and bioscience. This issue of Technology Impact offers a brief snapshot of our activities during the year under review (1 March 2002 - 28 February 2003) by highlighting a number of innovative projects and initiatives in these areas.

While some of these S&T solutions are still in the early stages of development, I am confident that you will share my sense of pride and excitement at the positive impact a number of these innovations are making on the lives of South Africa's people.

Dr Sibusiso Sibisi
CSIR President and CEO

BIOSCIENCE

Over the last few years, progress in the biosciences has been both profound and far-reaching. The advent of novel technologies for gene and protein analysis has brought new and exciting knowledge about many biological systems, including the human genome, plants, microbes and animals. Despite this scientific output and the great promise of the sector, biotechnology continues to encounter a number of barriers to the successful conversion of scientific knowledge to improved therapies against disease, better diagnostics, sustainable industrial processes and novel environmental technologies. Many organisations, including the CSIR, are focusing on these barriers in an urgent manner through the alignment of market relevance, technology development, enterprise creation and resource management.

The CSIR has, for instance, assisted, with other stakeholders, in the establishment of regional biotechnology innovation centres and a biotech-nology incubator, whose objectives are the stimulation of bioscience innovation leading to the generation of a biotechnology industry in the region. Over the next three years, the innovation centres will be supporting a number of projects, several of which are based at the CSIR, that will lead to the development of new industrial, human health and plant products.

In this section of Technology Impact 2003, we feature projects in biocatalysis, bioprospecting, bioceramics, nutrition and crop improvement. Of primary importance to our bioscience research, is the need to ensure relevance to South Africa and to create maximum impact with our investment funds through their appropriate allocation to regional problems. We have a portfolio of projects whose successful outcome may result in more nutritious cereals and other foods; recycling of waste materials; lower-cost production of important food additives; job creation and improved health care. These projects depend on several expertise platforms including genomics, proteomics, drug delivery, agroprocessing and bioprospecting. In addition to identifying and investing in new projects, the CSIR is actively supporting early stage opportunities that could lead to the platforms of the future. In this way, we strive to maintain an integrated and well-connected pipeline of research projects.

Equipping for world-class genomics research

Gene and genome analysis and their applications are at the heart of a platform established by SERA, the Southern Education and Research Alliance, during 2002. During the first year of operation, the African Centre for Gene Technologies (ACGT) made significant advances in equipping the centre for its role. A proteomics facility, a structural modeling facility and a DNA microarray facility have been established under its auspices.

The new proteomics facility, based largely at the CSIR, makes possible the separation of proteins through high-resolution 2D-gel electrophoresis, while a new mass spectrometer is used for the identification of the proteins. An example of the kind of work that falls within the ambit of proteomics is comparative analysis of genetically modified crops and regular crops. This can be used to identify unintended consequences arising from genetic modification.

Research in progress through the ACGT includes the isolation of disease-resistant genes from African crops, the development of a new HIV vaccine target, and the development of competence in bioinformatics and proteomics.

Community-based essential oils projects create jobs

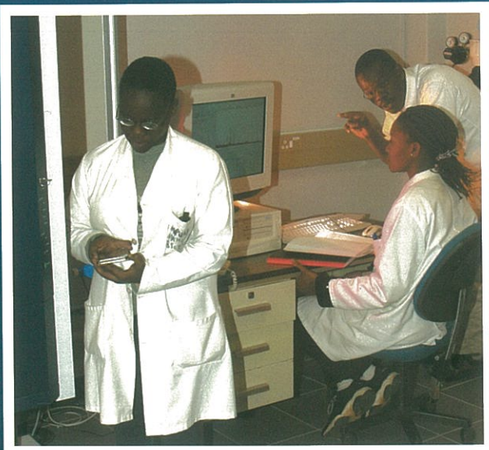
A CSIR-led poverty alleviation project initiated by the Department of Science and Technology (DST) is making an impact on the development of community-based essential oils businesses in the Western Cape, Limpopo and Mpumalanga. Essential oils (natural extracts from aromatic plants) are used in the flavour, fragrance, personal hygiene and aromatherapy markets.

At Pacaltsdorp in the Western Cape, budding farmers are achieving good essential oil yields and are producing high quality oils, which are now for the first time being offered to local and international producers. Projects in Giyani, Driekoppies, and Badplaas are also taking off.

CSIR-developed chemical processing technology allows the production of essential oils by community-based farmers in many of the diverse climatic zones of South Africa. The establishment of these businesses involves significant skills transfer to the communities, leading to sustainable businesses and creation of new jobs.

The ACGT has made significant advances in equipping the centre for its role.

Technology transfer in the biotechnology domain has supported the establishment of community-based essential oils businesses.



Making plastics more effective

Plastics are popular packaging materials because of their low cost, low density and the ease with which they can be processed. However, they have poor gas barrier properties, which excludes them from many other applications such as jams, preserves and sauces. The CSIR has developed a barrier coating system with very low gas permeability that can be used on both polyolefins and polyethylene. Because the barrier properties are situated in the thin coating, the properties of the base polymer become almost irrelevant, resulting in more freedom in the selection of materials. This novel technology has enormous potential to make plastic packaging suitable for new applications. The commercialisation of this technology, which is currently under way, could transform the plastic packaging industry and make a significant contribution to job creation.

Landmark benefit-sharing agreement for potential anti-obesity drug

2003 marked the signing of a landmark benefit-sharing agreement between the CSIR and the South Africa San Council. The agreement relates to the benefits that could arise from the commercial success of a CSIR patented pharmaceutical formulation for obesity control that followed R&D of new technology related to the Hoodia plant. Dubbed P57, clinical trials continue internationally on the product, which - if successful - will form the basis of a new obesity treatment.

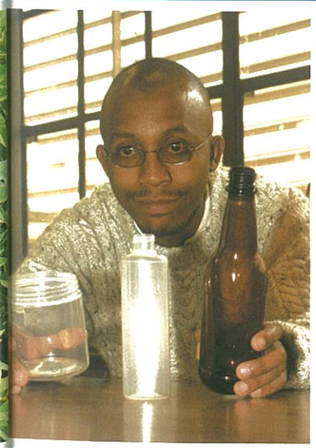
Under the terms of the agreement, the CSIR will pay the San eight percent of all milestone payments it receives from its licensee, UK-based Phytopharm plc, as well as six percent of all royalties that the CSIR receives once the drug is commercially available. Milestone payments are subject to agreed technical performance targets of P57 during its clinical development over the next three to four years, and royalties are based on sales which are not set to commence before 2008. The potential income stream will be deposited into a San Hoodia Benefit Sharing Trust, established by the CSIR and the San.

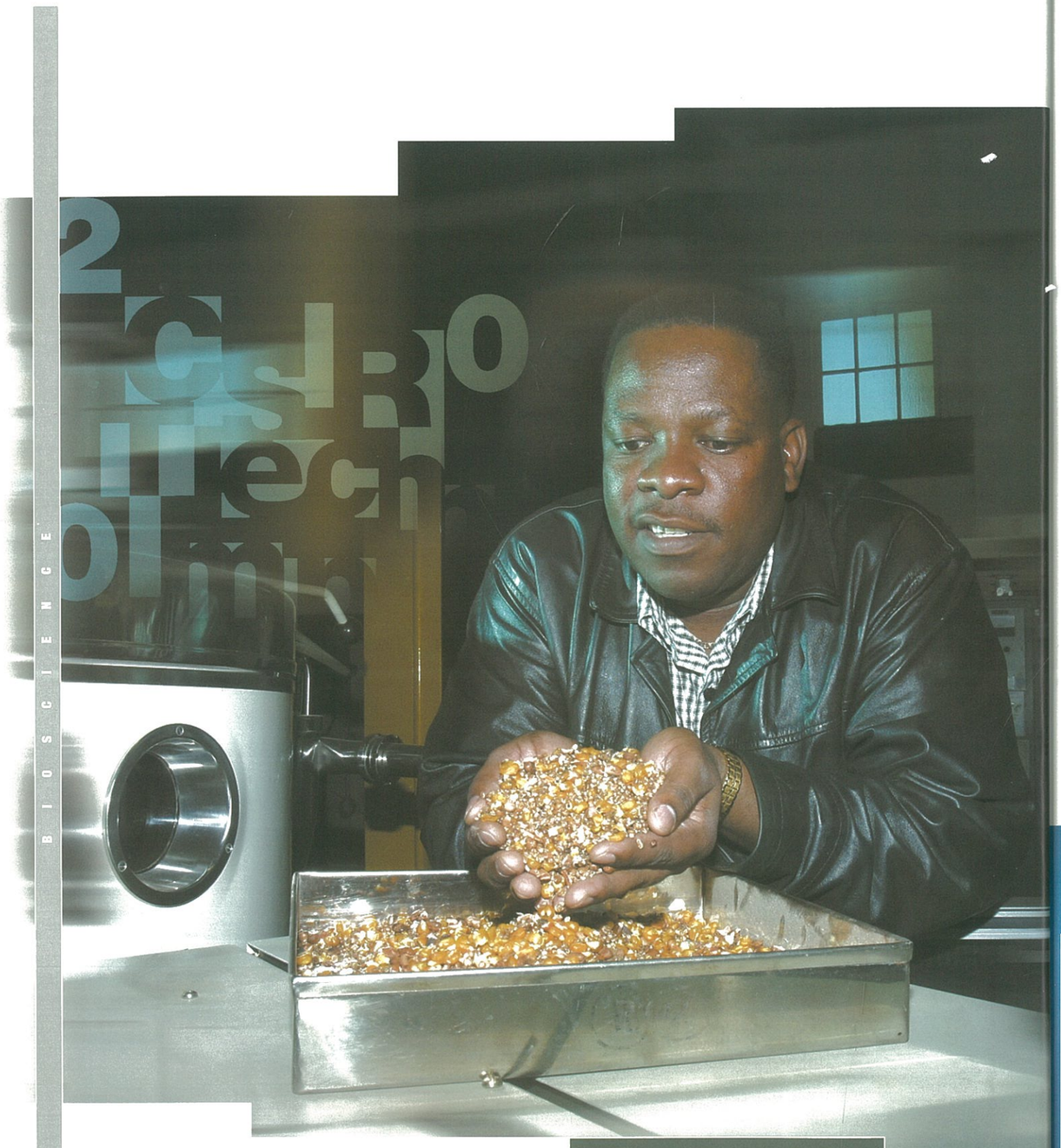
Alleviating Vitamin A deficiency in Africa

The CSIR is the first institution worldwide to gain permission to transfer the 'golden rice' technology to maize and sorghum under a sub-licence with Syngenta. This agreement represents a major breakthrough in terms of the responsible

Michael Mkhize is involved in CSIR research aimed at transforming the plastic packaging industry.

Minister of Arts, Culture, Science and Technology, Dr Ben Ngubane, with CSIR President Dr Sibusiso Sibisi and Mr Petrus Vaalbooi, Chairperson of the South African San Council, at the signing of the benefit-sharing agreement in March 2003.





