

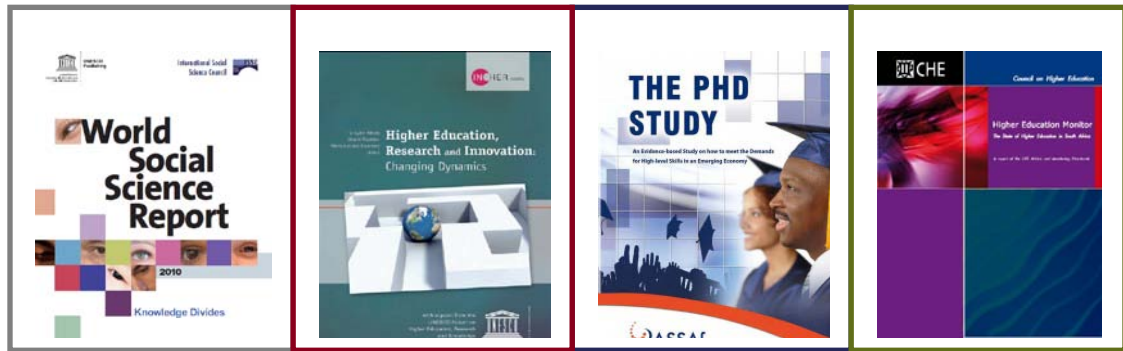


Centre for Research  
on Evaluation, Science  
and Technology

15 YEARS OF SCHOLARSHIP



2010



**Centre for Research on Evaluation, Science and Technology**

## **A review of scholarship**

**1995 - 2010**

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# The CREST Team

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## Acronyms

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ASSAf	Academy of Science of South Africa
CENIS	Centre for Interdisciplinary Studies
CHE	Council on Higher Education
CHET	Centre for Higher Education Transformation
CREST	Centre for Research on Evaluation, Science and Technology
CSD	Centre for Science Development
CSIR	Council for Scientific and Industrial Research
CWTS	Centre for Science and Technology Studies (Centrum voor Wetenschap en Technologische Studies)
DACST	Department of Arts, Culture, Science and Technology
DoE	Department of Education
DoHET	Department of Higher Education and Training
DoL	Department of Labour
DoE	Department of Education
DST	Department of Science and Technology
DTI	Department of Trade and Industry
DUT	Durban University of Technology
FRD	Foundation for Research Development
HEMIS	Higher Education Management Information System
HERANA	Higher Education Research and Advocacy Network in Africa
HEQC	Higher Education Quality Committee
HRD	Human Resource Development
HSRC	Human Science Research Council
IF	Innovation Fund
IRD	Institute for Development Research (Institut de recherche pour le développement)
ISAP	Index of South African Periodicals
M&E	Monitoring and evaluation

NACI	National Advisory Council on Innovation
NEPAD	New Partnership for Africa's Development
NMMU	Nelson Mandela Metropolitan University
NRF	National Research Foundation
NSI	National System of Innovation
NWU	North-West University
RDF	Research Directors' Forum
RU	Rhodes University
S&T	Science and Technology
SAASTA	South African Agency for Science and Technology Advancement
SAKb	SA Knowledgebase
SARIMA	Southern African Research & Innovation Management Association
SARUA	Southern African Regional Universities Association
SET	Science, Engineering and Technology
SU	Stellenbosch University
TUT	Tshwane University of Technology
UCT	University of Cape Town
UFH	University of Fort Hare
UFS	University of the Free State
UP	University of Pretoria
UWC	University of the Western Cape
Wits	University of the Witwatersrand

## Research portfolio

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The Centre for Research on Evaluation, Science and Technology (CREST) was established on the 1<sup>st</sup> of January 1995 as an interdisciplinary research centre of the Faculty of Arts and Social Sciences at Stellenbosch University. Then known as the Centre for Interdisciplinary Studies, the focus was more transdisciplinary. Since the late 1990's the work has become more focused on sociology of science and science policy issues and more recently also on knowledge production in Higher Education.

CREST predominantly conducts applied and policy-related work in the fields of science policy, higher education studies and the sociology of knowledge production. With the exception of the Director and his PA, all salaries are paid through contract funds. During the review period, CREST has generated contract income to the (estimated) value of R6 million. International collaborative work and presence in Africa have been strengthened through various projects. The main clients are national agencies (Council for Higher Education, the National Advisory Council on Innovation, the Department of Science and Technology and the Academy of Science of South Africa). In addition, funding has been secured from international agencies and funders such as the UNESCO Forum on Higher Education and Research, the Carnegie Corporation of New York, the Ford Foundation and recently the European Commission through an international consortium project.

CREST's work clusters around five broad themes”:

- ◀ Science and Innovation Policy Studies
- ◀ Research systems in Africa
- ◀ Research evaluation and bibliometric studies
- ◀ Sociology of science
- ◀ Knowledge production in Higher Education

This report on the first 15 years of scholarship at the Centre not only documents in detail the individual projects and research output of the centre, but also the significance, uptake and impact within various policy and scholarly discourses.



## The impact of CREST's work

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### Introduction

CREST has over the period 1995 – 2010 produced a huge volume of research output. In quantitative terms, the Centre has produced:

- ◀ 32 Articles in peer-reviewed journals
- ◀ 33 Chapters in international and national books
- ◀ 110 Research reports
- ◀ 105 presentations to international and national audiences

In addition, CREST has organised numerous conferences and seminars in the fields of science policy, knowledge production, bibliometrics and research management. We have selected EIGHT areas in which the work of CREST has had significant and demonstrable impact on the science and higher education system, not only in South Africa, but also beyond its borders.

- ◀ CREST's contribution to professionalizing the field of research management in South Africa
- ◀ A unique information resource on South African science – *SA Knowledgebase*
- ◀ The graying of the active scientific work force in SA and the challenge of the next generation of scientists and scholars
- ◀ Groundbreaking research on research systems in developing countries and specifically in Africa
- ◀ Research evaluation and bibliometric studies: Raising awareness and quality
- ◀ Knowledge production in higher education
- ◀ A new perspective on South African journals
- ◀ Original work on doctoral studies in South Africa

### I. The professionalization of research management

In 1998 CREST established and convened the first meeting of the Research Directors Forum (RDF). This would eventually become an annual event where Deans and Directors of Research would meet to discuss matters of common interest and exchange ideas about common policy and practical concerns. Between 1998 and 2008 a total of eight RDF-meetings would be convened – supported in the latter years by a generous grant from the CHE. These meetings would typically be addressed by leaders and prominent scholars in research policy and research management in South Africa, but also by international experts in various fields. These experts included Proffs. Arie Rip (University of Twente), Peter Weingart (Bielefeld University), Robert Tijssen (Leiden University), Ton van Raan (Leiden University) and Linda Butler (Australian National University).

