CSIR ANNUAL REPORT 1989

"CSIR undertakes and manages carefully directed research, development and the application of science and technology in selected national priority areas and provides comprehensive scientific and technological advisory services"

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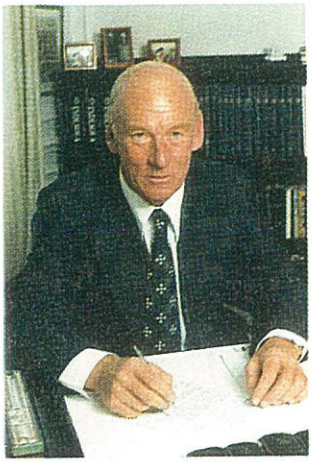
Chairman



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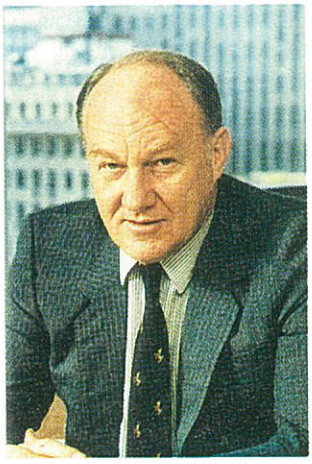

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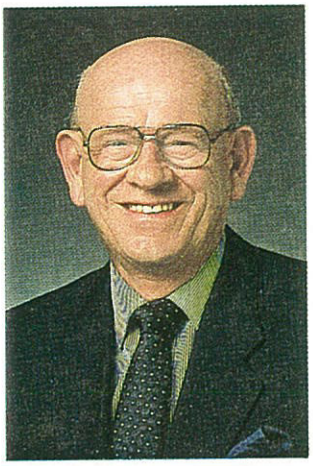

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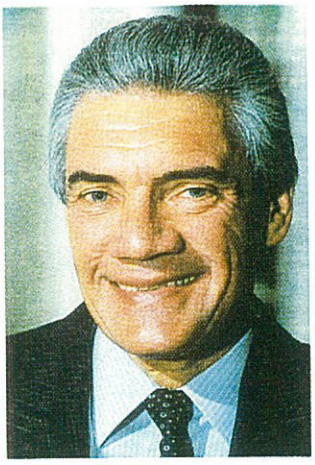
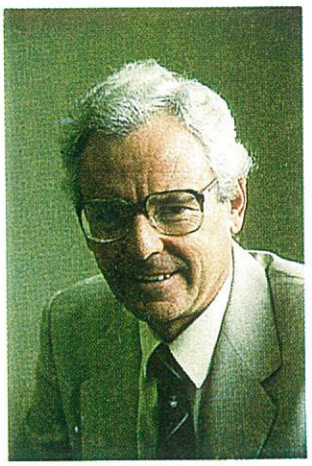


Dr W.P. Venter



Prof D.R. Woods

HIGHLIGHTS

- ***Sweetened egg product***
  whose extended shelf life at ambient temperatures means bakeries and other users need no longer buy eggs daily.

- ***New catalyst***
  for the conversion of ethylene to liquid fuels.

- ***Single cell protein***
  whose development may compensate for a coming shortage of natural protein.

- ***Medium speed wind tunnel***
  commissioned at the Division of Aeronautical Systems Technology and representing a major leap forward in South Africa's technological capability.

- ***Chemdata-guide***
  on South Africa's chemical industry to be the equivalent of the American Chemical Society's Chemcyclopaedia and the Stanford Research Institute's Oil Paint and Drug – "OPD" – Chemical Buyers' Directory.

- ***Microbial enzyme "cellulase"***
  goes into large-scale production at the Division of Food Science and Technology, winning international recognition for its Biotechnological Products and Processes Programme.

- ***Specialty metals***
  programme of the Division of Materials Science and Technology gains fine reputation in the exacting field of superalloys.

- ***Satellite applications R35m upgrade***
  to handle higher data rates flowing from advances in earth satellites and their sensors

Dr Louw Alberts, Chairman of the Board

CHAIRMAN'S REVIEW

There is overwhelming evidence that during 1989 the new-style CSIR won the approval and respect of the industrial and scientific communities in South Africa.

Comment from many quarters which I have received as chairman shows a widespread feeling that CSIR has restructured effectively and is now better able to fulfil its vital role in the promotion of technology. There is also high appreciation for the dedication and professionalism of CSIR people.

This makes it all the more lamentable that scientific collaboration with other countries in sub-Saharan Africa is not what it should be – though some continues, despite hostility of political as opposed to science leadership.

Some 14 African countries avail themselves of CSIR assistance in such fields as housing, water purification, land use planning by means of satellite imagery, food technology, and road construction and transport planning. Other areas in which we help are combating atmospheric and water pollution and mining and minerals technology.

One would wish, however, for re-establishment of the co-operation which existed in the fifties between ourselves and the Scientific Council for Africa South of the Sahara. The Africa Interaction Centre set up by CSIR's Foundation for Research Development – and mentioned in FRD's own report accompanying this annual report – is a step in the right direction.

Most research in Africa is undertaken precisely because available knowledge from elsewhere is not always directly applicable to our circumstances. Scientists and engineers in sub-Saharan Africa could benefit from the accumulated Africa expertise of CSIR and other South African institutions, and we could gain from their experience and need.

South Africa can help not only because it is also of Africa, but also because it straddles Third and First Worlds. It has already learned many of the lessons Africa needs to know in order to compete in First-World markets, at a time when the technology gap between Third and First Worlds is widening and development of new technologies has become highly cost-intensive.

CSIR can, at short notice, tackle the complex scientific problems associated with First World situations, as well as those typically arising in developing countries.

On top of the need for technology, one must recognise that "indigenous" technology is far more reliable, and familiar, than that which depends on imported science or scientists.

Technology is not simply a machine or device, but a system, born, developed and used in a particular social setting with its own commercial, aesthetic and political mores – it is culture-intensive. Two Indian scientists have written: "There is a feeling among developing countries that the imported know-how has been developed in alien ideologies and conceptual frameworks."