Morewane Mampuru of the CSIR team focusing on the promotion of indigenous foods, with the dried grain mixture called nyakafatane, one of the products being manufactured in the Free State.

introduction of the technology for the alleviation of vitamin A deficiency in Africa. The Department of Health recently reported that 33.3 % of preschool children in South Africa suffer from vitamin A deficiency, which can result in childhood blindness (xerophthalmia) and death. Researchers from the Johns Hopkins School of Medicine in the USA and their colleagues in Malawi have also reported a link between vitamin A deficiency and transmission of HIV from mother to infant. The so-called "golden rice technology", which involves rice being genetically engineered with daffodil genes to produce nutritionally significant levels of beta-carotene in the rice endosperm, was originally developed in 1997 to address the global problem of vitamin A deficiency.

Promoting and commercialising South Africa's indigenous foods

A poverty alleviation initiative spearheaded by DST and the CSIR is promoting and commercialising indigenous foods through the provision of technology solutions. The project aims to support social development and economic growth in rural areas through the establishment of sustainable SMMEs, and to promote an understanding of the potential of enter-

Bioceramics – offering enhanced quality of life

The CSIR is involved in a research project focused on the use of synthetic ceramics for medical applications. The basis of these ceramics is hydroxyapatite, a naturally occurring material in human bone. Laboratory-manufactured hydroxyapatite implants are well tolerated by the body, with few rejection problems. The project focuses on a range of ceramic objects, including the orbital (eye) implant to replace an eye lost to disease or injury. By providing more affordable orbital implants, the project will help to supply state hospitals with these prostheses for local use.

A further application of hydroxyapatite is bone repair. The patented CSIR research found that porous ceramics manufactured in a specific form induce bone growth even in soft tissue. This example of osteoinduction has promising implications for the rapid recovery of bone. The occurrence of osteoinduction through bioceramics is also being utilised in filler material for dental applications. Partners in this project, funded by DST's Innovation Fund, include the University of the Witwatersrand, the University of Pretoria and the Pretoria Eye Institute.

Dr Wim Rrichter (far left) and the late Dr Michael Thomas.

The work of Dr Wim Richter and the late Dr Michael Thomas of the CSIR's National Product Development Centre in the field of bioceramic materials for medical applications earned the CSIR a place as a finalist in the Materials category of the World Technology Awards. James Clark, Chairman and Founder of the World Technology Network, commented: "To be selected as a finalist of a World Technology Award, is to be recognised by your peers as being amongst the very few leading innovators in your field whose work is having a genuine and substantial impact on the world in which we live." As finalists of the World Technology Awards, they were granted automatic admission into the World Technology Network and full access to the World Technology Network's resources.

prise activities based on indigenous resources and innovative technologies. In the Free State, the indigenous food products manufactured include chocolate bars, a vegetable and maize pre-mix called potele, a dried grain mixture called nyakafatane (a Sotho word meaning "mixed together") and dipabi biscuits. These products are expected to be the first to progress to commercialisation. KwaZulu-Natal, Limpopo, North West and the Eastern Cape are following at the heels of the Free State. Various organisations have shown interest in partnering with DST and CSIR in the promotion and commercialisation of South African indigenous foods and a process to establish a Section 21 company is under way.

CSIR patents processes for commercial production of menthol

The CSIR made a breakthrough in the development and scale-up of a process for the production of the aroma compound l-menthol. Early laboratory trials and subsequent pilot scale validation of this process for commercial production of menthol from a low value raw material stream provided overwhelmingly positive results. Menthol has a characteristic peppermint odour and is used in numerous products ranging from toothpastes and cough drops to perfumed goods and chocolates. Licensing of the technology is currently under discussion.

Repelling mosquitoes

The development of a novel natural method for repelling mosquitoes, including species that carry malaria, was successfully completed in 2002. The repellent, patented by the CSIR, utilises the active ingredients of an indigenous plant that is not found in any of the current commercial repellents on the market. This innovation resulted from the ongoing collaboration between the CSIR and traditional healers, initiated in 1998. Traditionally, the plant stems with its leaves are hung in rural dwellings to repel mosquitoes. The CSIR's phytochemical research led to the identification of chemotypes of the plant with superior properties. The volatile components of the plant were isolated and the chemical constituents identified. Results of SABS tests show that the CSIR-developed products are significantly more efficient at repelling mosquitoes when compared with current products on the market. Potential commercial application of this technology is being explored.

Turning an environmental problem into a replacement for fossil fuel

Used cooking oil presents a major environmental and human health problem. The CSIR has developed and patented an alternative use of this material that promises to solve these problems, while at the same time developing a whole new strata of jobs in recycling and processing. The process involves the low temperature transesterification of used oil to a flammable fuel and glycerol and can be performed at low cost, with simple equipment. The fuel can be utilised in a number of industrial applications, including the heating of ovens and furnaces. The technology has been patented and licences offered for commercial application.

Mozambique soya education programme

A programme initiated by the American Soybean Association, in collaboration with the World Initiative for Soya in Human Health, aims to make locally produced soya available to African countries where there is a need to improve nutrition and health. As part of this programme, the CSIR participated in a Southern African Soy Food Association fact-finding mission to Mozambique to determine the current status of and knowledge on soya food in the country. The team, hosted by the University of Eduardo Mondlane in Maputo, investigated the availability of soya foods in Mozambique, its processing and use amongst communities and to what extent it is incorporated into indigenous foods. Nutritional needs of local people as well as the 'knowledge gap' with regard to the potential of soya also had to be determined. The research results were used to develop an appropriate soya training programme that is awaiting approval from the American Soybean Association prior to implementation.

The CSIR has made a breakthrough in the development and scale-up of a process for the production of menthol.

Food scientist Sonya Buchner is involved in the Mozambique soya education programme.

ENVIRONMENT

Martin Tjatji, Harma Greben and Esti Eloff are members of the CSIR team involved in research on water treatment and remediation technologies.

Recognising the national imperative to create wealth and jobs, and improve the quality of life in urban and rural areas, the CSIR's mission includes a commitment to support economic growth. We further recognise that solutions to current social, economic and environmental challenges need to provide ongoing benefits to future generations, and contribute to sustainable development.

The environmental competencies in the CSIR are integrated effectively with economic and social considerations to provide innovative solutions to the complex issues of sustainable development.

Our environmental R&D activities address issues associated with the management of the resource base (terrestrial and coastal resources, biological diversity, integrated water resource management, and air quality management) as well as the effective use of resources to support sustainable development. This section of Technology Impact 2003 offers a selection of environmental projects, ranging from research to improve the competitiveness of resource-based industries (such as forestry) and improving the efficiency of resource use, to minimisation of waste streams across industry.

Treating acidic and sulphate-rich industrial effluents

Coal mining, while contributing positively to the South African economy, could potentially have a negative effect on the environment by polluting surface and underground water sources. With financial support from the Department of Trade and Industry's (dti) Technology and Human Resources for Industry Programme (THRIP), the CSIR and the Water Research Commission have developed a number of technologies for the treatment of acidic and sulphate-rich industrial effluents. These technologies are being demonstrated through the full-scale operation of prototype plants. Examples of full-scale applications for the various developments include:

- a limestone handling and dosing system, as well as the application of integrated iron (II)-oxidation/limestone neutralisation technology and biological sulphate removal processes, in the Navigation section of Anglo Coal's Landau Colliery;
- fluidised-bed limestone neutralisation process at Botswana Collieries Limited; and
- partial sulphate removal through gypsum crystallisation at Ticor, in Empangeni.

A number of students involved in the CSIR research are currently registered for academic courses, ranging from a PhD. in Chemical Engineering to a MBA. Several CSIR papers on the treatment of acidic and sulphate-rich industrial effluents have been published in national and international journals, while patents have been registered in the USA, Australia, Canada and South Africa.

CSIR Water, Environment and Forestry Technology's Dr Jannie Maree, Ms Harma Greben and Ms Marinda de Beer recently received the Water Institute of South Africa's Umgeni Award for their paper entitled 'Treatment of acid and sulphate-rich effluents in an integrated biological/chemical process'. The Umgeni Award is made biennially to the author(s) of a paper that makes a noteworthy contribution to water science or engineering.

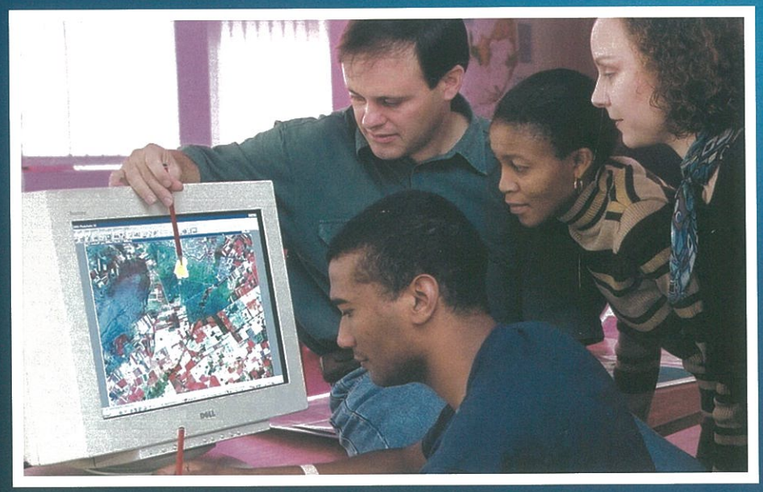
Keeping track of changes in land-cover

The current land-cover of every corner of South Africa is being mapped in the National Land-Cover 2000 project initiated by the CSIR and the Agricultural Research Council. An initial inventory of land-cover (and use) in South Africa was undertaken in 1994-95. The completion of the new project will allow for comparison of the change in dominant land-cover on a national basis and provide critical information on the rate and extent of change in land-cover. The new land-cover product is critical to a range of activities, including national and regional level State of the Environment reporting; integrated forest and water resource planning and management; spatial development initiatives such as the Wild Coast and Mpumalanga-Maputo Corridor; land-reform initiatives; local development and planning, and integrated sustainable rural development, where spatial information is a key component within the decision-making process.

Environmental Impact Report (EIR) for Aluminium Pechiney smelter

The CSIR was commissioned by the French-based company, Aluminium Pechiney, early in 2002 to undertake an Environmental Impact Assessment (EIA) for a R20 billion aluminium smelter proposed for the Coega Industrial Development Zone. Key issues and concerns addressed in the EIA included employment and skills development opportunities, potential negative impacts to the health of neighbouring communities, risks posed by the smelter's emissions to the citrus industry and the discharge of contaminated stormwater. The impact of industrial development on tourism to the region was another key issue. The final EIR, submitted to the provincial authorities for approval in November 2002, did not identify any negative impacts of high significance, provided the best practicable environmental options and mitigation measures were implemented effectively. In addition, numerous management recommendations were identified, which are being incorporated into a comprehensive Environmental Management Plan.

The CSIR team involved in the development of the new land-cover product.