At its 2004 meeting in Stellenbosch, the RDF decided to establish a society for professionals working in the field. This decision led to the formation of the Southern African Research and Innovation Management Association (SARIMA) which held its inaugural meeting in Hout Bay the following

January. The RDF continues to meet from time to time, but it is fair to say that CREST played a major role in the professionalisation and eventual institutionalisation of the field of research management in South Africa.

## **II. A unique information resource on South African science – SA Knowledgebase**

As a direct result of its involvement in the 1998 National Research and Technology Audit, CREST initiated a long-term database development project which aimed to document South Africa's scientific output in accredited journals. This database – *SA Knowledgebase* – aims to eventually capture basic bibliographic and biographic information of South African-authored papers in peer reviewed journals. The current version of *SA Knowledgebase* contains more than 200 000 records spanning the period 1987 to the current year.

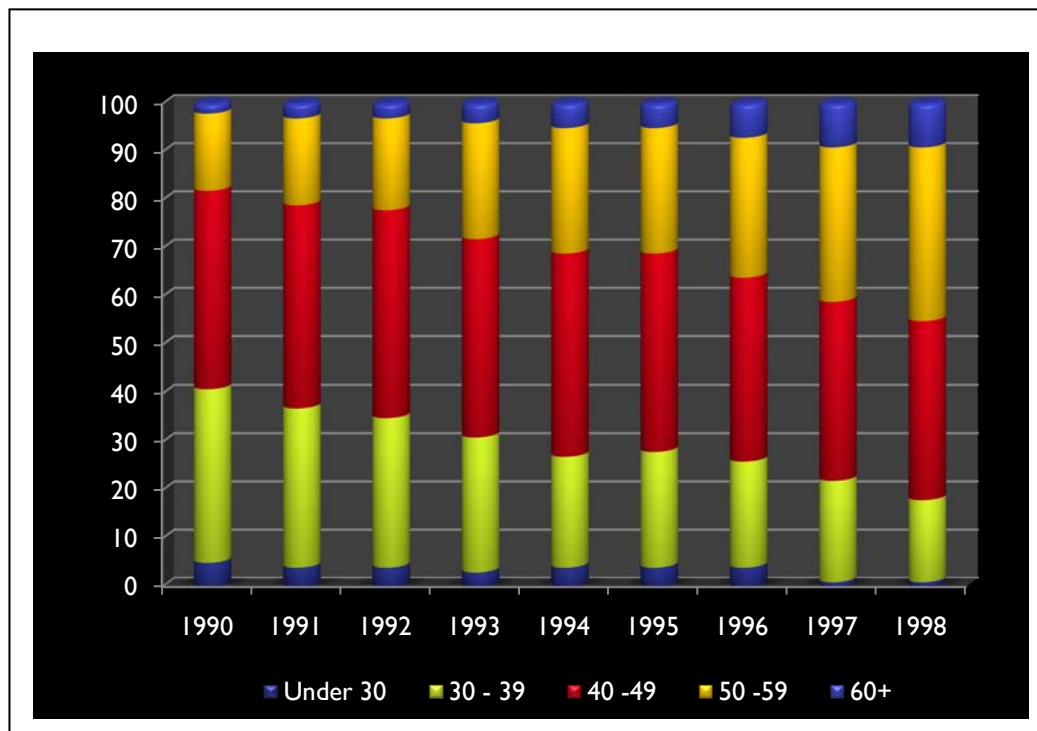
In addition to standard bibliographic information on the author, titles and journal source, the most innovative (and perhaps unique) feature of *SA Knowledgebase*, is the inclusion of basic demographic information on the author of each article (gender, race, birth year, institutional affiliation and highest qualification). The inclusions of these fields have allowed CREST over the years to conduct highly detailed analyses of the demographics of published science in the country. Not only has *SA Knowledgebase* become a crucial building block in most of the Centre's research projects, it allowed us to produce new and high-impact analyses on the demographics of the active scientific work force in the country.

## **III. The graying of the active scientific work force in South Africa**

In September 2000 CREST produced a report on the *State of science in South Africa* as part of an international collaborative study with the Institute for Development Research (IRD) in Paris. In a presentation at a conference in the same month, CREST first made public the results of its analyses of the demographics of South African science. This was followed by another major presentation on the same topic in March 2001 convened by the National Advisory Council on Innovation (NACI) in Pretoria.

Three significant results were reported for the first time at these meetings: the fact that in 1998 South African black authors only produced about 8% of total research output in the country, that female authors constitute only 22% of total research production and – the result that would impact most significantly on science policy in the years to come – the fact that there was a discernible ageing effect when comparing the age profiles of South African scientists in 1990 with that in 1998. The graph below, which was first presented at these meetings, clearly shows the increase in time of authors in the age brackets between 50 and 59 and above 60. Whereas only about 18% of all South African authors publishing in 1990 were above the age of 50, this percentage increased significantly to 45% by 1998.

**Figure 1: The graying of the scientific workforce**



At a time where the science policy debate in the country was shaped by the discourse of the transformation of the science system, the publication of these results evoked huge response. The results clearly showed that knowledge production in the science system was still dominated by white male scientists and that this cohort was an ageing cohort with very little infusion of young blood into the system.

One immediate impact was the inclusion of these results into the *National Research and Development Strategy* that was published in August 2002 by the Department of Arts, Culture, Science and Technology (DACST). In addition to including the graph above in the new Strategy document, the following paragraph on the need for cultivating the next generation of research referred to the innovative work done by CREST:

Our human resources in science and technology are not being adequately developed and renewed; we have an aging and shrinking scientific population. The key indicators show that black and women scientists, technologists and engineers are not entering the academic ranks and that the key research infrastructure is composed of people who will soon retire. In 1990, the percentage of scientific publications produced by researchers 50 years of age and older was 18% (one in five), but by 1998 this figure had increased, alarmingly, to 45% (one in two). Over the same period the percentage of publications by black scientists rose only very slightly, from 3,5% to 8% (less than one in ten). Participation by women has not changed over the 1990s, with publication output being about 10% of the total. Currently, there is less than one researcher for every thousand members of the workforce, as compared with five in Australia and ten in Japan. Given that “technology walks on two legs”, the “frozen demographics” prevalent in our National System of Innovation represents a critical state of affairs (2002:21)

The imperative to build the “next generation of scientists and academics” and to break through the “frozen demographics” in the science system would become familiar catch phrases that would shape science policy debates in the following decade. CREST was asked to present these results at numerous fora as the implications of these results were further discussed and interpreted. One of

the more interesting consequences of the work on the demographics of South African science were requests from numerous South African universities who were concerned about the then prevailing compulsory retirement age of 60 of their academic staff. Not surprisingly many universities decided in the following years to extend the compulsory retirement age to 65 in order to counteract the ageing of its academic work force.