Technology is truly indigenous only if it is strongly dependent on research and development done within a country itself by people who regard that particular piece of planet as their home. Naturally, however, each country must be free to try to import any shortfall of skilled manpower and to try to retain it.

Educational and research institutions, the fountainheads of technology – like the primary infrastructures of transport, electrical power and communication – must be able to ride the vicissitudes of political and social change. They do this better if they are essentially home-based and -nurtured.

When one examines technology trends outside Africa, faster development of science capability on this continent becomes even more urgent.

Most of the underlying technologies for products that will be on the market by the year 2000 are already in the laboratories or just entering them. In the developed countries, it it is generally accepted that while the "labour" part of much production can comparatively easily be automated, that which requires imagination, a capacity for learning or an ability to work with people, cannot.

South Africa's major technological resource, CSIR, has an important role to play – using technology to bridge chasms between peoples where all else has failed. That role will range from providing digested scientific and technological information from world data banks, to undertaking key research and transferring technology that will improve industrial abilities and output.

Leadership of such a resource has even more significance than in other types of organisation. In CSIR, machinery and equipment have only a support role. Creative staff members determine CSIR's productivity, and their innovative, smart ideas are the core of its products.

From the sub-group level to the very top, the leadership must understand, believe in, and be enthusiastic about the organisation's objective of making a contribution to the country's technology through science and engineering.

A science leader must have proved in the very first decades after university training that he or she is capable of original thinking, putting it into action, and achieving results that will achieve peer recognition locally and internationally.

Furthermore, leadership of the restructured CSIR must have empathy with industry. Technological innovation must fit in with the profit motive, which is far removed from the atmosphere of a laboratory; successful innovation from the laboratory through to the factory floor takes courage and willpower.

Leaders meeting these requirements have certainly been developed by CSIR, and strong support for them comes from a board of directors with immense depth and variety of experience. The past year has shown the board and the internal science leaders of the CSIR pulling together as a strong team.

I would like to convey my own and the Board's thanks to the president, Dr Chris Garbers, and the members of his Executive for being the "beacons of change" within CSIR, and to the staff who, through their sterling work, justify our faith in them.

An era in CSIR's history comes to an end as Dr Garbers follows his intention - which he clearly stated on assuming the position in 1980 - of not serving more than two five-year terms. Although his second term ends on 4 May 1990, he has agreed to a Board request to remain in office until 30 September to facilitate a smooth transfer of responsibility.

South Africans, and in particular the scientific community, owe a huge debt of gratitude to the man responsible for leading CSIR during the most critical phase in its history. No person has done more for the cause of science in this country, or has done more to ensure that vital modern technologies and expertise will be available to future generations in South Africa.

The Board has appointed Dr Brian Clark, currently Group Executive: Research, Development and Implementation, as sixth president of CSIR. Responsible for giving considerable impetus to the restructuring of CSIR, Dr Clark is highly respected throughout the South African and international scientific communities.

Leadership of CSIR will remain in highly competent hands.

LOUW ALBERTS
Chairman

PRESIDENT'S REVIEW

The reconstituted CSIR got down to business in 1989, adding forcefully to technology expertise in South African industry and to research capability on its own campus and at universities, museums and technikons.

This "pincer" approach is intended to ensure that, despite the difficulties brought by disinvestment, sanctions and boycotts, South Africa generates the technology input essential to economic success and rising living standards. Expertise already developed and harnessed by CSIR did extremely well, while we continued to generate "scientific literacy" for the future.

Wide success rewarded the efforts of both our Research, Development and Implementation Group (RDI) and our Foundation for Research Development (FRD), as is shown by their respective separate annual reports published together with this one. External income has risen from R166,8 million in 1988/89 to a budgeted R211,1 million for 1989/90, and the number of research contracts handled, predominantly through RDI, increased from 2 500 in 1984 to more than 5 000.

FOUNDATION FOR RESEARCH DEVELOPMENT

An historic occasion for FRD was the opening of its new headquarters building on the periphery of our Scientia campus in April. This signified its broadening and more independent role, in line with the Board's recommendation to Government that FRD should become an independent statutory council.

The opening ceremony was attended by delegates from sister funding organisations locally and overseas, notably the National Science Foundation in the US and the Alexander von Humboldt Foundation in West Germany. Also represented was the Standing Committee on the Free Circulation of Scientists of the International Council of Scientific Unions (ICSU).

During the preceding one-day symposium on "Science – The Endless Frontier", a large audience was addressed by national and international scientific leaders, notably the Nobel Prize laureate, Sir Aaron Klug, from the UK.

Three of the five members of the CSIR Executive: Dr R R Arndt, Group Executive, FRD
Dr J B Clark, Group Executive, RDI
Dr C F Garbers, President

The other two members are: Mr A Michau, Group Executive, Finance and Management Services
Mr R F Camphor, Group Executive, Human Resources Services

The inauguration of its new home comes after remarkable advances by FRD over the past 10 years. It now –

- supports 808 researchers at universities, museums and technikons, after peer review on a truly international basis, involving nearly 7 000 highly regarded experts from around the world

- awards 1 300 postgraduate bursaries a year in the natural sciences and engineering to selected students, including a record number of 27 special merit bursaries to outstanding students for local and overseas studies

- allocates some R4,5 million to South African universities, technikons and museums to buy new research equipment or replace or upgrade obsolete equipment, and

- manages multi-user facilities predominantly devoted to high-level manpower training - including the National Accelerator Centre (NAC) and the South African Astronomical, Magnetic and Radio-Astronomy Observatories. In its second full year of operation, following the closure of CISR's Pretoria cyclotron, NAC is delivering isotopes to 15 hospitals and research institutions for the treatment of some 150 patients a week.The new FRD building, with a modern auditorium and conference rooms, established itself as an ideal location for contact and interaction between scientists and engineers nationally and internationally. Through the South African secretariat for the ICSU, which it houses, FRD provided assistance to South African delegates to attend ICSU-sponsored meetings across the world.