Making clean water accessible to rural communities

A significant number of rural communities do not have access to reliable and safe drinking water supply sources and draw their domestic water requirements from unprotected springs, streams and rivers. The CSIR has provided an innovative solution to this problem in the form of the AmaDrum, a storage and purification system that enables water collected from raw water sources (even communal water sources) to be treated and stored in a user-friendly manner. Developed for and tested in rural communities to ensure functionality of use for the target communities, benefits of the technology include reducing suspended solids; turbidity; microbiological contaminants; colour; odour and bad taste in water and reducing the risk of diseases such as gastroenteritis, dysentery, diarrhoea and cholera through disinfection.

The AmaDrum is accompanied by a Health and Hygiene Awareness Programme, which includes training on how to operate the AmaDrum and the importance of clean drinking water in order to reduce infection from waterborne diseases. While the technology remains in the custody of the CSIR, small enterprises are being licensed to manufacture and/or distribute the AmaDrum. A number of business models for production and

The AmaDrum gives rural communities access to clean water.

Sharing our expertise

Dr Alex Weaver from CSIR Water, Environment and Forestry Technology is founder chairman of the Southern African Institute for Environmental Assessment (SAIEA). Established in 2000, this Windhoek-based institute acts as a regional node co-ordinating EIA work in the region. SAIEA is the recipient of the International Association for Impact Assessment's 2003 regional award for achievement in impact assessment.

Dr Pete Ashton from CSIR Water, Environment and Forestry Technology has been appointed Honorary Professor of Water Resources Management at the University of Pretoria, for a second three-year term. Since 1999, Dr Ashton has served as Vice-President of the International Commission on Water Quality of the International Association of Hydrological Sciences. During the year under review he also addressed several regional and international conferences as keynote speaker.

Sean Moolman, Heidi Rolfes and Thilo van der Merwe of the CSIR team involved in the project to establish a viable post-consumer PET recycling industry in South Africa.

distribution are in place, aimed at benefiting local entrepreneurs. The AmaDrum is currently produced and distributed in the Eastern Cape by a black economic empowerment small enterprise, which is fully owned by women.

Polyethylene (PET) recycling

The CSIR was a consortium member in a recently-completed Innovation Fund project aimed at establishing a viable post-consumer PET recycling industry in South Africa. Three key components of the recycling chain were included in the study: collection, recycling and conversion into end-products. The project team adapted and tested mechanical recycling technology, and provided recycled material to several industrial companies for product testing. During the three-year lifespan of the project, the overall South African PET recycling rate increased from 4% to 10%. Over the same period, the price of collected PET bottles increased by more than 200%, which translates into an annual income of approximately R12 million for collectors, indicating the project's success in job creation.

Waste coal: Boosting the economy and reducing environmental contamination

Exciting results have been obtained from CSIR research to investigate and identify economically viable processes that would render fine coal both handleable and saleable. This work is being carried out for the collaborative coal research programme, Coaltech 2020. As much as 6% of run-of-mine coal tonnage ends up in waste slurries as coal that is considered too fine to use. Manufacturing saleable coal products from this fine coal would have the potential to bring in an additional R170 million per year and would offer significant job creation potential. Another important advantage is the benefit to the environment, especially by assisting the coal-mining industry to comply with pending water control legislation that will call for zero-discharge management systems and the management of tailings dams and slurry ponds. Early results from a beneficiation pilot plant for fine coal at Koornfontein Mine indicate it is running effectively and is capable of producing product of the required quality.

Excellence in mining research

Dr Lindsay Linzer is the winner of the prestigious Rocha medal for her thesis dealing with the application of a relative moment tensor inversion technique to seismicity induced by mining. This award, which is made annually for the best PhD written in the area of rock engineering throughout the world, gives CSIR Mining Technology an unprecedented four Rocha medals, three of which have been awarded in the past 10 years.

Mr Hartmut Ilgner received the "Best Technical Paper Award" at the 8th Coal Science and Technology Conference, Coal Indaba, Fossil Fuel Foundation for his paper entitled: "Cost-effective utilisation of fine and coarse ash to maximise underground coal extraction and protect the environment".

The South African Institute of Mining and Metallurgy (SAIMM) awarded a gold medal to Messrs Arno Daehnke and Mike Roberts, and Ms Melanie van Zyl for a paper on "Review and application of stope support design criteria".

National Oil Spill Contingency Plan for Cameroon

In one of the biggest infrastructure development projects currently underway in Sub-Saharan Africa, a 1000 km oil transfer pipeline is being constructed to enable the exploitation of a natural crude oil reservoir in Chad and its export via a marine terminal in Cameroon. To ensure compliance with the environmental safeguard policies of the World Bank, which is partly financing the project, the CSIR was commissioned to develop a National Oil Spill Contingency Plan for Cameroon, covering the marine, coastal and inland environments. The plan proposes an organisational structure to provide the framework against which the

roles and responsibilities of a National Competent Authority and National Oil Spill Response Standing Committee are described. It also identifies the major sources of oil spill risk within the country and, through oil spill simulation modelling, determines the statistical probability of oiling of the environment exposed to such risk. Combined with the results of an environmental sensitivity analysis this directs oil spill response preparedness to priority areas.

Audit manual for integrated waste management

Waste collection and disposal often involve substantial costs for a company. Savings can be achieved by minimising waste streams (the prevention of waste), optimising waste streams (the separation and collection of waste) and drawing up well-formulated contracts with waste collection firms (reducing collection costs). The CSIR has developed a manual to assist organisations with the planning and measuring stages of a waste management programme. The manual contains tips and hands-on advice on how to investigate and characterise waste and provides conversion tables, benchmarking and performance indicator data. The methodology is applicable to a number of business sectors, but is specifically aimed at offices, restaurants and office services.

Hydrodynamic modelling to predict red tides and rock lobster mortalities

A joint project between the CSIR and Marine and Coastal Management is investigating the use of a hydrodynamic model to predict red (harmful algal blooms) tides along South Africa's west coast, an area particularly susceptible to red tide formation and its negative impacts. The first phase of the project assessed the value of a hydrodynamic model in establishing the spatial development and advection of red tide responsible for the loss of approximately 1 200 tons of rock lobster (valued at R120 million) in the Elands Bay/St Helena Bay area in January 2002. During the second phase of the project, a ground truthing exercise will be run, while simultaneously collecting remote sensing images and running the model. The research is expected to make an important contribution through the Benguela Current Large Marine Ecosystem Project towards the development of an early-warning system for both red tides and low-oxygen events on the West Coast.

Wood fibre optimisation

The CSIR, in association with major pulp and paper companies, has developed FOREST IQ, a suite of techniques specifically designed to help pulp and paper companies understand and manipulate their wood resources and fibre supplies to increase pulp yield, mill throughput and consistency of pulp quality. The system can also assist in reducing variable costs and improving product specifications. FOREST IQ has the capacity to deliver these gains through a process which involves understanding and measuring the key factors driving forest resource characteristics and then developing tailor-made solutions to optimise an individual mill's processes, products and markets.

The benefits of the system are already being realised by a number of pulp and paper companies, that are demonstrating short-term potential for an improvement in pulp quality variation, as well as significant increases in pulp strength characteristics.

Unique thermite technology

The CSIR, in collaboration with Metlite Gauteng (Pty) Ltd, has patented an improvement on pyrotechnic technology that consumes previously contentious waste materials to produce useful products, at a greatly reduced cost. This is the first cradle-to-grave technology that deals with the full spectrum of industrial waste materials. These products can be used in a variety of applications as affordable substitutes, while reducing the environmental impact of previously landfilled waste. The thermite technology has been used to destroy illegally imported pharmaceutical drugs, DVDs and CDs, as well as illegal ammunition and firearms.

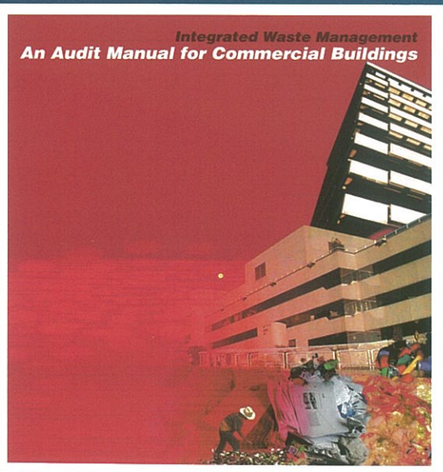
Catchment2Coast Project

The CSIR is leading a three-year R&D initiative to create greater understanding and predict the consequences of river catchment management options on coastal resource economics. Entitled the Catchment2Coast project, this partnership between the European Union and regional R&D institutions is using the Maputo Bay – Incomati River catchment as a pilot study to test a number of scientific ideas and develop a methodology which can be extended to support the management of other large comparable systems. Regional partners participating in the project include the University of Cape Town, University of Natal, Eduardo Mondlane University and the Fisheries Research Institute in Mozambique, and the University of Swaziland. The study is aimed particularly at tropical and sub-tropical systems, which are less understood than temperate systems. This initiative will also make a significant contribution to regional capacity-building in science and enhancing the technical skills of managers.