CREST continued its work on *SA Knowledgebase* and the demographics of South African science in the years that followed. This increasingly allowed CREST to “drill deeper” into the issue. As a result, results were recently presented on the age profile of active scientists both at the institutional level (cf. Table 1 below) as well as at the level of scientific field.

**Table 1: Age profiles for selected South Africa universities (1990 compared with most recent year)**

University	<40 years (1990)	50+ years (1990)	<30 years (most recent year)	50+ years (most recent year)
WITS	38.3%	23.9%	7.8%	64.6%
NWU	36.6%	25.5%	12.7%	57.8%
UNISA	34.3%	25.8%	15.2%	52.6%
UCT	34.8%	26.3%	17.8%	50.3%
UFS	36.5%	30.6%	20.4%	49.2%
UP	38.1%	23.4%	23.2%	49.1%
UKZN	2.5%	83.3%	16.1%	48.3%
Rhodes	34.4%	17.3%	11.9%	44.5%
UFH	22.4%	42.3%	19.5%	42.1%
NMMU	49.6%	18.6%	18.9%	40.8%
TUT	7.5%	65.0%	17.7%	38.5%
SU	32.0%	34.0%	26.0%	38.0%
UWC	50.0%	14.0%	19.0%	38.0%

#### **IV. Groundbreaking work on research systems in Africa**

CREST's interest in the state of science on the African continent has its origins in a request by Drs Roland Waast and Jacques Gaillard from the IRD in Paris in 2000 to participate in an international project to map research systems in developing countries. CREST produced a country report on the state of science in South Africa as its contribution to a twelve country report on the state of science in Africa. This study was widely disseminated (also as part of a special issue of the journal *Science, Technology and Society*), but more importantly it "inaugurated" a line of scholarship that would become one of the core research thrusts of CREST.

In 2006 CREST won a tender (in partnership with High Impact Innovation) to produce S&T profiles of 22 African countries as listed:

- Large countries (population above 30 million): Algeria, DRC, Ethiopia, Kenya, Morocco, Sudan and Tanzania.
- Medium-sized countries (pop. between 10 and 30 million): Angola, Ghana, Malawi, Mali, Senegal, Zambia and Zimbabwe.
- Small countries (pop. less than 10 million): Botswana, Burundi, Lesotho, Libya, Namibia, Rwanda and Tunisia.

In the following year, CREST partnered with the IRD in Paris on an even more ambitious project to produce country reports for 56 developing countries in Latin America, Asia and Africa. This very large study – commissioned by the Forum for Higher Education at UNESCO and sponsored by SIDA – culminated in a huge output 18 months later. This study produced a wealth of reports and nearly 1400 pages of text:

- Four regional compilations on country reviews:
  - Africa compilation (22 countries; 447pp)
  - Arab compilation (11 countries; 238 pp)
  - Latin American compilation (14 countries; 245 pp)
  - Asia compilation (13 countries, 134pp)
- Four regional reports
  - African regional report (42pp)
  - Arab regional report (38pp)
  - Latin American regional report (26pp)
  - Asia regional report (30pp)
- A consolidated bibliography (46pp)
- A final synthesis report and template (149pp)

In addition to the wealth of information produced by this study, the project also proposed a novel and innovative TEMPLATE for the measurement of key dimensions of research systems in developing

countries. The development of this template was based on prior work by Roland Waast and Jacques Gaillard in the 1990's but augmented by insights from the 56 country reports. Standard OECD categories were revised and additional “indicators” added. The template eventually proposed nine categories (or topics) to be covered in a typical country study. It also proposed THREE different kinds of information and data to be collected and presented in such a study. These are:

- Statistical indicators (Social, Demographic, Health, Educational, Science, Technology and Bibliometric)
- Descriptors: quantitative or visual descriptions that present the facts of a certain category of entities or events. We distinguish between Listing descriptors and Diagrammatic descriptors.
- Narratives: More elaborate and deep historical and contemporary descriptions of aspects of the research system in a country.

**Table 2:        Template for the measurement of core dimensions of research systems**

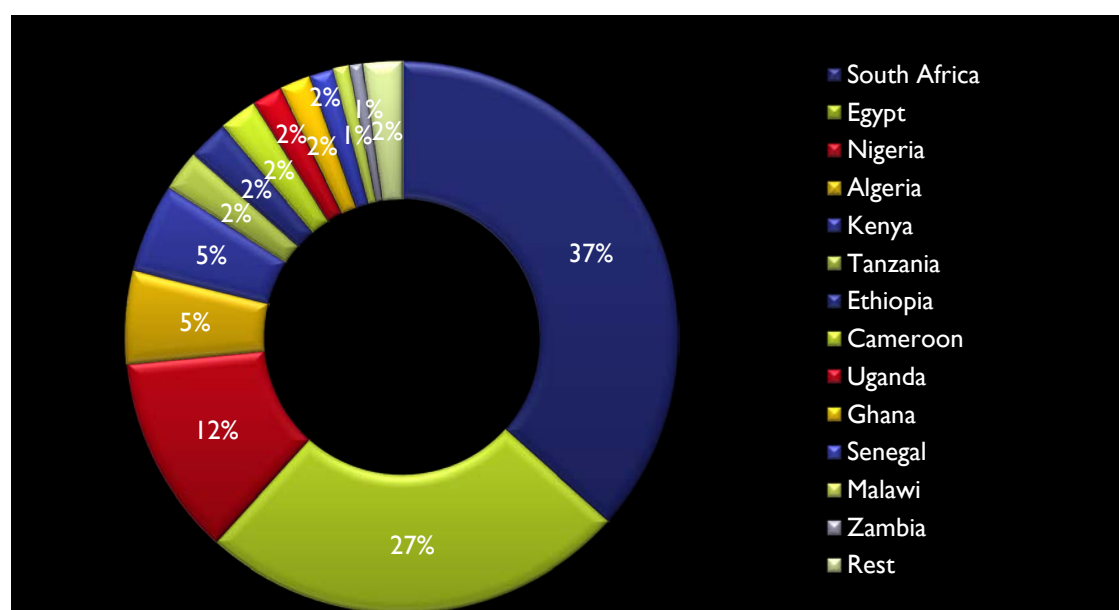
Category	Description	Nature of data
<b>1. Contextualization of the science system within broader political, economic, educational and social systems</b>	1.1 This section contains a brief narrative description of the political and socio-economic “status” or “climate” of the country highlighting significant strengths, weaknesses and major events and developments.	<b>Historical narrative</b>
	1.2 In addition a set of uniform tables listing demographic, social, economic and technological indicators should be included.	<b>Statistical indicators</b>
<b>2. Some considerations about the History of science in the (country, region) under review and especially the development trajectory followed.</b>	2.1 Date (decade) of establishment of first research institute (s) Date of establishment of first public university Date (and names) of first scientific journals Date of establishment of academy of science and/or first professional societies Date of establishment of dedicated ministry for science, research and/or higher education Date of first science policy and HE policy documents	<b>Descriptors (listing)</b>
	2.2 Description of specific models of scientific organization and governance as influenced by colonial and other powers historically Major periods in the institutionalization of science in country Major events shaping the development of HE and science in country	<b>Narrative</b>