In pursuance of its stated mission to promote research and high-level manpower in the sciences and engineering, it launched a number of new initiatives:

- A Scientometric Advisory Centre (SAC) began cross-national and cross-discipline analyses and comparisons. Among them: determining how dependent the country is on foreign science and technology in certain fields; evaluation of the performance of specific universities, institutes and laboratories; and assessment of the performance and impact of journals and individual scientists.

- UNINET, a South African scientific computer network with an international link, became operational.

- An Africa Interaction Centre was brought into being.

- An investigation began into electronically assisted mass education to improve the quality of mathematics and science teaching in schools.

- A survey conducted among 157 policymakers in science and technology and more than 1 000 scientists identified priority areas for Special Research Programmes. The strongest candidates are biotechnology and production, electronics and information technology.

- A register of South African scientists abroad was started to keep them informed regarding local science and technology developments.

In addition, FRD set up forums for multidisciplinary interaction and co-operation and also co-operation with industries associated with a wide variety of institutions and organisations. The purpose is to more effectively address complex issues and bottlenecks in scientific and technological priority areas.

It has become clear that the potential identified at universities and technikons is far greater than can be optimally developed with funds available from the State. In essence, the current two-pronged approach entials baseline-funded, own-initiated research – the only criterion being excellence in immediate past research – thus ensuring the continued availability of broad-based, multidisciplinary scientific and engineering expertise. The second component of this approach concentrates on the development of manpower in the enabling technologies, thereby increasing South Africa's self-sufficiency in the highly competitive world of technology. In its new home, FRD, with its extended mandate and greater autonomy, will grow, change, and increasingly influence the development of science and technology in this country.

RESEARCH, DEVELOPMENT AND IMPLEMENTATION

This Group and its individual divisions continued their successful drive to become true partners of both the public and private sectors. Growth in market acceptance and credibility was demonstrated by a commissioned survey, and by attendance at promotional functions for clients in South Africa's industrial centres. An internal survey by TWS Communications showed sure progress in establishing a market-driven culture embracing customer-orientation, willingness to take risks, shared responsibility, promotion of innovation and a new approach to decision-taking.

Further rationalisation started in 1989 when it was decided to incorporate the bulk of the Division of Processing and Chemical Manufacturing Technology (PCMT) within the Division for Materials Science and Technology. It is intended to unite PCMT's timber research activities and those of the independent South African Forestry Research Institute in a new strategic unit, probably under the CSIR umbrella. The merger, if comes about, will lead to a tremendous strengthening of CSIR's capability in biotechnology, one of the thrust areas identified for the future.

The PCMT Programme for Textiles and Fibres will be developed into a new strategic unit within the next two years.

The Division of Energy Technology has transferred its activities at its laboratories in Lynnwood Road, Pretoria, to the Scientia campus. Their former premises will now be used to house expansion of the engineering faculty of the University of Pretoria - a small return for the university's generous donation more than 30 years ago of the site of Scientia!

After a detailed market survey, communication audit and financial investigation, RDI's activities in the Western Cape are to be consolidated at its Stellenbosch premises by the end of 1990. A decision has also been taken to cater for Natal clients by strengthening CSIR's corporate presence there.

Enhanced technological capability

CSIR is determined that financial exigencies shall not affect investment in state-of-the-art equipment and so reduce long-term technological capability. During the year, three major investment programmes, representing a major leap in South Africa's technological capability, came to fruition:

- An R80-million medium speed wind tunnel was inaugurated by the Division of Aeronautical Systems Technology. This stands as a tribute not only to many scientific disciplines within CSIR, but also to South African industry, overwhelmingly responsible for its construction, and its American designers, working with the approval of their government.

- To meet changing requirements under a statutory responsibility of CSIR, a 1 500-ton, R8,5-million cable test facility was inaugurated at our Laboratory for Mine Hoisting Technology at Cottesloe, Johannesburg. The test machine is the largest of its kind in South Africa, has the highest workload in the world - testing some 5 000 new and used cables a year - and serves the 125 mines registered with the Department of Mineral and Energy Affairs.

- A three-year, R35-million upgrade of our Satellite Applications Centre at Hartebeesthoek was completed. The centre processes and disseminates data from earth observation satellites for use in meteorology, agriculture, oceanology, mineral exploration, regional planning and other disciplines. Its ground station equipment has served for 10 years and the upgrade was needed to handle much higher data rates flowing from advances in satellites and sensors which have brought better spectral coverage and ground resolution.

Information processing

Information - particularly up-to-date research and technical information - is of paramount importance in our current "technology era". Those who have access to it and who run fastest with it are destined to be the most successful competitors in the technology race.

Our Division for Information Services moved decisively to provide processed information to South African institutions and companies. In active collaboration with the Advisory Council for Technology it launched the SA Technology Information System, SATIS. Subscribed to by 2 100 industrialists, the service handles some 6 000 enquiries a year, 1 500 industrial liaison visits, the provision of some 100 000 technical publications, and the distribution of 5 200 SATIS newsletters each month.

During the year a number of studies and compilations were completed:

- Government accepted findings of a CSIR investigation - commissioned by the Minister of Economic Affairs and Technology - which showed that a major South African space programme cannot be justified on economic grounds alone. It also accepted recommendations to the effect that no country can isolate itself from space technology and that a brains trust must be maintained to advise on South Africa's optimum involvement.

- Chemdata, a CSIR directory of chemicals available locally from both South African and international manufacturers, was published jointly with Keeble Publishers of Johannesburg. It provides a service to both the chemical and pharmaceutical industries and is backed by a technical inquiry service of our Centre for Advanced Computing and Decision Support, in collaboration with the Division of Information Services and other divisions. It was hailed by the industries concerned as an essential development, and an updated issue is planned for 1991.

Innovation: strengthening the economy

As CSIR's multidisciplinary technology muscle is brought to bear on complex problems, product improvements become feasible and market opportunities are opened up. Details regarding many projects cannot be disclosed, because CSIR takes pride in maintaining strict confidentiality in dealings with customers from the public and private sectors.

A good example of innovative research work is an integrated circuit designed by CSIR and produced by our integrated circuit facility (which, compared with overseas facilities, can only be described as archaic). The integrated circuit was incorporated into an existing product, giving it certain unique properties. Although the price of the circuit represents only one fiftieth of the selling price of the product, it has already earned our client R100 million in foreign exchange, with more transactions in the pipeline.