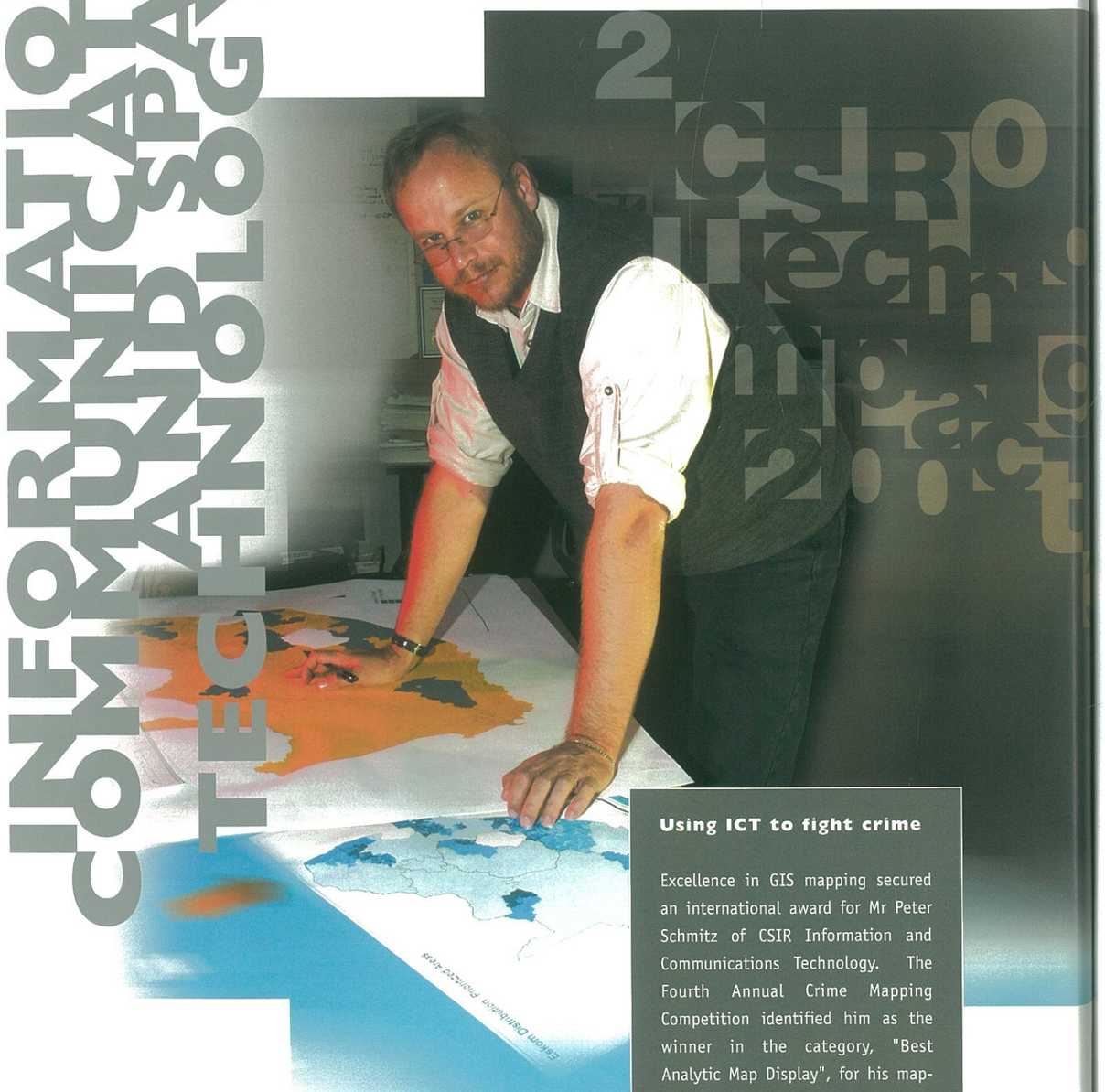
A strategy for water banking

The City of Windhoek is currently implementing an artificial recharge project developed and recommended by the CSIR. This follows an intensive study on how to rapidly replenish the Windhoek aquifer after periods of excessive pumping. Treated surface water was injected into boreholes that penetrate highly permeable parts of the aquifer. The results of the tests were encouraging and the implementation of a large-scale borehole injection scheme is underway. The main aim of artificially recharging the Windhoek aquifer is to replenish the groundwater that has been removed from storage. The overall objective is however to ensure a dependable groundwater resource by ensuring that the city's "water bank" is full when water is available for artificial recharge.

Forest IQ optimises mill processes, products and markets.



INFORMATION AND COMMUNICATIONS TECHNOLOGY



Information and communications technology (ICT) touches almost all aspects of our lives in numerous ways, yet these interactions are mostly invisible to us. The rapid growth of cellular telephony in South Africa and the region, together with its impact on the way we work, communicate, do our banking and even play, often go unnoticed. In addition, ICT tends to receive scant recognition for its significant contribution to economic growth and the competitiveness of industry in the region, such as support to the manufacturing and mining sectors; more efficient and pervasive banking systems; reducing costs through logistics solutions and ensuring better utilisation of our infrastructure through the application of intelligent transport systems.

The pace of ICT R&D, development of products and applications and changes to the policy and regulatory environments is accelerating and the impact of these technologies is becoming pervasive and far-reaching.

The appropriate application of ICT is fundamental to the future of southern Africa because of its ability to provide solutions to our challenges and make a positive impact on people's quality of life. ICT has the potential to make a significant contribution to aspects of education, health, service delivery and poverty alleviation, and the need to capitalise on these opportunities is urgent. A major challenge, especially for the developing world, is to ensure that the benefits of ICT are not confined to the more privileged sections of society, but spread throughout every sector and area. The need for innovation in these areas is evident.

The CSIR's R&D activities in ICT are spread across the entire spectrum of our competencies. These activities, informed by both the current and future needs of our clients and stakeholders, balance the need to impact on the competitiveness of industry with the drive to maximise the contribution of ICT to the quality of life of society. This section of Technology Impact 2003 provides only a brief snapshot of CSIR projects within this key focus area, ranging from policy support activities to pilot projects impacting on the way we learn.

CSIR exports locally-developed simulator technology

The CSIR recently exported the Enigma ll Electronic Countermeasure and Radar Target Simulator, representing a major milestone in the development of Digital Radio Frequency Memory-based simulator technology. Developed in close collaboration with EW Simulation Technologies, the Enigma system can be used to evaluate operational radar robustness against electronic attacks, in acceptance testing of new radar and to test tracking filters and electronic protection functionality during radar technology development. It can also be used in the development of advanced electronic countermeasures and counter-countermeasures and to provide support for training and doctrine development. The client base for the system, which includes a Graphical User Interface and realtime control software developed by the CSIR, includes users in Europe, Australia, South Africa and the Far East.

Digital Doorway project promotes computer literacy

A joint undertaking by the DST and the CSIR in Cwili Township in Kei Mouth, Eastern Cape, is investigating the concept of minimally invasive education as an alternative mechanism for promoting wide-scale computer literacy. Dubbed the Digital Doorway project, it seeks to verify results in the South African context, of research conducted in India, indicating that children possess the cognitive ability to acquire functional computer skills without formal training. Similar findings in South Africa could inform methodologies to introduce alternative mechanisms for computer literacy.

International space industry values its 'Eyes over African Skies'

The CSIR Satellite Applications Centre strengthened its reputation in the international space industry as a reliable provider of satellite ground segment services to the telecommunications and satellite manufacturing and operations industries.

The completion of a new Ka-band antenna for the tracking, commanding and monitoring of a new constellation of satellites - dubbed Spaceway - under contract to The Boeing Company, put the CSIR at the cutting-edge of satellite tracking worldwide. Ka band refers to very high frequencies that have not - until now - been used for operational satellite tracking. The antenna system will be used operationally for the first time when the first of this next-generation communication satellite system, owned by Hughes Network Systems, is launched later this year.

Missions successfully supported include the NASA Solar Radiation and Climate Explorer (SORCE), as well as a number of satellite launch supports for the French National Space Agency and The Boeing Company.

The CSIR established a monitoring ground station to be used in the European Geostationary Navigation Overlay Service, a global satellite navigation system. Satellite telecommunications solutions were also provided to various African countries including South Africa, Rwanda and Botswana.

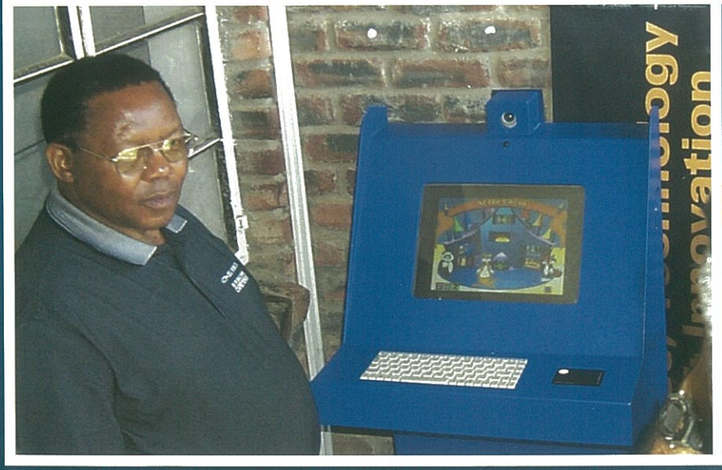
Telephone-based delivery of government services

The tremendous growth in prepaid cellular telephony has brought telephone connectivity to an unprecedented number of South African citizens, thus creating an ideal platform for delivering services to a wide cross-section of the population. A three-year project by the CSIR, the University of Pretoria and the Fraunhofer Gesellschaft in Germany is aimed at realising the potential of telephone systems for government service delivery. The project addresses the need to improve the efficiency and quality of government services; ensure that government services are delivered to all levels of society at the most convenient times and locations; grow government's portfolio of services; create government service transparency and provide citizens with feedback mechanisms. Research is aimed at understanding how to develop effective, efficient and usable telephone-based interfaces to informational and transactional systems within a developing-world context.

Low-cost connectivity for rural communities

A CSIR-developed Wireless Network Package provides a fast and cost-effective solution for the roll-out of communications to rural communities, where installation of telephone lines may still be at the planning stage. The novel combination of equipment is easy to install and can be customised or integrated with any system that requires wireless networking. An interesting application of the technology was recently demonstrated in the Eastern Cape, where a rural clinic was linked to a hospital enabling data, voice and video communication between the clinic sister and doctor.

The Minister of Arts, Culture, Science and Technology, Dr Ben Ngubane, opened the first Digital Doorway project in Cwili in December 2002.



The CSIR Satellite Applications Centre continues to provide valuable support to the international space industry.

The team studying telephone-based delivery of government services.

The CSIR's Wireless Network Package was used at a rural clinic in the Eastern Cape to facilitate communication between the clinic sister and doctor.

Putting satellite imagery to work in the region

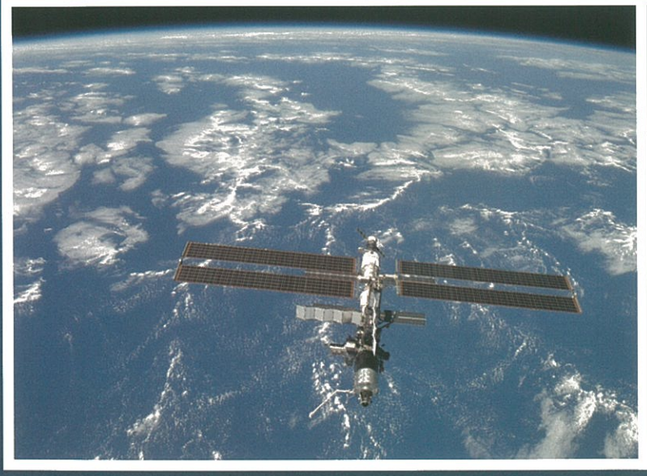
The CSIR is continuing its quest to put affordable, accessible data from earth observation satellites in the hands of the region's users. Regional access to affordable data will place the emphasis on the use of world-class technology for developing and applying local solutions ranging from food security, to water resources monitoring, to prevention and mitigation of disasters.