Category	Description	Nature of data
<b>3. The governance of science in the country and available policies (especially S&amp;T, R&amp;D and HE)</b>	List of science policy, research strategy and HE documents as well as formal reviews and commissions into HE and research in the country	<b>Descriptors (listing in chronological order)</b>
	Research and science priorities as identified in science policy documents	<b>Narrative</b>
	Diagrammatic representation of science governance	<b>Descriptor (diagrammatic)</b>
<b>4. Knowledge and R&amp;D performers (Establishments/ Institutions/ Universities/NGO's)</b>	Names of public universities Names of private universities Key university/college research centres Key government funded research institutes/ centres Key internationally funded research institutes/ centres Key private sector research facilities	<b>Descriptor (listing)</b>
	Description of strengths and weaknesses of the university system Niche areas of research in the system and at universities Nature of knowledge production undertaken in various sectors of the system	<b>Narrative</b>
<b>5. Informal S&amp;T structures (Academies, Associations, Trade unions, Journals, etc = Scientific Community)</b>	National scientific journals Scientific societies and associations Academies of science	<b>Descriptor (Listing)</b>
	Status of main journals (still being published or not) (Historical) description of information structures	<b>Narrative</b>
<b>6. S&amp;T Human Resources (Description/statistics + The Profession of researcher: status, salaries, etc)</b>	Number of researchers/ scientists in country Number of academics in HE institutions Number of PhD students Number of researchers per million of labour force Nr of academics by scientific field Nr of academics (gender breakdown) Number of academics in HE institutions per million of labour force Nr of Masters and Doctoral students (enrolments) * gender Nr of M and D students by field of study (6)	<b>Indicators</b>
	Profession and status of academics and knowledge workers Remuneration compared to other public professions Scientific mobility and brain drain challenges	<b>Narrative</b>
<b>7. Research Funding (Public or private; National and international; Trends)</b>	R&D intensity (GERD/GDP) Expenditure on R&D per researcher Expenditure by sector Source of funding (incl. overseas agencies) – actual values and proportions Expenditure by scientific field (6)	<b>Indicators</b>
	Role of government and other domestic agencies in funding research Role of international donor and funding agencies in funding and steering research in the country	<b>Narrative</b>
<b>8. Research Output (postgraduates/ publications/ papers/ patents)</b>	Total output in ISI-journals (by scientific field) Total output in local journals (by field) Nr of Masters and Doctoral graduates Nr of PG theses/dissertations Nr of patents Niche areas of research and impact of publications	<b>Indicators</b>
	Description of specific policies (funding, incentive) and initiatives to	<b>Narrative</b>

	encourage a participation in innovation, technological learning, and research publications locally and internationally	
<b>9. Scientific co-operation and agreements</b>	Nr of bilateral scientific agreements	<b>Descriptors (Listing)</b>
	Nr of multilateral and regional agreements	
	Nr of international agencies operating in country	
	Degree of scientific collaboration as measured through share of foreign co-authors of papers	
	Nr of bilateral scientific agreements	<b>Narratives</b>
	Nr of multilateral and regional agreements	
	Main international and regional scientific partners	
	Main institutional collaborators	
	Domains and topics of scientific research	

CREST's "investment" in research into African science and technology was further consolidated with the development in 2009 of *Africa Knowledgebase* – a database on Africa's scientific production. The database combines records from four major databases: the Web of Science, Scopus, Pubmed and CAB. Current work is aimed at adding to these sources, records from African Journals in order to improve coverage of local scientific production. In the most recent study of Africa's science, a detailed bibliometric assessment of 19 African countries was undertaken for a new book on African Innovation sponsored by NEPAD and under the leadership of scholars at the University of Lund. As Figure 2 shows, South Africa dominates scientific knowledge production on the continent. South Africa, together with Egypt and Nigeria, produce three quarters of total scientific output on the continent.

**Figure 2: Share of individual SSA countries (top 13) to total output (n = 236 567 papers) for the period 1990 - 2009**



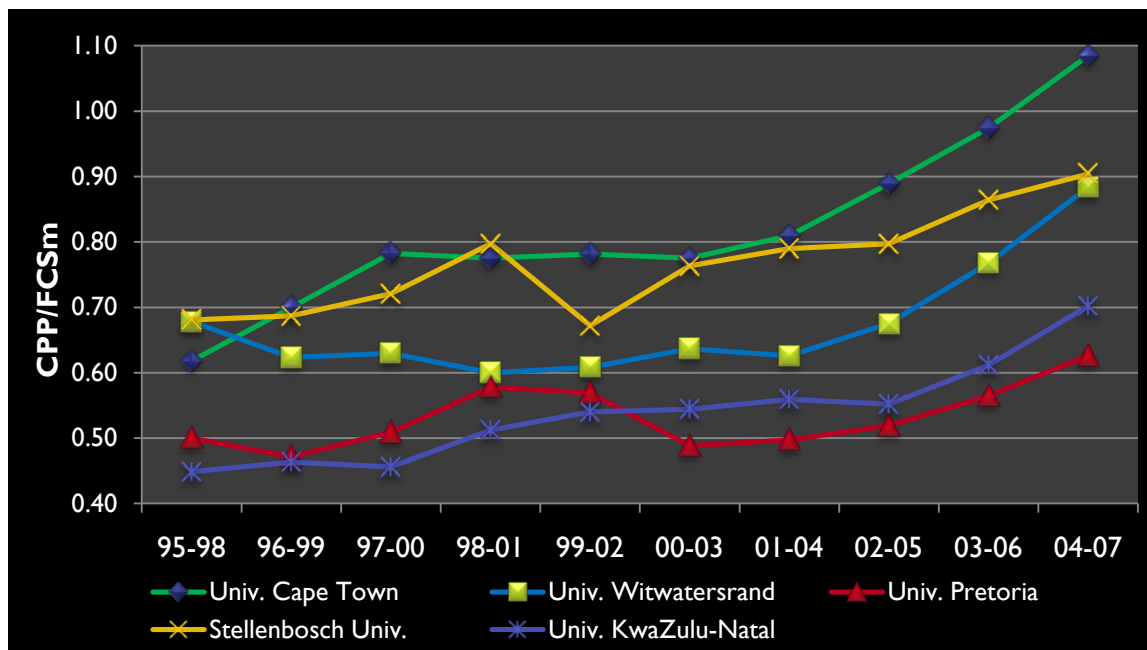


## **V. Research evaluation and bibliometric studies: Raising awareness and quality**

South Africa does not have a long history of scholarship in R&D evaluation and bibliometric research. Some pioneering work using ISI-data has been done by Anastasious Pouris (science policy expert) and more recently by scholars in information science. CREST started working in this field early on in its existence (through its participation in the NRTA in 1998), but only began to strengthen its expertise in bibliometrics through a strategic partnership with the Centre for Science and Technology Studies (CWTS) at Leiden University in 2004. Through the involvement of its senior staff (Ton van Raan and more specifically Robert Tijssen), CREST not only gained access to the comprehensive bibliometric database housed at CWTS, but also to the expertise of its senior staff. Robert Tijssen started running one week courses on bibliometrics and scientometrics in 2005 to students and staff at CREST – currently a key component of the Masters in Science and Technology Studies offered by CREST.