A further example is the commissioning of a locally developed radar system (see accompanying panel "Merit Awards").

We also moved decisively to identify areas in which our corporate strength can be more effectively exploited:

- The motor industry. The Phase VI programme for this industry, setting local content targets over nine years, will expand manufacturing activity considerably, as an estimated R4,5 billion (at 1989 values) is to be invested. To strengthen an already wide-ranging involvement and good working relationship, we launched a major corporate programme and negotiated or are in the process of negotiating contracts in areas such as production automation, component design and testing, and field condition data logging.

- The Lesotho Highlands Water Scheme. Through sub-contracts, a variety of developmental problems were addressed in close collaboration with the Department of Water Affairs and major engineering consulting groups. The projects included: satellite remote sensing studies of Lesotho; environmental impact and slope stability studies; follow-up laboratory studies on rock strengths; achieving acceptable concrete mixtures from poor-quality local aggregate; and the Katse dam overflow.

Currently being developed are corporate programmes focusing on mining and on the environment, and more are in the pipeline.

Major achievements of RDI during the year are summarised in the accompanying Technology Impact document.

Those achievements range from a computer programme to combat the "bouncing ball" virus to the design of a magnet for a superconducting isochronous cyclotron with an energy of 3,5 GeV; from South Africa's first single-crystal demonstrator components to a sweetened egg product with an extended shelf life at ambient temperature; from an internationally accepted rapid test for alkali reactivity in aggregates for concrete structures to major contributions to lithium-battery technology; and from the development of a borehole camera to the commissioning of a fluidised-bed hot-gas generator.

Venture capital

Technifin, the R50-million venture capital company founded by CSIR and the IDC, completed its first year of operation. Four projects were approved and launched, while 11 are still under investigation.

The pervasive effect of CSIR's technology muscle in many of the projects was noticeable, and it is pleasing to note that two of the approved projects are based on technology developed within CSIR.

I am confident that Technifin will continue to gain further momentum in the years ahead.

LEADERSHIP: CHANGES AND ACKNOWLEDGEMENTS

1989 was CSIR's first year of operation under its new Executive of five members - myself, Dr Brian Clark, Dr Rein Arndt, Mr Albert Michau and Mr Fred Camphor. During the year the "bedding in" phase of our new corporate culture continued. In addition to overseeing manpower and technology development in pursuance of CSIR's mandate, we implemented a new staff policy and refined our management information system.

A corporate stocktaking exercise, Leadership Day, was held on 30 August 1989, with 200 of CSIR's top people participating. It served a useful purpose in establishing how far we have advanced along the path we have chosen.

My task as president has been greatly eased by the dedication and support of my Executive and all CSIR staff. Inputs from my chairman, Dr Louw Alberts, and the CSIR Board proved of immense value. I would also like to thank former member of the Cabinet, Dr Danie Steyn, for his encouragement and support during his term of office. I further want to welcome back Mr Kent Durr; we look forward to continued guidance and support from him and Deputy Minister Dr Theo Alant.

As has been publicly announced and also mentioned by Dr Alberts in this report, I intend to retire on 30 September 1990, after completing my second five-year term of office in May of that year. I am extremely happy that the Board has chosen as my successor Dr Brian Clark, Group Executive: RDI.

I have worked closely with Dr Clark throughout my term of office, witnessing his illustrious science career being followed by an outstanding contribution to CSIR in a management role. Dr Clark was a driving force in the massive team effort required to carry CSIR through the period of greatest course adjustment in its history, ably blending leadership and management excellence.

The Board also approved the following promotions:

- Dr Geoff Garrett and Dr Daan Toerien, Directors of the Division of Materials Science and the Division of Technology and Water Technology, respectively, to Deputy Group Executives: RDI.
- Dr Harry Swart, Programme Manager for Coastal Processes and Management Advice, to Director of the Division of Earth, Marine and Atmospheric Science and Technology.
- Dr Ben van Vliet to Director of the Division of Water Technology.
- Mr Jan Bekker to Programme Manager for Textiles and Fibres, an identified growth area of the future.

During the year, Professor Dawie Roux retired from the Executive Directorate of FRD. Two resignations from the service of CSIR were those of Dr Jan van Zijl as Director of the Division of Earth, Marine and Atmospheric Science and Technology and Dr Tony Pizzi as Director of the Division for Processing and Chemical Manufacturing Technology. All three of these men have made a lasting impression on the organisation.

This annual report, covering activities during 1989, but recording financial results only up to 31 March, appears earlier than has been customary. As requested by the Board, our next report will be published in October 1990, bringing us still more closely into line with generally accepted corporate practice.

As happens every year, many CSIR employees and operational units, and CSIR itself, were honoured by scientific and other bodies for achievements in diverse fields during 1989. This recognition is most heartening and is much appreciated.

We are also deeply indebted to our many clients for their collaboration and constructive criticism, helping us realise our vision for the future.

CHRIS GARBERS
President

Merit Awards

Each year CSIR presents Merit Awards to three employees "for outstanding research achievements and/or inventions of practical value, so recognising pioneering work which benefits the South African and international community".

The persons elected in 1988 for the 1989 Awards were:

FRANCOIS ANDERSON, for his leading role in the local development of a radar system incorporating the latest technology - research which has already been honoured with two prestigious prizes awarded by outside organisations.

DR NEVILLE COMINS, for his rejuvenation of a diverse range of metallurgical projects of great importance for industry; for the establishment of the Specialty Metals Programme of the Division of Materials Science and Technology (DMST); and for his pivotal role in pulling together the corrosion- and wear-related research of the CSIR, now two full programmes in DMST.

DR TERENCE WATSON, for his internationally recognised leadership in large-scale economic production of the microbial enzyme "cellulase" and for the elaboration of technology for the production of other microbial products. Currently Dr Watson is investigating the application of recombinant DNA technology to industrial biotechnology and is leading a major research effort to produce a single cell protein.