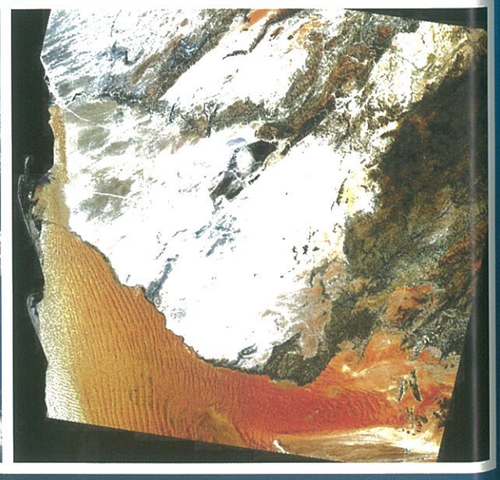
The real value of applied satellite imagery was evident from a project in which South Africa's electricity provider, Eskom, was provided with information on fast-growing areas. This was done by means of change detection data and maps over the nine provinces and aims to support Eskom in its drive to provide electricity to all the people of South Africa. In addition to the daily use of satellite imagery in, for example, agricultural applications, earth observation satellites also captured the ferocity of a cyclone in the Mozambique channel; the extent of an oil spill alongside the coast of St Lucia, a World Heritage Site; and a severe occurrence of red tide off the Cape West Coast.

i-Studio initiative: ICT for education

The CSIR is playing a leading role in the i-Studio (internet-Studio) initiative, an ICT project that aims to bridge the digital divide across continents and create new frontiers in education through groundbreaking ICT applications. Through contacts established with existing i-Studio coordinators in the Americas, the CSIR facilitated the first SA i-Studio link-up via video conference with Santiago, Chile, during October 2002. The link-up opened up the possibility of international collaboration amongst students from the two continents, using digital real-time and ICT-based technologies. The Freedom Park Architectural Competition, aimed at selecting designs for a museum, a garden of remembrance and a memorial, to be dedicated to South Africa's newfound democracy and to be located on Salvokop Hill outside Pretoria, forms part of the i-Studio initiative. The competition includes inputs from architectural students from the University of Pretoria and a student team from Florida, Chile and Venezuela. The i-Studio concept will be extended to other universities and schools in South Africa, involving previously disadvantaged institutions.

The CSIR plays a leading role in making affordable, accessible satellite imagery available to the region.





Volunteer Child Network to assist in combating child abuse

The national drive to combat and prevent child abuse received a boost in October 2002 with the launch of a Volunteer Child Network, a web-accessed database to facilitate a match between volunteers in the prevention of child abuse and organisations who recruit, train or manage such volunteers. The Volunteer Child Network was developed by the CSIR in partnership with a number of government organisations and NGOs. The site provides potential volunteers with web-based access to information and contact details of relevant organisations. It facilitates a process to match the skills and preferences of volunteers to the specific needs of individual organisations. The initial response to the website (www.volunteerchildnetwork.org.za/) has been positive.

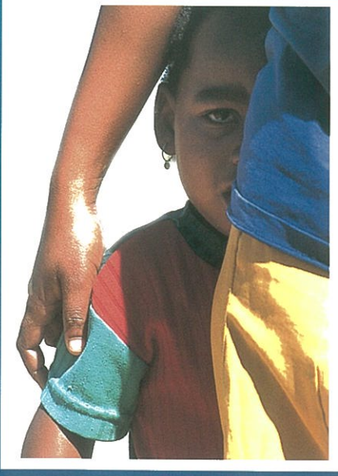
Promoting the use of South Africa's languages

The CSIR has developed a multilingual South African website for the Pan South African Language Board (PanSALB). PanSALB was established in order to promote multilingualism and develop previously marginalised languages. It also seeks to create conditions for the development and use of official languages, the Khoe and San languages and sign language, and to promote and ensure respect for all languages commonly used by communities in South Africa, including German, Greek, Gujarati, Hindi, Portuguese, Tamil, Telegu, Urdu and Arabic, Hebrew, Sanskrit, and other languages used in religious contexts.

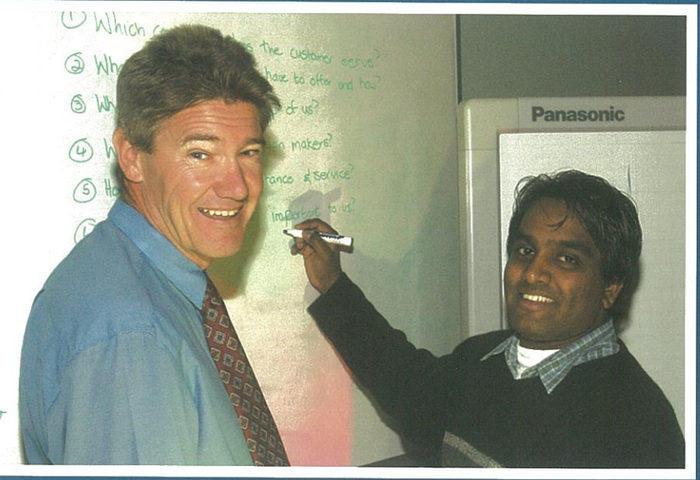
ICT for economic empowerment

As part of an Innovation Fund project, the CSIR has formed a number of successful partnerships with rural communities in bridging the digital divide. In Pomfret, situated in the rural areas of the North West Province, the CSIR implemented an ICT project in support of local economic development. The project stresses the importance of community participation, innovative technologies, quality of life and sustainability. The multi-purpose community centre, set up with the assistance of the CSIR, forms the hub of the community's PC literacy and business skills training activities. Additional activities include the establishment of ICT hubs at Itsoseng and Vryburg, and training at the Mmabatho Centre of Excellence. In addition to business skills training, twenty-eight community members from Pomfret, Itsoseng and Vryburg have successfully completed computer training courses and recently received their graduation certificates from the North West Province

The CSIR-developed Volunteer Child Network is supporting the national drive to combat and prevent child abuse.



Chris Morris and Ajay Makan are leading the Innovation Fund ICT project in support of local economic development.



MEC for Developmental Local Government and Housing, Mr D Africa.

CSIR activities in the open source arena

The CSIR has identified open source as a long-term R&D focus area. The advantages of open source go far beyond potential cost savings, to being a powerful vehicle for local human resource development and stimulation of indigenous ICT innovation. CSIR involvement in open source activities includes:

- the application of open technologies in developing affordable custom ICT solutions in the public sector, including a workflow system developed for the National Department of Health, and a data management system supporting the National R&D Survey of DST;
- the development of commercial ICT systems using open source components, such as the Client Service Centre at the University of Pretoria, and internal systems for ABSA's AllPay group;
- the management of collaborative open source projects involving a number of internal and external contributors and stakeholders, such as the Open School project for the InfoDev programme of the World Bank, in partnership with SchoolNet SA, and the Open Source School Management System in partnership with Wits and Kgatelopele Technologies (one of the companies participating in the pre-incubation programme at The Innovation Hub);
- contributing to existing open source initiatives, such as the freeBSD operating system (a derivative of BSD UNIX);
- innovative projects within the e-government space, closely involving the Centre for Public Service Innovation (CPSI);
- public sector networking, advocacy and thought leadership, in particular in collaboration with units such as the CPSI, the State Information Technology Agency and DST, and forums like the Government IT Officers Council Open Source Workgroup.

Director of CSIR Information and Communications Technology, Mr Sello Matsabu, has been nominated by Minister of Communications, Dr Ivy Matsepe-Casaburri, to chair the Independent Selection Panel that appoints the Board for South Africa's Domain Name Authority.

The CSIR team involved in open source activities.

Improving simulation capability

The field of Computational Fluid Dynamics (CFD) is subject to constant improvements in simulation capability. To stay at the forefront of CFD capability, continuous hardware upgrades are required. Trends in the industry are moving toward parallel processing, yet the cost of installations can be prohibitive. The CSIR has developed a Linux-based parallel cluster system, with sixteen stand-alone nodes and two high-power workstations. This system offers an affordable alternative to the expensive installations associated with parallel processing. The system is modular and uses cheaper hardware, thus allowing easy and relatively cheap upgrades, redundancy and maintenance. Total hardware costs were limited to approximately R500 000, and benchmarks have shown that significant increases in capacity as well as processing speed have been achieved when compared with older scalar-based hardware.

Sports technology provides competitive edge

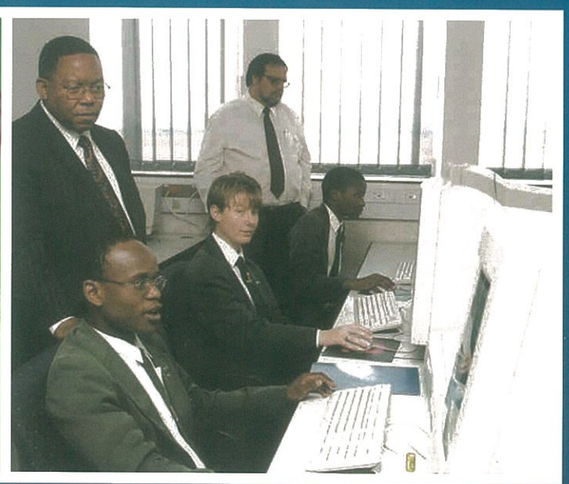
The CSIR's Sports Technology Centre is internationally recognized as a pioneer in the development and application of performance analysis tools aimed at developing winning teams and individuals. In 2002, a CSIR technical support team accompanied South Africa's athletes to the Manchester Commonwealth Games. Their contribution focussed on developing and enhancing the skills of individuals and teams with the aid of existing or specially developed technologies. Video footage of performances by the South African team members and their opponents was captured and analysed to provide our athletes with a competitive advantage.

Developing design capacity at secondary schools

The DST and the Automotive Industry Development Centre (AIDC) are jointly financing a project aimed at developing design capacity at secondary schools. As part of this project, the CSIR has been involved in training more than 660 secondary school learners in computer-aided design technology and techniques over the past two years. Starting in 1999, the project involved Grade 10 to 12 learners at twenty-four Gauteng schools from all levels of society. A specific set of training modules has been developed for the programme, which is not limited to any particular commercial software brand. The project aims to establish sustainable educator training by familiarising teachers with this discipline during their basic training at university or technikon.

The CSIR's Sports Technology Centre provides South Africa's athletes with a competitive edge.

The Minister of Arts, Culture, Science and Technology, Dr Ben Ngubane, with secondary school CAD-learners.



INFRASTRUCTURE

Research in support of infrastructure development is one of the CSIR's key focus areas.

A well-functioning built environment and the supporting physical infrastructure are fundamental not only to the future development of South Africa, but to the entire region. Infrastructure development underpins the competitive performance of every facet of a country's industrial and commercial base, and supports the welfare and quality of life of the people.

Since 1994, the government has recognised the importance of infrastructure development, and the Reconstruction and Development Programme placed great emphasis on infrastructure delivery as part of government's objective to create a better life for all South Africans and to address the imbalances of the past. This was followed by the Growth, Employment and Redistribution Strategy, which (amongst others) targeted infrastructure delivery to promote economic growth.

Almost every national and provincial government department, as well as all local authorities, have a direct or indirect interest in the performance of the built environment and the supporting physical infrastructure. Given the enormity and the complexity of the task of the public sector, R&D offers substantial benefits for the public sector in meeting its own goals of continuing performance improvements and delivering improved value for money to the public.

Infrastructure development is increasingly being undertaken as a partnership between the public and private sectors, in areas such as roads, rail, water supply and sanitation, health services, education, ICT support services, tourism services and accommodation. R&D offers substantial benefits in these sectors.

The CSIR's mandate is to undertake research and technological innovation in support of an improved quality of life for all South Africans. R&D in support of infrastructure development is therefore one of our key focus areas. Our R&D activities in this area are informed by the current and future needs of our clients and stakeholders in the public and private sectors. This section of Technology Impact 2003 offers a brief snapshot of selected CSIR projects focused on infrastructure development.