Under the auspices of the strategic partnership CREST increasingly received commissions from various agencies to conduct bibliometrics studies of South African science (NACI, DST and the CHE) as well as specific fields (study on health research commissioned by the DST). But arguably the most important significance of this area of work was demonstrated when the Higher Education Quality Committee (HEQC) of the CHE commissioned CREST in 2005 to compile institutional research profiles of all South African universities who were to be audited. Typically CREST would, in collaboration with the audited university, compile an institutional research profile that would include extensive bibliometric data sourced from the CWTS. These profiles were subsequently sent to the HEQC audit panels as additional background information when conducting the institutional site visits. Over the past five years CREST has produced no less than 18 institutional research profiles which have directly impacted on the research audit process. Using Leiden's "crown indicator" the field-normalised journal impact score, CREST assisted the HEQC and the universities concerned to identify areas of research strength and international impact as well as areas where their scientific production is less visible. The work for the HEQC has generated various follow-up studies including institution-specific profiles commissioned by the University of the Witwatersrand (Wits), University of Cape Town (UCT), North-West University (NW) and Stellenbosch University (SU). In its most recent study on the state of university research, CREST in collaboration with CWTS, have produced comprehensive citation profiles of more than 40 scientific fields as well as institution specific results. An example of this work is illustrated in Figure 3 below which shows how the international citation impact of the top five South African universities has improved over the past ten years.

**Figure 3: Trends in field-normalised citation impact of 'Big Five' universities**



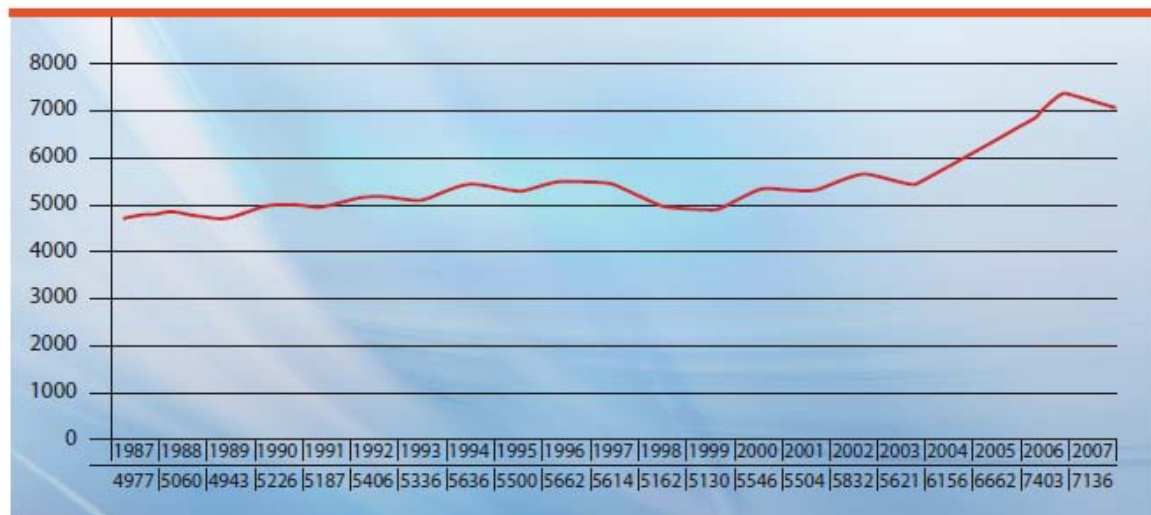
## VI. Knowledge production in South African Higher Education

Measuring South Africa's scientific output is not a straightforward matter. How "output" is defined depends on the set of scientific journals taken as the basis for the measurement. Internationally, it is common practice to use as "reference" set the journals indexed in the Thomson Reuters (ISI) Web of Science (the Science Citation Index, Social Sciences Citation Index and the Arts and Humanities Citation Index). Most bibliometric scholars use the same reference journals in order to make comparison across countries possible. It is well documented, however, that the ISI-journals have a significant Anglophone and developed-country bias which penalises Francophone and other non-English speaking countries, as well as developing countries in general. In the latter case, journals in developing countries (including South Africa) are not well covered in the ISI database simply because many of them are local journals with small subscription bases and consequently very low international visibility.

Another consideration when measuring scientific output locally is South Africa's unique system of state funding of research output through the official recognition of a set of so-called 'accredited journals', as managed by the national Department of Higher Education and Training (DoHET). As a result, more than 290 local journals across all fields of science benefit indirectly as South African academics publish in these journals in order that their institutions can qualify for the publication subsidy (an amount of R106 000 in 2007). Unless research output in local journals is included in any measurement of national research output, the result is a skewed picture of knowledge production,

particularly for the social sciences and humanities. Based on information captured in SA Knowledgebase, one can take a long-term view of research article output at South African universities.

**Figure 4: Research output of South Africa's universities (1987 – 2007)**



As Figure 4 shows, total article output (fractional counts) remained very stable from the inception of the funding framework in 1987 until the revision of the original policy in 2003. With the promulgation of the new policy framework in 2003 (which came into effect in 2005), there occurred the first significant increase in 15 years – a trend that has continued until 2006 (when the system reached its recent peak of 7400 article units).

Recent studies by CREST have revealed large variations between South African universities in terms of publication “behaviour”. CREST introduced the notion of differences in the “shape of knowledge production” in its recent publications to highlight some of the more salient differences. A breakdown of institutional profiles as far as publication in ISI versus non-ISI journals is concerned is shown in Table 4.