Mr Fred Camphor

HUMAN RESOURCES

There were four important characteristics to the human resources scene in CSIR during 1989:

- The annual rate of staff turnover reached a turning point at 18,4% and is now decreasing.
- Performance management became a reality, with individuals getting involved in setting their own goals and managers acting as coaches and guides rather than adjudicators.
- Change management became a participative process.
- Industrial relations became more important.

At the end of October, the staff complement numbered 4 419, compared with 4 950 five years ago. Of these, approximately 1 800 are administrative support staff.

As the accompanying graph shows, staff turnover (recorded monthly on an annualised basis) reached a peak at the end of 1988, continued high until the middle of 1989, and in the second half of the year fell to just above 15%. National shortages of certain categories of manpower resulted in high turnover for these categories.

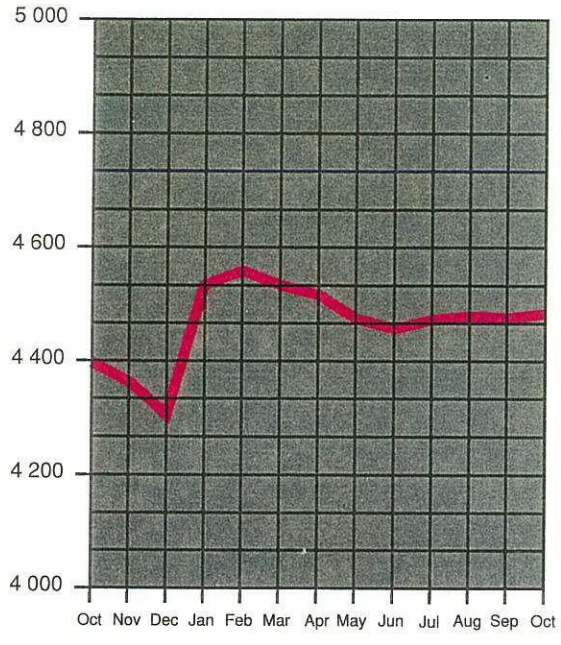
STYLE OF MANAGEMENT

CSIR says that its people are its most important asset. Today, it can also say that that asset is managed in a manner befitting its role.

Scientific evaluation of posts and their remuneration, using both the Hay and Peromnes systems, has been allied to participative management. Joint goal-setting by managers and individual staff members is now becoming the norm and performance measurement will therefore be based on achievement of goals.

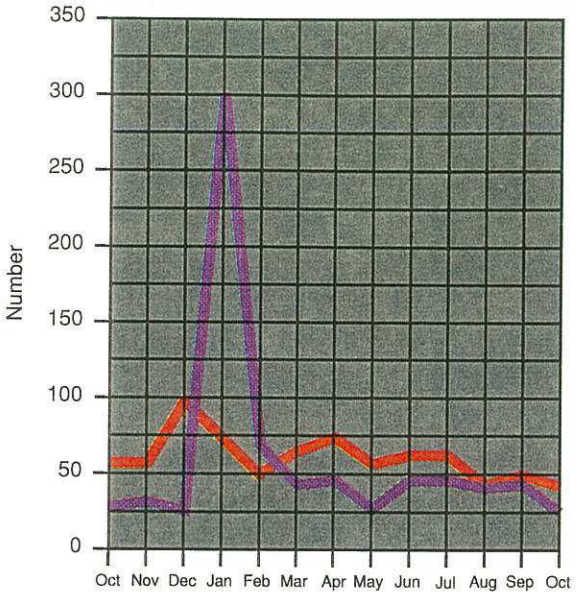
The restructuring of CSIR over the past three years initially brought greater management cohesion in the upper levels of the organisation. The management and credibility gap seen by outside consultants between the