Road safety strategy for World Bank programmes

The CSIR is carrying out a road safety audit and developing a plan of action for the establishment of a road safety strategy for World Bank programmes in sub-Saharan Africa. The objectives of the study are to:

- carry out a road audit of current World Bank projects in the areas of health, education, transport and urban development;
- collect information on the institutional framework for road safety as well as other relevant information related to key road safety factors;
- prepare a plan of action which will provide the basis for the establishment of a road safety strategy in sub-Saharan Africa. This strategy will facilitate the upgrading of road safety initiatives in World Bank programmes and serve as a platform to mobilise multilateral, bilateral and trust fund financing to support implementation of the strategy.

Poverty relief through infrastructure development

A project by the South African National Roads Agency Limited with technical support provided by the CSIR, is supporting poverty relief while creating safer environments for pedestrians along South Africa's national roads. The safety aspect of the project is addressed by educating road users, particularly from poverty-stricken communities bordering national roads, on road safety programmes being implemented in their provinces. In support of poverty alleviation, the project is engaging emerging contractors, non-government and community-based organisations to assist in the implementation of education and infrastructure programmes.

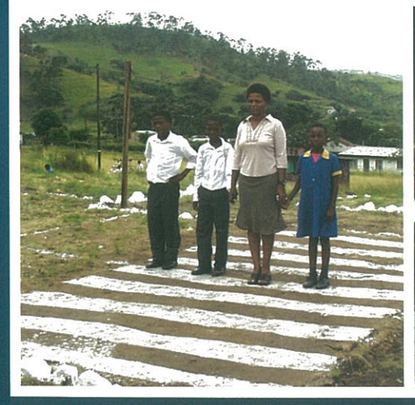
Creating enabled environments

The CSIR participated in a two-year, comparative study, funded by the UK Department for International Development, to study the quality of the linkages between people with disabilities and their physical, social and economic environment. With case studies in South Africa and India, the study identified and examined the environmental and attitudinal barriers that work against legislation and often frustrate targeted support programmes from achieving the full integration of people with disabilities. Practical means of overcoming these barriers were explored through consultation with people with disabilities, their families, communities and service providers. The project encouraged people with disabilities who are living in poverty to examine the nature of their experiences, their development priorities and their ideas about how barriers that prevent their full participation in society may be overcome. In addition, the study encouraged the establishment of advocacy groups by raising people's awareness of disability rights, providing training in research and advocacy and facilitating meetings and discussion. At a strategic level, the project has generated findings that will inform policy-makers and practitioners of ways in which people with disabilities can be integrated into the development process.

Promoting Integrated Development Planning (IDP)

The CSIR is a key roleplayer in a drive initiated by the Department of Provincial and Local Government to achieve greater awareness of the contribution of IDP in the alleviation of poverty and the improvement of the quality of life of local inhabitants in a sustainable manner. The initiative also aims to contribute to opening up streams of international donor funding for local planning and development processes. An awareness campaign and information package are being used to promote and popularise IDP as an important and uniquely South African approach to achieving sustainable local reconstruction and development in the context of NEPAD.

The CSIR is providing technical support to a SANRAL project aimed at supporting poverty relief while creating safer environments for pedestrians.



CSIR research supports the creation of enabled environments for people with disabilities.

Improving road infrastructure delivery

The CSIR has provided technical support to the National Department of Transport in developing a Road Infrastructure Strategic Framework for South Africa. The primary purpose of this document is to identify suitable mechanisms and define an action agenda for addressing the most critical challenges preventing our road infrastructure from fulfilling its intended role as a catalyst for development and a key provider of accessibility and mobility. Priority areas addressed in the document include:

- the review and re-declaration of the separate areas of the road network;
- the assignment of the separate elements of the revised total road network to the appropriate institutional authority;
- the review of the institutional arrangements for road planning and delivery at provincial and municipal level;
- the revision of the funding arrangements for roads;
- setting in place a capacity enhancement process to ensure that adequate road engineering expertise is available in the country.

Road Safety Information System for Namibia

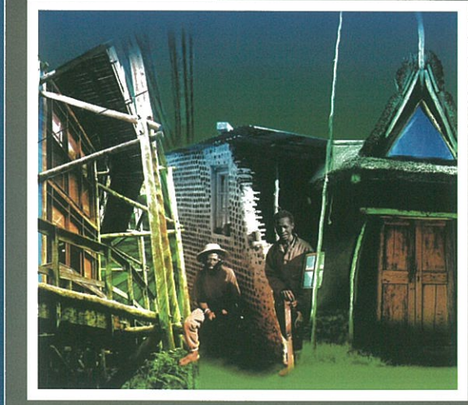
The CSIR, in a joint venture with private sector companies, is developing and implementing an integrated accident information system for the Namibia Road Safety Council (NRSC). The

The Road Infrastructure Strategic Framework addresses the most critical challenges facing road infrastructure in South Africa.

Supporting sustainable construction in developing countries

In response to the UN Agenda 21, formulated at the Rio Earth Summit in 1992, the International Council for Research and Innovation in Building and Construction and the United Nations Environment Programme commissioned the CSIR to prepare the Agenda 21 for Sustainable Construction in Developing Countries. This document sets out an R&D agenda and supporting strategy for action that will ensure that the contribution of the construction sector to the physical development of developing countries supports the principles of sustainability. The document will also be used to guide national and international investment in R&D, and to stimulate debate and encourage exchange of learning on sustainable construction within the developing world. The document is the result of a collaborative process that represents an important step in the empowerment of developing countries, providing an agenda prepared entirely by experts from developing countries to respond to specific needs and challenges.

Ms Chrisna du Plessis from CSIR Building and Construction Technology played a leading role in preparing the Agenda 21 for Sustainable Construction in Developing Countries. Her contribution to sustainable construction in South Africa was acknowledged when she was awarded the prestigious JD Roberts Award in 2002. The award was instituted by Murray & Roberts in the late 1970s to promote competitiveness in seeking environmentally sustainable solutions to human dilemmas and to encourage scientific research into technology that enhances the quality of life of all South Africans.



NRSC requires accurate and reliable data to benchmark the improvement or successes of the Five-Year National Road Safety Plan currently being developed to manage road safety in Namibia. Accurate accident information is also required for the effective management of functions such as the identification of hazardous accident sites on the road network, effective enforcement actions, and supporting the Motor Vehicle Accident Fund. The CSIR has drawn up functional requirements for the accident information system, and a new Accident Recording Form has been developed in cooperation with relevant role players in Namibia.

Sustainability of human settlements in South Africa

Commissioned by the Department of Housing, the CSIR has completed a report on the sustainability of human settlements in South Africa. Based on an analysis of seven different case study areas, the report illustrates the complexity of the sustainable settlement challenge. The report highlights a number of tensions, threats and successes pertaining to the sustainability of human settlements in South Africa. Critical threats include water scarcity; crime; the AIDS pandemic; growing poverty; institutional complexity and underperformance and inefficiency in some parts of the public sector. Areas of progress include increased awareness of the relationship between human settlements and their biophysical environment and the need for interventions to prevent damage to the environment. There is also greater understanding of the concept of sustainable development and the need for integrated planning. The report identifies national housing policy as a critical area requiring revision, as well as the body of policy and legislation that influences the interaction between human settlements and the biophysical environment.

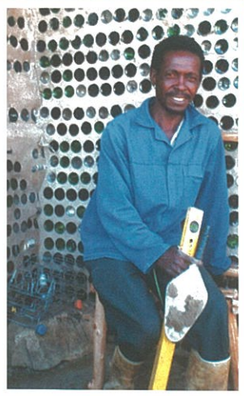
Decision-support system to facilitate integrated planning

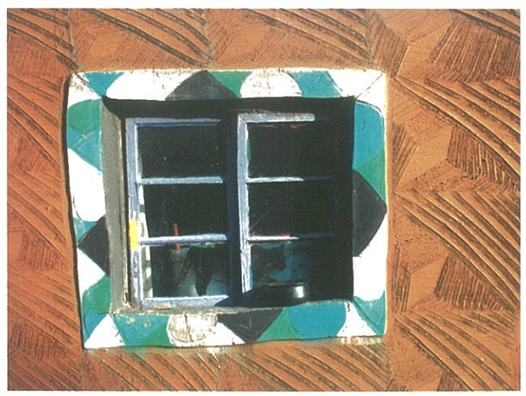
The CSIR, in cooperation with the Gauteng Provincial Government, has developed eLand, a GIS-based, interactive, decision-support system aimed at assisting decision makers in assessing the availability of land and evaluating the suitability of vacant land for low-income housing development in Gauteng. The system also assists planners and decision-makers by integrating information from diverse government departments for consideration in spatial planning.

eLand consists of eight modules, each designed specifically in support of one of the following objectives:

- integration of spatial information from diverse sources;
- data conversion to appropriate formats and standards;
- estimation of short/medium-term land availability;
- providing an overview of the geographic distribution of potentially suitable land;
- spatial profiling of specific land parcels earmarked for development.

The CSIR has completed a report on the sustainability of human settlements in South Africa.





Turning South Africa's schools into centres for community development

An innovative project initiated by the National Department of Education with funding from the Poverty Alleviation Fund, is set to introduce a new approach to the design, construction and operation of school buildings in South Africa. Entitled Thuba Makote ("breaking soil clods to prepare for planting'), the project is managed by the CSIR, working closely with local consultants. The programme aims to address the need for high-quality school education and community development in poverty-stricken rural areas of South Africa. The project investigates how the design, construction and management of school buildings can be developed to support cost-effective, high-quality school education as well as community development through training, employment creation and enabling access to gardens, workshops and learning resource centres. Pilot projects have been initiated in each of South Africa's nine provinces. To develop understanding, capacity and support around this new approach, the pilot projects are participatory and involve a range of stakeholders, including provincial departments, local communities and businesses.

The Thuba Makote project is turning South Africa's schools into centres for community development.

Sustainable and environmentally friendly road maintenance

A partnership between the CSIR, government, TEIs and industry is making an important contribution to the sustainable and cost-effective rehabilitation of South Africa's roads. For the past three years, this partnership has been conducting research to develop interim guidelines for the local use of foamed bitumen treated materials, which is both cheaper and more environmentally friendly than traditional road rehabilitation methods. The first phase of this ongoing project entailed comprehensive laboratory assessment and testing of foamed bitumen and emulsion-treated material with the Heavy Vehicle Simulator. This phase resulted in the publication of an interim technical guideline on the design and use of foamed bitumen-treated materials. Data from the second phase of the project will be used to introduce additional design catalogues and charts in future revisions of the guideline document.