**Table 4: Percentage distribution of ISI- and non-ISI articles by university**

University <sup>13</sup>	%ISI-articles (non-SA journals)	%ISI-articles(SA journals)	Total ISI-share for most recent year	%non-ISI SA journals	%IBSS-journals <sup>14</sup>	Total article equivalents recorded <sup>15</sup>
UCT	67.2%	12.3%	83%	15.0%	1.4%	17 204
Wits	56.9%	12.9%		26.5%	3.6%	16 352
UKZN	53.8%	13.9%		30.5%	1.8%	12 804
SU	40.4%	9.6%		50.0%	N/A	13 740
UP	39.1%	14.5%		44.9%	1.4%	14 967
UFS	34.0%	13.8%		56.7%	1.1%	6 304
RU	33.8%	15.0%		51.2%	N/A	3 103
UWC	33.0%	9.0%		52.0%	6.0%	1 588
NWU	32.4%	7.0%		57.7%	2.8%	5 542
UNISA	13.0%	4.0%		80.0%	3.0%	6 878
NMMU	12.5%	39.7%		45.4%	2.5%	2 527
DUT	64.8%	10.7%		20.2%	4.3%	347
TUT	46.3%	12.1%		30.7%	10.9%	486
UEH	42.6%	14.7%		37.6%	5.2%	639

A distinction can also be made between those South African journals that are indexed in the Web of Science (approximately 65, mostly in the natural and health sciences) and those that are not. In the group of the most productive universities, large differences are evident between the three (historically English-medium) and the two (historically Afrikaans-medium) universities. The relatively high proportions of outputs from UCT, Wits and the University of KwaZulu-Natal (UKZN) in foreign ISI-journals (all above 50%) contrast with their relatively small output in local non-ISI journals; conversely, University of Pretoria (UP) and SU academics still publish extensively in local South African journals. In the outputs of medium-sized institutions, some of these differences are even more apparent. With the exception of Rhodes University (RU), the other universities in this category are either historically Afrikaans or dual-medium universities. These patterns have to be understood in conjunction with the dominance of the social sciences and humanities at the traditionally Afrikaans-medium universities. The profile for RU could be explained partly by the fact that it does not have a medical school (publication in the health sciences is more prevalent in foreign journals). It is also clear from the institutional profile that the social sciences and humanities are quite strong at RU (constituting nearly 42% of total output).

The three universities in the small-sized category have interesting profiles as they all produce significant numbers of papers in ISI-journals. This is mainly due to small pockets of capacity and knowledge production in such areas as agriculture (University of Fort Hare (UFH)), engineering and the built environment, physics and chemistry (Tshwane University of Technology (TUT)) and materials sciences and biotechnology (Durban University of Technology (DUT)).

In summary, differences between universities in the production of ISI-indexed papers are evidently related to historical factors, the presence or absence of specific faculties and schools, as well as to research niche areas. Most universities have adopted research policies to encourage their staff to publish more of their work in ISI-indexed journals, to become rated in the NRF system, and to collaborate internationally.

## **VII. A new perspective on South African journals**

Given the centrality of local journals within the South African science system, the Academy of Science of South Africa in 2003 launched a study entitled the “Scientific management of South African journals”. CREST, in partnership with CWTS at Leiden University, conducted the main empirical research for the overall project. The results of this study were wide-ranging and addressed a number of key issues: such as the distribution of output by scientific field, the demographics of South African authors and institutional contributions to different journals. But arguably the most interesting – and even unexpected – result pertained to the analysis of institutional patterns of publication by journal.

For this analysis those South African journals which had published 300 or more articles over the previous 13 years (1990 – 2003) were selected. This produced a list of 60 South African journals. In each case, the top 3 – 5 South African institutions were then listed, each with the number of authorships in that journal (Table 5). So, for example, in the first row of Table 5, it shows that the journal “In die skriflig”, had published a total of 349 articles with 391 authorships between 1990 and 2003. It then lists the five institutions that contributed most to articles in this journal in descending order of authorship. The proportion of authorships contributed by the highest institution as calculated – in this case, Potchefstroom University for CHE (now NWU). Over this period, academics from this institution generated 235 authorships out of the total of 391, which means that they produced 60% of the content of this journal. Journals are listed in Table 5 in descending order according to the proportion of the highest “contributing institution” in relation to the overall article content in that journal.

**Table 5: SA Journals and institutional publication patterns**

Journal (>300 articles)	Place of publication/ Publisher	INSTITUTIONAL AFFILIATION						Articles	Authorships
<i>In Die Skriflig</i>	Reformed Theological Society of South Africa, Potchefstroom	PU (235)	60%	SU (45)	UFS (19)	UP (18)	UNISA (14)	349	391
<i>Annual Survey of South African Law</i>	Published for the School of Law, Wits by Juta Law	Wits (303)	58%	SU (58)	UNISA (35)	UCT (33)		506	520
<i>SA Mercantile Law Journal</i>	Juta Law	UNISA (210)	53%	UN (23)	SU (20)	RAU (17)	PU (12)	366	399
<i>De Jure</i>	Butterworth Publishers	UP (252)	49%	UNISA (57)	PU (43)	RAU (26)		475	513
<i>Bothalia</i>	National Botanical Institute, Pretoria	NBI (411)	47%	UP (71)	UFS (70)	RAU (36)	UN (31)/SU (31)	495	880
<i>Koers: Bulletin for Christian Scholarship</i>	Bureau for Scholarly Publications, Potchefstroom	PU (185)	47%	UFS (40)	UNISA (28)	RAU (23)	SU (21)	339	397
<i>Hervormde Teologiese Studies</i>	Faculty of Theology, UP	UP (297)	45%	UNISA (66)	UFS (26)	SU (21)		646	663
<i>Acta Criminologica</i>	Criminological Society of South Africa	UNISA (307)	44%	UP (84)	UNIN (29)	TSA (21)		455	705
<i>Comparative and International Law Journal of Southern Africa</i>	Institute of Foreign and Comparative Law, UNISA	UNISA (140)	43%	UP (21)	Vista (13)	Wits (12)		306	329
<i>Tydskrif vir die Suid-Afrikaanse Reg</i>	Faculty of Law, RAU	RAU (382)	43%	UNISA (70)	SU (55)	PU (50)	UP (39)	821	887
<i>Journal of the South African Veterinary Association</i>	SA Veterinary Association, Pretoria	UP (664)	41%	Medunsa (197)	ARC (195)	Foreign (60)	SU (54)	599	1632
<i>NGTT</i>	Faculty of Theology, SU	SU (270)	41%	UFS (89)	UP (65)	UWC (37)	UNIN (27)	600	666

The results of this analysis of institutional contributions to particular South African journals revealed some disturbing trends. In the sample of 60 journals, a SINGLE institution contributed 30% or more of the article content to 21 of these journals; of these journals, a SINGLE institution contributed 40% or more of the article contents in 12 of these journals. It is also pertinent to point out that of the 10 journals with the highest single institutional contribution, nine are in the arts and humanities (only “Bothalia” excluded) and 4 are in the field of Law. In fact, it is fair to say that journals in the fields of Law and Theology are particularly prominent in this listing.