MANAGEMENT REPORT
PERSONNEL TURNOVER
OCTOBER 88 TO OCTOBER 89



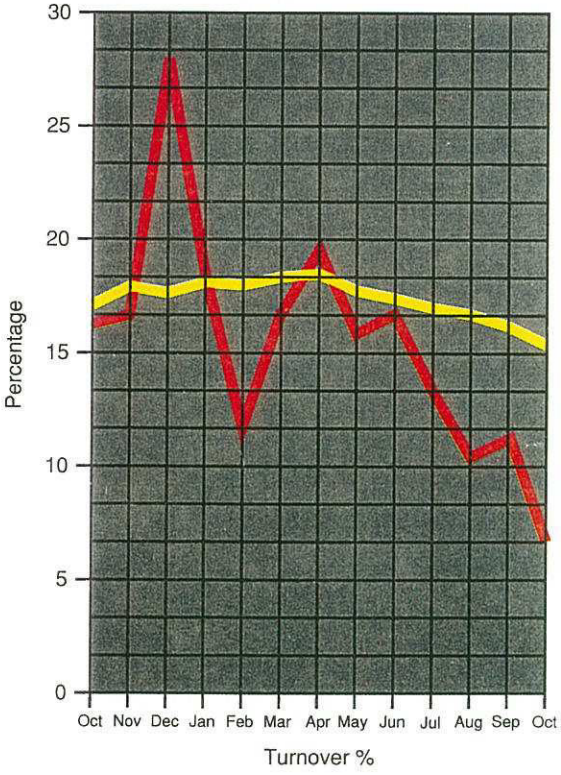
Personnel complement

MANAGEMENT REPORT
APPOINTMENTS AND RESIGNATIONS
OCTOBER 88 TO OCTOBER 89



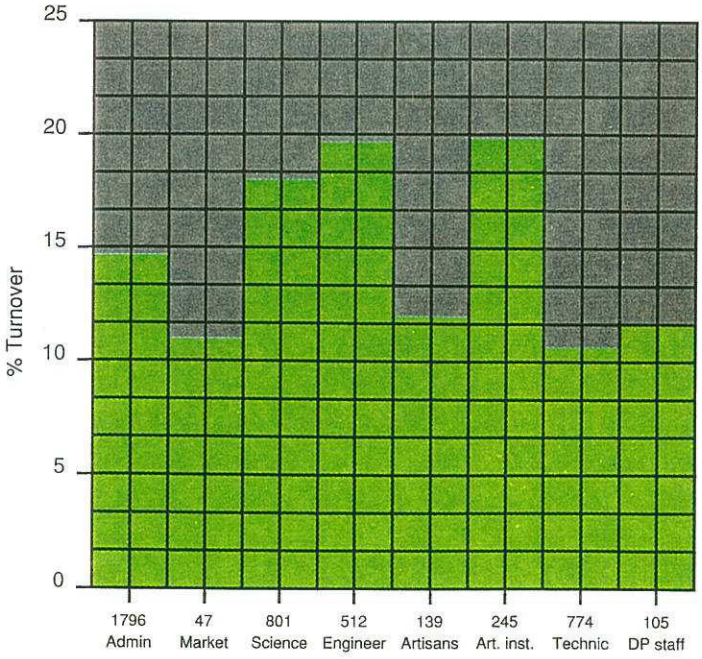
Resignations
Appointments

MANAGEMENT REPORT
PERSONNEL COMPLEMENT
OCTOBER 88 TO OCTOBER 89



Monthly annualised
Moving ave annual

MANAGEMENT REPORT
GROUP 1 – 8
PERSONNEL TURNOVER PER OCCUPATIONAL GROUP



Turnover

Executive and the former Institutes disappeared as the 21 institutes were reconstituted into 12 divisions and one centre.

Towards the end of 1989, the change process was far advanced among project leaders, and CSIR can be confident that very soon no management and credibility gap will remain in the organisation. Interracial groups to discuss the impact of the changes are one of the latest developments.

There is strong recognition of the fact that the new focus on implementation of research through remunerative external contracts must be tempered by the need to improve scientific competence. Development of its people through further study and exposure to the best international scientific talent is a CSIR priority.

NEGOTIATION

It became apparent during the year that CSIR should be further streamlined through the disbandment of the Division of Processing and Chemical Manufacturing Technology and absorption of its components in other divisions.

A programme of consultation with the division's staff began, so that they participated in the change process. The eventual outcome has been a compromise between what the Executive envisaged and the choices of staff members.

A corollary of the change in CSIR is that the Employees Association is re-defining its role. This has to be a spontaneous process, and it is expected that the Association will emerge in a role different to its previous one of being largely a passive channel for one-way communication.

FRED CAMPHOR
Group Executive: Human Resources Services

Mr Albert Michau

FINANCE AND MANAGEMENT SERVICES

The presentation of CSIR's financial statements for the year to February 28, which follow, in a more generally acceptable form is indicative of the change which took place in this Group during 1989, the first full year of its existence. The Group has more than 800 personnel.

For the first time, depreciation has been applied to the value of fixed assets, and an R18,4 million provision makes CSIR's surplus of R23,2 million all the more satisfactory. A one-off R67,7 million provision has been made against results of previous years.

Another development during the year was the introduction by Budget and Financial Services of a comprehensive budgeting and reporting system. Although this system still needs refinement, its benefits can already be clearly seen.

Auditing procedure was radically altered and brought into line with the best modern practice. Corporate Audit Services, with 12 people, is now headed by a manager with wide auditing experience in the private sector.

Management Information Services came into the Group from the Centre for Advanced Computing and Decision Support and, with the help of consultants, is developing an integrated information system. In view of the complexity of the management information required by the managers of RDI's strategic business units, it's expected that this task will require up to two years and implementation will only be gradual.

CSIR's new commercial orientation meant that Legal Services staff were in heavy demand for help in the drafting of contracts with clients.

Security Services successfully faced the challenge of meeting the requirements of CSIR in a way acceptable to the general public and staff. It is always difficult to reconcile the convenience of the public with security requirements.

Technical and Site Services saw management of the CSIR vehicle fleet taken over by a private-sector organisation, and its draughting office privatised by staff. Savings brought about in this way were enhanced by increased productivity throughout the department, and I can say that the greater efficiency is appreciated throughout the campus.

ALBERT MICHAU

Group Executive: Finance and Management Services

BALANCE SHEET

31 MARCH 1989

	Notes	1989 R'000	1988 R'000
Capital employed			
Accumulated funds	2	530 007	511 323
Contract reserve		4 248	4 248
		534 255	515 571
Employment of capital			
Fixed assets	3	397 499	471 985
Investments	4	27 225	5 000
Net current assets		109 531	38 586
Current assets		190 011	93 922
Debtors and advances		50 865	32 989
Cash and money on call		139 146	60 933
Current liabilities		80 480	55 336
Advances received		41 361	38 486
Creditors and provisions		39 119	16 850
		534 255	515 571

A L MICHAU
GROUP EXECUTIVE

C F GARBERS
PRESIDENT

The accounts of the CSIR, excluding the cash flow statement, have been audited in terms of sections 5 and 18(2) of the Auditor-General Act, No 52 of 1989, read with section 14(1) of the Scientific Research Council Act, No 46 of 1988, by external auditors under the supervision of the Auditor-General. Subject to the final review by the Auditor-General, the annual financial statements are a fair representation of the financial position of the CSIR as at 31 March 1989 and the result of its operations for the year then ended.

INCOME STATEMENT

31 MARCH 1989

	Notes	1988/89 R'000	1987/88 R'000
Income			
Parliamentary grant		220 865	194 101
Contract income		150 189	108 740
Interest		12 557	3 994
Sundry		3 304	2 744
		386 915	309 579
Expenses			
Salaries		190 795	165 490
Depreciation		18 418	—
Running expenses		154 495	121 908
		363 708	287 398
Surplus for the year		23 207	22 181
Prior years' adjustment	5	67 737	—
Surplus (Deficit) transferred to accumulated funds		(44 530)	22 181

CASH FLOW STATEMENT

31 MARCH 1989

	Notes	1988/89 R'000
Cash retained from operating activities		52 074
Cash used in operations	6	(188 407)
Parliamentary grant received		220 865
Investment income – interest received		12 557
Cash utilised to increase working capital	7	(370)
Contract income received – capital		7 429
Cash generated by investment activities		26 139
– Fixed assets	8	26 144
– Investments	9	(5)
Cash surplus		78 213
Cash effects of financing activities		
Increase in cash and short-term deposits		(78 213)
Cash utilised		(78 213)

1. ACCOUNTING POLICIES

The financial statements are prepared on the historical cost basis and incorporate the following principal accounting policies:

Foreign currencies
Assets and liabilities in foreign currencies are converted to the South African rand at the rate of exchange ruling at year end. Conversion differences are dealt with in the income statement. Transactions during the year are converted to the South African rand at the rate of exchange ruling at date of payment, unless forward exchange contracts have been arranged.