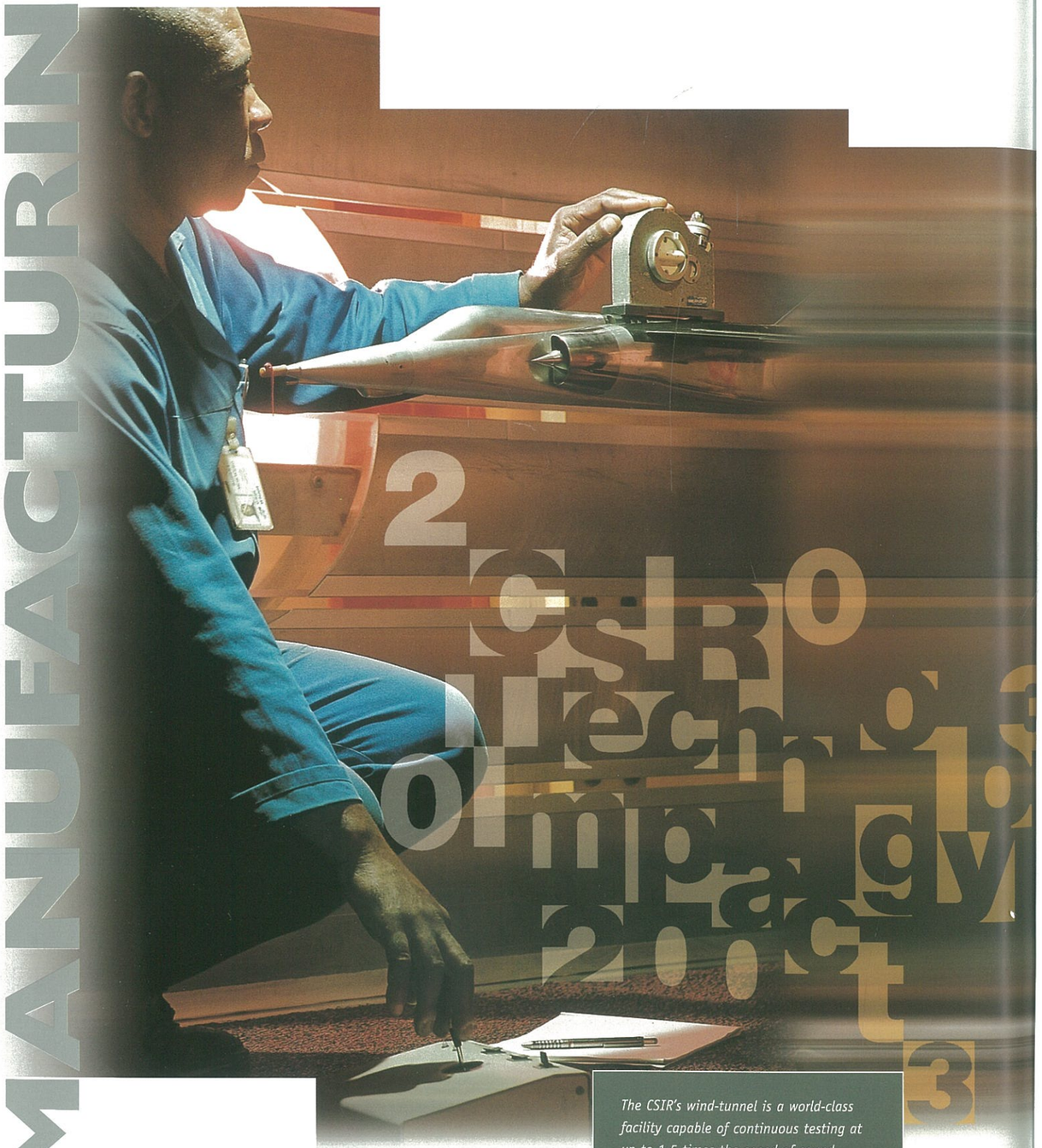
CSIR research is contributing to sustainable and environmentally friendly road maintenance.

CSIR walks away with National Planning Award

A joint project by the CSIR and the eThekwini Municipality was awarded the prestigious 2002 National Planning Award of the South African Planning Institute in the category, Best Regional Planning / Policy Planning Project. Led by CSIR Roads and Transport Technology's Ms Ntsotiseng Morojele and Ms Cheri Green, the project focused on accessibility mapping for community social services and public facility investment around transport nodes. Judged best in terms of professional standards, the CSIR project received top marks for addressing social needs. Evaluation criteria included aspects such as growth management, sustainable development principles, rural development, poverty alleviation, regional development and sector co-ordination.

Pictured at the awards ceremony in Durban in September 2002 were (left to right) Ms Ntsotiseng Morojele (CSIR), Ms Christine Platt (SAPI President), Ms Teresa Dominik (eThekwini Municipality) and Ms Cheri Green (CSIR).

MANUFACTURING



The CSIR's wind-tunnel is a world-class facility capable of continuous testing at up to 1.5 times the speed of sound.

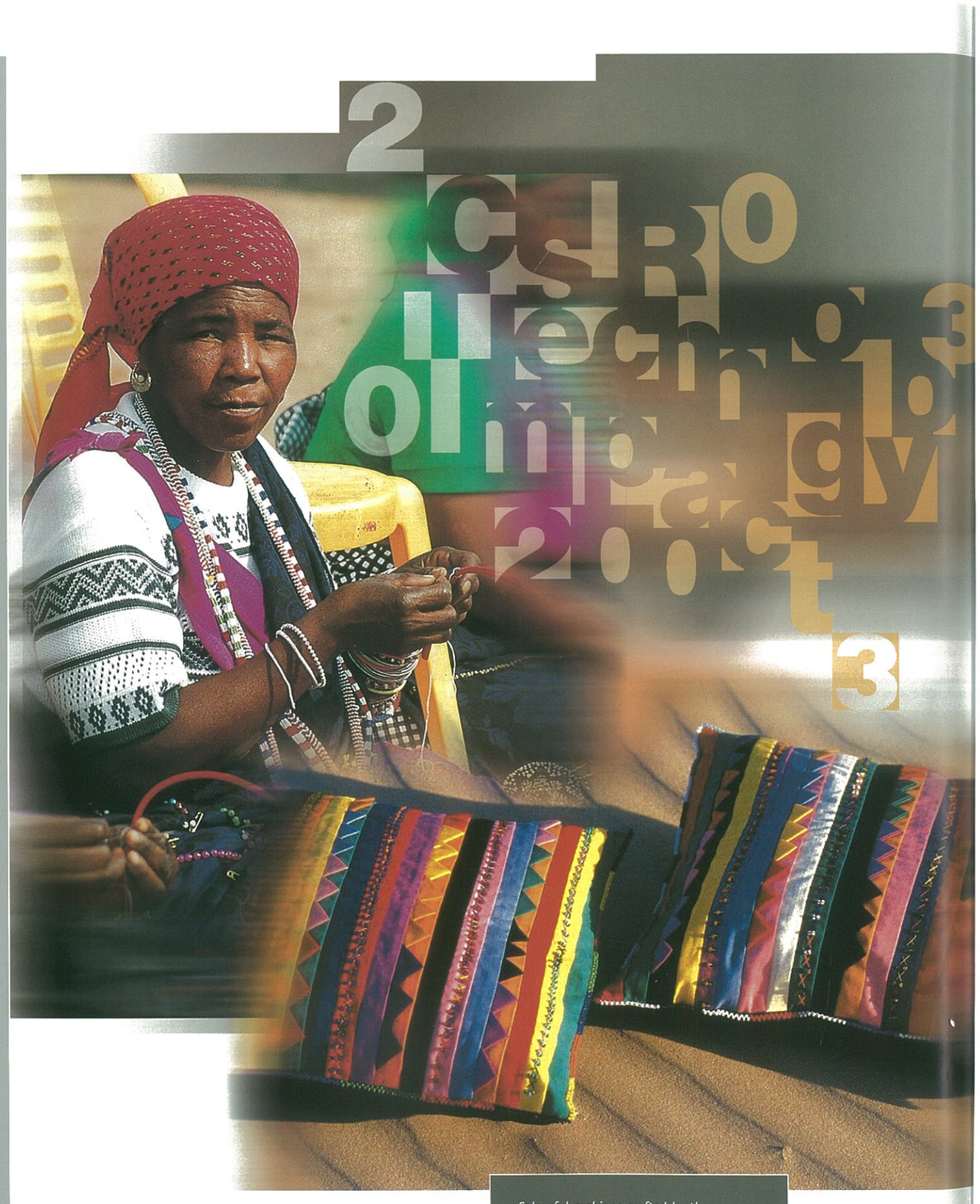
Technology through innovation is key to the economic development of a nation. It is widely accepted that the manufacturing sector of a country is its engine for growth and that the application of advanced manufacturing technologies is critical to gain competitive advantage in global markets. The South African government has recognised the strategic importance of both technology and manufacturing as catalysts for growth in our economy, and two national strategy documents were released during the past year to which the CSIR's approach to manufacturing is aligned. The National R&D Strategy recognises Advanced Manufacturing as one of the four Innovation Missions central to accelerating economic growth, sustainable wealth creation and the improvement of South Africans' quality of life. Furthermore, the Integrated Manufacturing Strategy, driven by the dti, recognises that our future competitiveness will depend on the capacity and capability of the manufacturing sector to master advanced technology domains and to move increasingly from raw material-intensive manufactured goods towards knowledge-intensive goods and services.

A third national initiative which impacts on the manufacturing strategy of the CSIR is the National Advanced Manufacturing Technology Strategy (AMTS). The CSIR has been mandated by the National Advisory Council on Innovation to develop this strategy. The objectives of the AMTS are, amongst others, to make our country less dependent on imported technologies and enhance local innovation; to increase the value of exports; to enhance the knowledge base and the knowledge intensity of local industries; to create new knowledge networks to foster innovation; to optimise costs in supply chains and to support significantly higher levels of human resource development.

The manufacturing sector is integral to South Africa's growth, and accounts for the largest contribution towards GDP at some 18,4%. This section of Technology Impact 2003 offers a glimpse into selected CSIR projects focused on manufacturing.

Largest transonic wind-tunnel test series in sub-Saharan Africa

The CSIR recently completed the largest transonic test series ever performed in sub-Saharan Africa, in the Medium Speed Wind Tunnel (MSWT). This wind-tunnel is a world-class



Colourful cushions crafted by the Ilingelihle Project in the Eastern Cape, one of the DST poverty alleviation projects implemented by the CSIR.

facility capable of continuous testing at up to 1.5 times the speed of sound. This test series, commissioned by Kentron, was on a missile airframe, and was run continuously, using the MSWT's new Continuous Force Testing technique, coupled with the High Angle of Attack-capability. The continuous force method allows data to be captured as the model sweeps through different altitudes. This significantly improves the efficiency and productivity of the MSWT, as compared to the "pitch-pause" technique previously used, resulting in significant cost savings to the client.

Refining uniquely South African design

The CSIR has established a design unit to lead cultural industry design nationally and internationally through quality skill and excellence. The CSIR Cultural/Craft Industries Design Unit (CIDU) was formed following a directive from government to create a style that was "uniquely South African" and draws on expertise and skills from three CSIR Centres: the Centre for Fibres, Textiles and Clothing, the National Product Development Centre and the Enterprise Development Centre. The new unit will incorporate various aspects of design including ceramics, furniture, interior décor, weaving and jewellery. It also offers an interior design service using traditional crafts in new ways.