If one looks at the 20 journals with the highest contribution by one institution (all above 30%), it surely is no coincidence that in 11 of these cases, the journal is published by the same institution/unit that produces the majority of articles. The CREST study showed that there were strong indications that some South African journals currently may be published for the benefit of certain institutions only, rather than for that of a research field or a national scholarly association. In fact, “in-house” publishing seemed to be the norm for a number of journals!

These results provided one of the main reasons for a set of recommendations related to the quality of South African journals. The main recommendation in this regard – which would eventually be accepted by the Department of Higher Education and Training – was that each South African journal would in future be reviewed by a panel consisting of international and local experts in the field every five years in order to decide on the continued accreditation of that journal by the Department. Such a process of regular peer-review began in 2009 and has started already to impact on editorial practices in the country – a result that has its origins in the original scholarship by CREST and CWTS.

## **VIII. Original work on doctoral studies in South Africa**

For various reasons, the state of postgraduate studies in South Africa has come under increasing scrutiny in recent years. Questions about the quality of postgraduate supervision, possible shifts in the nature and focus of theses and dissertations and the implications thereof for supervisory models, the slow growth in masters and especially doctoral graduates and so on are much more prevalent nowadays than even five years ago. There are at least three reasons an increased interest in the state of postgraduate studies have been witnessed.

First, the institutional audits of the HEQC over the past five years have demanded that universities look more closely at various aspects of the quality of postgraduate studies. The quality of management systems and procedures, supervision and examination processes and support to postgraduate students have all come under (renewed) scrutiny. Perhaps surprisingly, informal feedback has revealed that most universities, including the more established research universities, are not doing enough to ensure that the necessary conditions are in place to ensure quality of postgraduate studies across the board.

Second, research undertaken by CREST on the ageing of active scientists in public science in South Africa, have produced concerns about the provision of quality supervision to the next generation of scholars and scientists. The most productive scientists often also assume disproportionate

supervisory loads. The fact that nearly half of the total research output in the country in 2010 is produced by scientists over the age of 50, remains a major matter of concern. Unless we take immediate and incisive steps to reverse this trend, we will not only see an increasing decline in overall research production, but also the steady erosion of the supervisory capacity in the system.

Third, the increasing internationalisation and even institutionalisation of corporatism and managerialism in South African universities, has brought with it a concomitant shift in attention from concerns of quality and effectiveness to concerns about efficiency and throughput. In the field of postgraduate studies, this trend has manifested itself in a growing belief in certain circles that the management and supervision of Masters and Doctoral students at South African universities is inefficient. It is inefficient, because it is believed that these students take too long (on average) to complete their studies and that the conversion rate from Masters to Doctoral is too small. It was against this background, that the NRF in its Business Plan for 2005 included a section on “The PhD as driver”. In this section, the authors write as follows:

Responding to challenges facing the South African National System of Innovation (NSI) the NRF identified a key driver for all its programmes, “the production of large numbers of high quality PhDs that are required to provide the bedrock for an innovative and entrepreneurial knowledge society”. Inherent in the understanding of PhD as a driver, is that the entire education system must be effective, from pre-school to primary, through senior phase and eventually at tertiary level. Efforts to de-link the different parts of the chain will render the implementation of any strategies less effective and unsustainable in the longer term. While proposed interventions are concentrated at postgraduate level, the NRF will continue to advocate at policy level for an effective education system and will also work alongside other stakeholders in advocating for an effective and efficient education system in its entirety. (NRF, 2005)

These concerns and considerations led the Academy of Science of South Africa in 2008 to commission a series of studies on the state of the PhD in South Africa. CREST was requested to produce 5 separate reports covering the following topics:

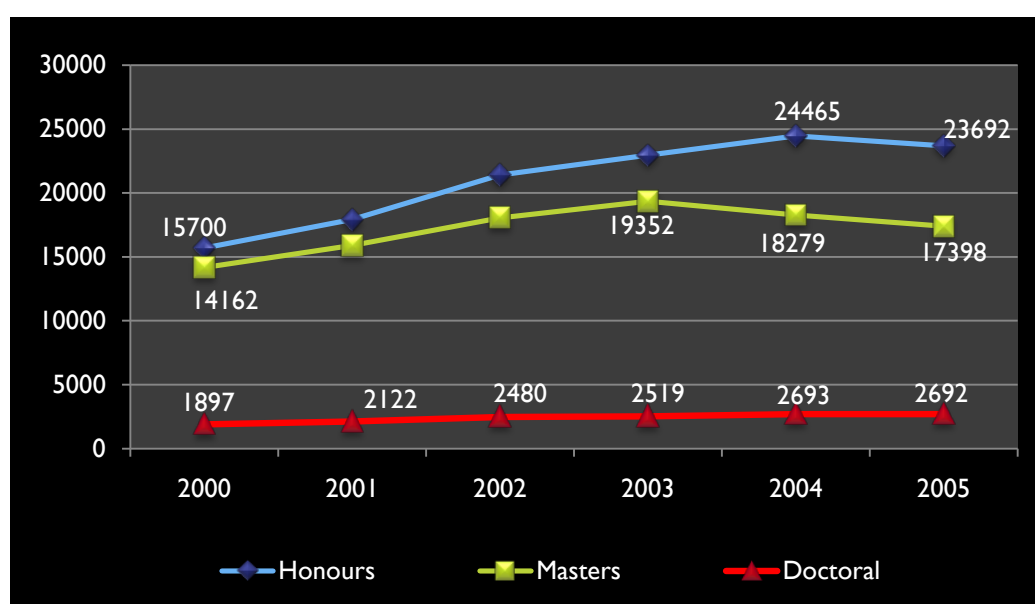
- A statistical profile of the SA PhD
- Systemic blockages in doctoral studies
- Attrition of doctoral students
- Employers’ perspectives on doctoral graduates
- A tracer study of doctoral graduates

The findings of these various studies have subsequently been integrated into a single report which was released in October 2010. CREST’s research has made a significant contribution to our understanding of the SA doctorate. Two of the most interesting and potentially far-reaching results from our empirical studies pertain to the possible “shrinking” of the pipeline for doctoral students and the consequences of the age profiles of doctoral students. As far as the former is concerned,