Fixed assets
All assets costing R1 000 or less are written off when purchased.

Land and buildings are stated at cost. No depreciation is provided on buildings.

Equipment and vehicles are stated at cost less accumulated depreciation. These assets are depreciated at rates considered appropriate to reduce book values to one rand over the estimated useful life of the assets.

Stock
Raw material and contracts in progress are stated at the lower of cost or estimated net realisable value. Cost is determined on the average method. Work and contracts in progress include direct costs and an appropriate portion of overhead expenditure. Where contracts in progress extend over more than one accounting period, income is recognised as expenses are incurred or when predetermined milestones are reached.

Investments
Investments are stated at cost of acquisition.

Income
Capital income is not reflected in the income statement but is accounted for directly in the relevant fund.

2. ACCUMULATED FUNDS

		Building Fund R'000	Equipment Fund R'000	General Fund R'000	Total R'000
Balance brought forward		135 049	336 752	39 522	511 323
Transfer to contract reserve		—	—	(4 248)	(4 248)
Less:	Deficit	—	—	(44 529)	(44 529)
	Assets relinquished	—	(2 119)	—	(2 119)
	Assets written off	(710)	(37 279)	—	(37 989)
		134 339	297 354	(9 255)	422 438
Plus:	Capital Income	13 587	71 763	—	85 350
	Fund gain*	—	—	22 220	22 220
		147 926	369 117	12 965	530 008

**Capitalisation of value of paid-up share capital in SAIDCOR ceded to the CSIR by the SA Government*

3. FIXED ASSETS

	Cost 01/04/88 R'000	Additions/ Adjustments R'000	Written off/ Adjustments R'000	Relinquished R'000	Cost 01/04/89 R'000	Accumulated depreciation R'000	Book value R'000
Land and buildings	129 564	10 979	710	—	139 833	—	139 833
Books and journals	14 258	147	14 210	—	195	—	195
Prefabricated structures	96	18	29	27	58	—	58
Equipment	320 160	42 682	19 125	2 056	341 661	85 985	255 676
Vehicles	5 449	423	3 928	36	1 908	170	1 738
	469 527	54 249	38 002	2 119	483 655	86 155	397 500

4. INVESTMENTS

	% Holding	Value	
		1989 R'000	1988 R'000
South African Inventions Development Corporation (See note 2)	100%	27 220	5 000
Woodchem (Pty) Ltd	50%	5	—
		27 225	5 000

5. PRIOR YEARS' ADJUSTMENT

	1989 R'000
Depreciation provided in respect of prior years calculated in accordance with the stated accounting policy	67 737

6. CASH USED IN OPERATIONS

	1989 R'000
Surplus income for the year	23 207
Interest received	(12 557)
	10 650
Adjustments	
– Parliamentary grant	(220 865)
– Depreciation	18 418
– Provisions	7 638
– Contract reserves	(4 248)
	(188 406)

7. CASH GENERATED BY DECREASE IN WORKING CAPITAL/ (CASH UTILISED TO INCREASE WORKING CAPITAL)

	1989 R'000
Increase in debtors and advances	(17 876)
Increase in advances received	2 875
Increase in creditors	14 631
	(370)

8. FIXED ASSETS – CASH GENERATED (UTILISED)

	1989 R'000
– Purchased	(51 777)
– Parliamentary grant received	73 583
– Proceeds from sale of fixed assets	4 338
	26 144

9. INVESTMENTS – CASH GENERATED (UTILISED)

	1989 R'000
– Shares purchased or received	(22 225)
– Value of paid-up share capital in SAIDCOR received	22 220
– Proceeds of sale of shares	—
	(5)

10. COMPARATIVE FIGURES

Since this is the first time that the financial statements are given in the present format, comparative figures can not be supplied in all instances.

SUMMARY IN GERMAN

AFRIKA UND DER CSIR

In seiner Übersicht in diesem jährlichen Bericht stellt der Aufsichtsratvorsitzende des CSIR, Dr. Louw Alberts, die Bitte, um grössere Zusammenarbeit in wissenschaftlicher Forschung zwischen Südafrika und den anderen Ländern in Afrika. Er schreibt:

Etwa 14 afrikanische Länder bedienen sich der Unterstützung des CSIR auf Gebieten wie Wohnungsbau, Wasserreinigung, Planung für den Gebrauch von Ländereien durch Satellitdarstellungen, Lebensmitteltechnologie, Strassenbau und Verkehrsplanung. Andere Gebiete, auf denen wir helfen, sind die Bekämpfung von atmosphärischer- und Wasserverunreinigung und Minen- und Mineraltechnologie.

Die meiste Forschung in Afrika wird unternommen, weil zur Verfügung stehende Kenntnis von anderswo nicht immer direkt auf unsere Zustände anwendbar ist. Wissenschaftler und Ingenieure in Sub-Sahara könnten von der angesammelten Afrikaerfahrung des CSIR und anderer südafrikanischer Einrichtungen profitieren und wir könnten Vorteil aus ihrer Erfahrung und ihrem Bedürfnis ziehen.

Südafrika kann nicht nur helfen weil es auch Afrika ist, sondern auch weil es dritte und erste Welten umfasst. Es hat bereits viele von den Lehren, die Afrika wissen muss, um auf ersten-Welt-Märkten zu konkurrieren, gelernt, zu einer Zeit, in der der Technologieabstand zwischen dritten und ersten Welten sich weitet und die Entwicklung neuer Technologien höchst kostenintensiv geworden ist.

ERRUNGENSCHAFTEN WÄHREND 1989.