The skills and expertise of the CIDU have been applied in a range of poverty alleviation projects for DST, such as:

- projects established in the Limpopo Province, including Vuk'uzenzele (fashionable cushions based on traditional Ndebele designs, beaded lamp bases, door handles and jewellery); the Vuhlalo project (a range of highly sophisticated cushions, runners, shawls, throws and scarves); the Siloe Workshop project (functional basketry products, including lampshades and trays); the Zamani project (pottery items) and the Pfunekani Community project (furniture manufacture);
- the Ilingelihle Project in the Eastern Cape, which crafts picnic baskets, cushions, beaded glasses and bed linen. This colourful range won international acclaim at exhibits in San Francisco and New York. Also in the Eastern Cape, the Mveliso Project designs and manufactures a range of colourfully beaded souvenir dolls;
- the Ngezandla Zethu Handcraft Project in the Maputaland region of KwaZulu-Natal, which produces furniture and other craft products from the local natural resources;
- Together with Leather and Siyazuza Ngesikhumba in the North West Province and KwaZulu-Natal, which design and manufacture a range of leather products, including bags, belts, key holders, cell phone pouches and book covers.

Database to support the chemical industry in southern Africa

A joint undertaking by the CSIR and CMCS, a marketing research company, has resulted in a unique online database, CHEMISSA, which offers complete analyses of production, trade and demand in the chemical pipeline in all fourteen SADC countries. The database is detailed to sub-sector level and offers quantitative information that is regularly updated. Sponsored by the dti, CHEMISSA facilitates international and regional trade and provides investment decision-support and access to information from local and international sources.

R&D casting facilities

With an advanced casting facility to support its work on aerospace applications, the CSIR undertook high-technology casting for Swedish company Volvo Aero. This initial success has led to a request by Volvo for future cooperation on two related joint projects, involving life assessment, materials development and casting.

Metrology services for the automotive industry

The CSIR's National metrology Laboratory (NML) has established an Automotive Metrology Laboratory, which operates as a technology centre to serve the needs of manufacturers, OEM suppliers and allied industries. It

promotes good measurement practice, offers specialist projects to transfer state-of-the-art technology to commercial laboratories and provides non-commercialised specialist calibration and metrology services. The laboratory provides a cost saving for companies that do not have their own measurement infrastructure. Additional services offered to the automotive industry include paint adhesion and corrosion studies, failure investigations and forensic studies in fraud cases.

Aerospace initiatives

As an acknowledged Rolls-Royce Centre of Excellence, the CSIR continues to work closely with consortium members, the Royal Canadian Air Force, the National Research Council Canada, the United States Navy, the Defence Science and Technology Organisation (Australia) and the South African Air Force to perform structural analysis of a specific class of gas turbine engine of relevance to the aerospace community worldwide. For French company Snecma, engine component manufacture and life assessment continue to be valuable services provided by the CSIR and its partner, Denel. The CSIR is also at present focusing on advanced composite materials for Boeing's aerospace applications.

Tooling Industry Support Initiative

South Africa's tooling industry is a fundamental component of the country's manufacturing capabilities. In line with government's Integrated Manufacturing Strategy, the SA Tooling Industry Support Initiative was launched in 2002 to mobilise collaborative delivery within the industry and support the development of the industry to compete with international markets. A forum, led by the CSIR, has been established to steer the initiative, which is supported by DST and the AIDC. The three key features of the initiative are the establishment of a database of toolmakers; the development and implementation of a learning system in the area of tooling and the establishment of a not-for-profit organisation to act as a conduit for client needs, filtering work through to the tool-making network. The initial focus of activities will be on the automotive industry.

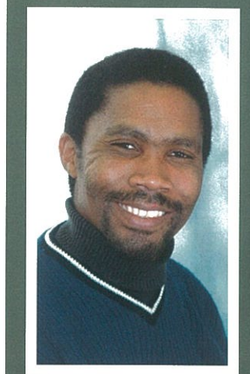
Improving measurement practice for the manufacturing industry

Current trends in the manufacturing sector leading to globalisation and international acceptability of manufactured goods, increased competitiveness and rapid technological development have culminated in the CSIR's NML developing a Measurement Practice Improvement Guide aimed at SMMEs in the local manufacturing sector. The guide aims to improve metrology awareness and empower companies to instil good measurement practice. This will contribute to an improvement in the competitiveness level within South African manufacturing companies, thereby increasing local and international trade.

Mobile metrology laboratory

The CSIR's NML has developed a mobile metrology laboratory for the Mozambican National Institute for Standardisation and Quality, under contract to the United Nations Industrial Development Organisation. The mobile metrology facility will provide a calibration service to industry as well as legal metrology services in the remote areas of the country as an alternative to and a possible precursor for establishing branch metrology laboratories at various regional centers. The NML was responsible for the commissioning of the metrology modules, while the main sub-contractor, the AIDC, has undertaken the design, construction and commissioning of the mobile laboratory carrying the metrology modules. The facility carries equipment for mass, volume, temperature and length metrology.

Lesley Harris of the CSIR's National Product Development Centre, which utilises structural analysis techniques to analyze the design, manufacture and operation of aerospace components and systems.



S&T excellence

Mr Sunshine Blouw, Acting Manager of the dti-funded National Fibre Centre based at the CSIR's Port Elizabeth site, was the recipient of the Current Achiever Award in the Science and Technology category of the Metropolitan Eastern Cape Awards.

Sharing our expertise

Dr Bruce Simpson of the CSIR's NML is the Chairman of Section II of the Consultative Committee for Ionising Radiation, with participation in the full CCRI executive meetings. Following the NML being voted in as a member of the International Committee for Radio-nuclide Metrology (ICRM), Dr Simpson also serves as a Vice-President on the ICRM Executive Board.

Design successes

CSIR industrial designer Mr Gold Mametja was selected among dozens of designers when South Africa's new National Orders were commissioned, following the extensive review process of the old system of orders. Mr Mametja received public acknowledgement from President Mbeki for his efforts. Among Mr Mametja's other design successes is the Man of the Series trophy for the ICC Cricket World Cup 2003.

CSIR Management Team

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Dr Petro Terblanche, Director: Food, Biological and Chemical Technologies

Mr Gerhard Smith, Acting Director: Water, Environment and Forestry Technology

Ms Tina Eboka, Executive Vice-President: Organisational Development and Communications

Dr Hoffman Maree, Director: Manufacturing and Materials Technology

Mr André Nepgen, Director: Defence Technology

Dr Günter Gürtunca, Director: Mining Technology

Dr Rodney Milford, Director: Building and Construction Technology

Mr Neo Moikgangoa, Executive Vice-President: Policy and Technology for Development

Dr Anthos Yannakou, Executive Vice-President: Operations

Front left to right:

Mr Sello Matsabu, Director: Information and Communications Technology

Dr Sibusiso Sibisi, CSIR President and Chief Executive Officer

Mr Albert Jordaan, Executive Vice-President: Finance and Commercialisation

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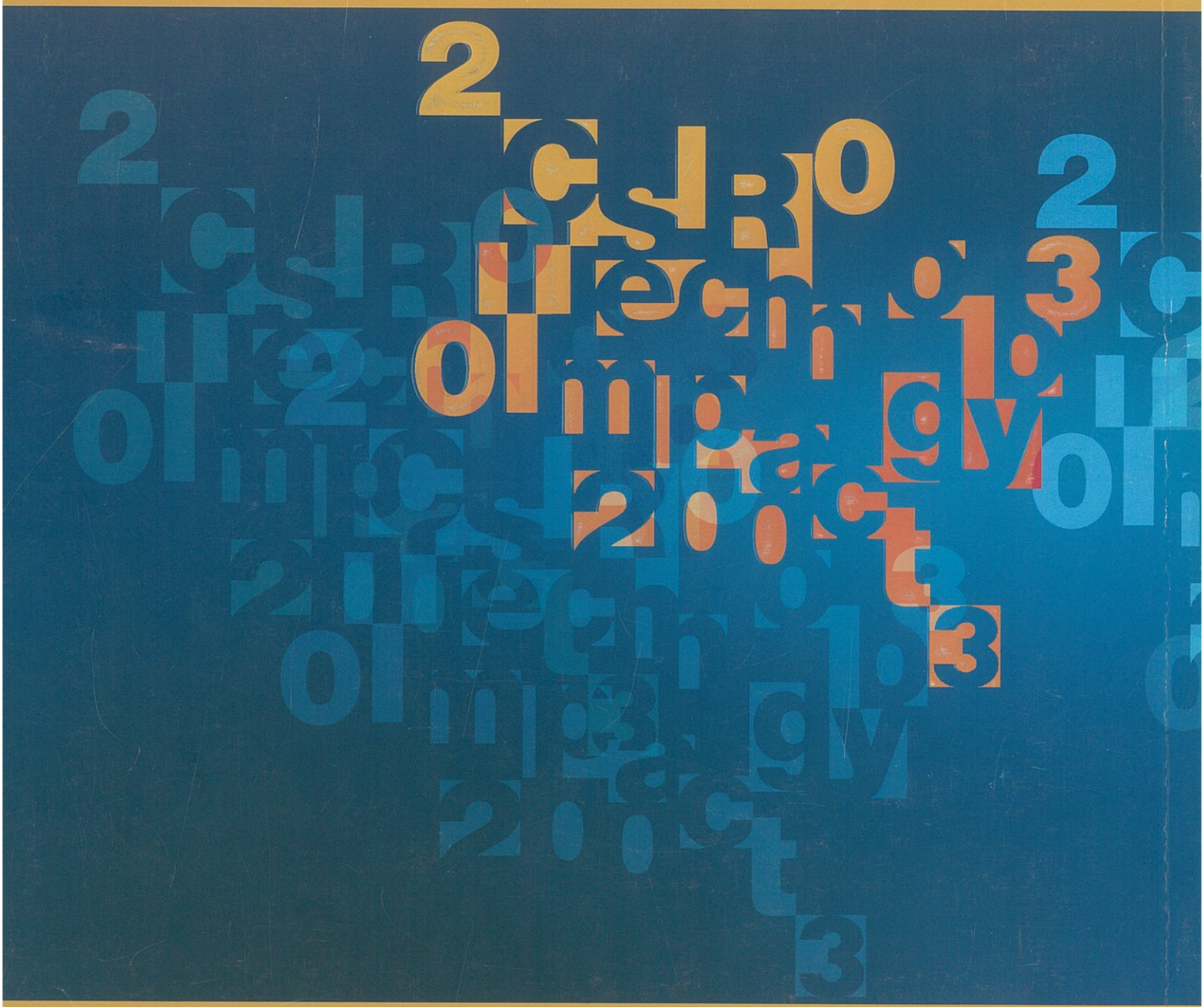
www.csir.co.za
Produced by CSIR Communications
Design: Loretta Steyn Graphic Design Studio - Pretoria



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