In seiner Übersicht hebt der oberste ausführende Beamte, der Präsident, Dr Chris Garbers, bestimmte wissenschaftliche Leistungen der Organisation während 1989 hervor. Die Erzeugnisse schliessen ein:

- Osmiumtetroxyd. Der CSIR hat die einzige Einrichtung auf der südlichen Halbkugel, diese äusserst giftige Chemikalie sicher in exportierbaren Mengen herzustellen.
- Ein gesüsstes Eierprodukt, das eine verlängerte Haltbarkeit bei Zimmertemperatur hat.
- Ein neuer Katalysator für die Umsetzung von Äthylen in flüssigen Brandstoff.
- Ein einzelliges Eiweiss, das eine lebenswichtige Rolle spielen könnte, eine kommende Knappheit an naturlichem Protein auszugleichen.
- Südafrikas erster Chemdata-Führer in Konkurrenz mit der Chemcyclopaedia der amerikanischen chemischen Gesellschaft und Öl, Farbe und Droge - OPD - des Stanford Forschungsinstitutes, Verzeichnis für Chemikalienkäufer.

  Enzelheiten über diese und andere Produkte, die durch die Arbeit des CSIR verfügbar wurden, sind aus dem begleitenden Bericht der Forschungs-, Entwicklungs- und Anwendungsgruppen zu ersehen.

  Unter anderen Meilensteinen und Errungenschaften erwähnt Dr Garbers:

- Ein grosser Sprung vorwärts wurde in Südafrikas technologischer Leistungsfähigkeit gemacht als die CSIR Abteilung für die Technologie äronautischer Systeme einen R80 Millionen Windtunnel für mittlere Geschwindigkeit in Betrieb nahm.
- Internationale Anerkennung wurde dem Programm für biotechnische Produkte und Verfahren der Abteilung Lebensmittelwissenschaft und -Technologie für seine Grossproduktion von mikrobialem Enzym "Zellulase" zuteil. Die gleiche Technologie für die Herstellung von anderen mikrobialen Produkten wie Lysin, Vitamin C und Xanthangummi wurde ausgearbeitet. Alle diese Produkte warten auf industrielle Ausnutzung.
- Das Metallveredelungsprogramm der Abteilung Materialforschung und -Technologie hat ein gutes Ansehen auf dem Gebiet von Superlegierungen, eines der genauesten in physikalischer Metallurgie, bei seinen Auftraggebern.

SUMMARY IN FRENCH

L'AFRIQUE ET LE CSIR

Dans ce rapport annuel, le président du conseil d'administration du CSIR, le docteur Louw Alberts, fait un appel pour une plus grande collaboration dans la recherche scientifique entre l'Afrique du Sud et les autres pays d'Afrique. Il écrit:

"Quelque quatorze pays africains ont utilisé l'aide du CSIR dans les domaines d'habitations, purification de l'eau, planification de l'utilisation des terres au moyen d'images transmises par satellites, technologie de l'alimentation, construction des routes et planification des transports. D'autres domaines dans lesquels nous pouvons apporter une aide sont le combat contre la pollution de l'air et de l'eau et les technologies minières et relatives aux minéraux.

"La plupart des recherches entreprises en Afrique le sont parce que les connaissances en provenance d'autres continents ne sont pas directement applicables en raison de circonstances spécifiques. Les chercheurs et ingénieurs des régions africaines au sud du Sahara peuvent profiter de l'expérience de l'Afrique que le CSIR et d'autres organismes sud-africains ont accumulée; et nous pouvons profiter de leur expérience et besoins.

"L'Afrique du Sud peut aider non seulement parce qu'elle fait partie de l'Afrique mais également parce qu'elle chevauche le tiers monde et le monde industrialisé. Elle a déjà appris bien des leçons que l'Afrique doit connaître afin d'être compétitive sur les marchés des pays industrialisés, à un moment où le fossé technologique entre le tiers monde et le monde industrialisé s'élargit et le développement de nouvelles technologies est devenu extrèmement onéreux."

REALISATIONS EN 1989

Dans son article, le président du CSIR, le docteur Chris Garbers, souligne certaines réalisations scientifiques de 1989. En ce qui concerne les produits:

- Tetroxide d'osmium. Le CSIR est le seul organisme de l'hémisphère sud qui possède les moyens de produire en quantités industrielles et d'une manière sûre ce produit chimique extrèmement toxique .

- Un produit sucré à base d'oeuf qui peut être conservé longtemps à température ambiante. Les boulangeries ne sont plus forcées d'acheter des oeufs journellement.

- Un nouveau catalyseur pour la conversion de l'éthylène en carburants liquides.

- Une protéine à cellule unique qui pourra jouer un rôle vital dans le remplacement de protéines naturelles.

- Le premier guide sud-africain "Chemdata" pour concurrencer la "Chemcyclopaedia" de l'"American Chemical Society" et le répertoire "Oil Paint and Drug - OPD - Chemical Buyers" du "Stanford Research Institute".

Des détails concernant ces produits ainsi que d'autres produits issus du travail du CSIR se trouvent dans le rapport du Groupe "Research, Development and Implementation".

Parmi d'autres résultats importants, le docteur Garbers mentionne:

- Un bond en avant important dans la capacité technologique de l'Afrique du Sud grâce à l'inauguration de la soufflerie à vitesse moyenne de 80 million de Rands de la Division "Aeronautical Systems Technology" du CSIR.

- Une reconnaissance internationale du programme "Biotechnological Product and Processes" de la Division "Food Science and Technology" pour la production à grande échelle de l'enzyme microbienne "cellulase". La même technologie a été utilisée pour la production d'autres produits microbiens, tels que la lysine, vitamine C et la gomme xanthine; et tous ces processus sont prêts pour une exploitation industrielle.

- Le programme "Specialty Metals" de la Division "Materials Science and Technology", a acquis une réputation enviée parmi ses clients dans le domaine des super-alliages, un des plus exigeants de la métallurgie physique

CSIR Annual Report 1989

The Annual Report reviews the activities and contains the financial statements of the CSIR for 1989.

Technology Impact

A selection of reports on successful co-operation between the CSIR and the South African industry in 1989.

FRD 1989

A review of the CSIR's Foundation for Research Development's activities and achievements in 1989.

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