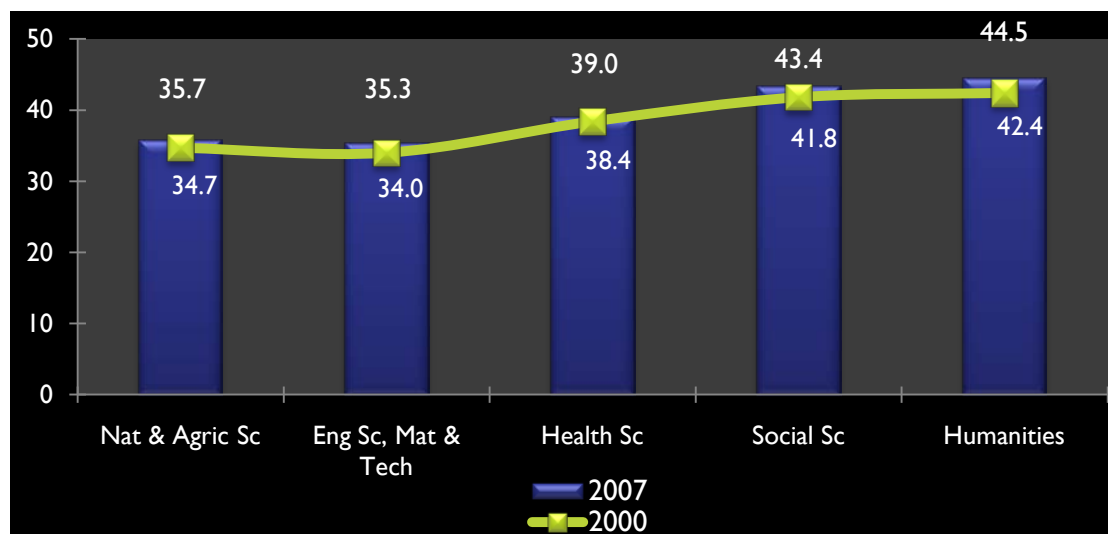
CREST published for the first time breakdowns of doctoral enrolments to distinguish between “first” and “historical enrolments”. As Figure 5 shows, trends in first enrolments across all postgraduate students reveal a clear decline or flattening of in first enrolments. This means that the pool for new doctoral students is not expanding and all expectations of huge growths in doctoral graduates over next 10 years may have to be significantly revised.

**Figure 5: Trends in first enrolments of PG students**



A second major finding concerns the typical age profile of doctoral graduates. Figure 6 below presents a breakdown of the mean age of doctoral graduates by main field. In the Humanities the average doctoral graduate is nearly 45 years old at age of graduation, compared to the average student in the Natural Sciences (36 years old).

**Figure 6: Mean age of doctoral graduates by main scientific field**



When correlated with completion rates (or Time to degree) it is clear that the age of the doctoral students also correlates quite significantly and strongly with the length of the study. As Table 6 shows, the older the student at completion of his or her studies, the longer it has taken them to complete their thesis. In 2007 the average student under the age of 30 when completing the doctoral studies took 3.6 years to complete compared to the average students over the age of 50 who took 5.7 years until completion.

**Table 6: Mean age of doctoral graduates and time to degree (2006 and 2007)**

	2000		2007	
	Mean yrs	N	Mean yrs	N
<30	3.7	89	3.6	145
30-39	4.5	251	4.7	458
40-49	5.0	171	4.9	340
50+	5.6	77	5.7	220
All	4.6	822	4.8	1274

## Conclusion

This overview of research at CREST over the past 15 years focused on its value and impact in eight areas. There are many other areas where we believe that CREST has made both original and far-reaching contributions – on the state of women in SET in South Africa, research on scholarly publishing, an evaluation of the biotechnology strategy of the country, comprehensive research on models and methods of knowledge-utilization and the development of new measures to study research collaboration.

CREST is committed to continuing a programme of innovative and high-impact research that will serve science and higher education scholarship on the African continent. New initiative and partnerships are being pursued to ensure that it remains a unique and highly-valued resource in South Africa and beyond.

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## Project information

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The aim in this section is to provide more detailed information on the goals, contents and outcomes of some of the more significant and substantive studies that CREST has undertaken over the past fifteen years. The discussion is organised according to the main research thrusts of the Centre.

### I. Science and innovation policy studies

#### **I.1 Human capital and the SA Knowledgebase (NACI)**

The detailed brief for this study required that the study addressed the following elements:

- (1) Investigate the relationship between the different layers/sources of information (R&D surveys/NRF grants database/NRF rating systems/SARIMA studies/SA Knowledgebase) and to identify and explain points of convergence and divergence as and when they arise.
- (2) Provide a detailed conceptual/theoretical justification and framework around the meaning of the “national knowledgebase” concept by interrogating the latest literature in S&T policy studies and knowledge production.
- (3) Provide a quantitative profile of the knowledgebase in terms of critical “knowledge entities” such as:
  - a. Peer reviewed articles
  - b. Scientific books
  - c. Monographs
  - d. Patents
  - e. Doctoral dissertations
  - f. And other related knowledge products.

This profile had to cover a relatively long period of time (1990 - ) and focus on breakdowns by, *inter alia*, scientific field, knowledge producer profiles (gender/race/age) and institution.

- (4) Produce a more detailed profile of the key institutions producing knowledge in highly strategic fields (strategic to be defined in terms of the notion of “competitiveness” and innovation imperatives). Such a profile will identify the “centres of critical mass” where there are long-standing and well-established capacities of knowledge production.

- (5) Deliver a bibliometric profile of the international 'visibility' of South Africa's knowledgebase and a comparison with similar economies in terms of world share in knowledge production. The first part will be based on an extensive analysis of citation profiles of scientific fields (both ISI and non-ISI).
- (6) Generate a network analysis of patterns of scientific collaboration and networking of the top 20 scientific fields in the country.
- (7) Align this study with the HR model exercise currently being developed by NACI and other NACI studies such as skill shortage advice, utilisation of research findings.
- (8) Assess the capacity of the knowledgebase in attaining the goals as set in national priorities. This will also include introducing qualitative leavers such as quality of education system.

## ***1.2 Researching Inequality through Science and Technology (ResIST, EU)***

The starting point for ResIST was research which had established that S&T do not merely cause or alleviate inequality, but are more profoundly implicated in social relations of distribution and access. The most pervasive and obdurate sources of social distribution are enshrined and entrenched in S&T systems.



ResIST's objective was to understand processes that contribute to the increase in inequalities *through* the role of S&T, but also to understand processes that contribute to mitigate inequalities *through* S&T. The enhanced role of S&T in the global knowledge economy gives such understanding urgency.

ResIST would therefore:

- Analyze how global policy contexts for key S&T processes affect the distribution and redistribution of knowledge resources, and the scope for alternative framings (Work Package [WP] 1 – led by Susan Cozzens of Georgia Institute of Technology and Egil Kallerud of NIFU-STEP)
- Identify the features of effective policies and programmes to build S&T human capital and institutional capacity in disadvantaged populations and places (WP 2 – led by Louise Ackers of Leeds and Johann Mouton of Stellenbosch )

- ◀ Critically assess new initiatives to construct S&T priorities reflecting the needs of the disadvantaged, and review current constraints and future opportunities for their full realization (WP 3A – led by João Nunes of Coimbra)
- ◀ Map structures of accountability in the distribution of technological risks, and propose effective accountability channels to protect the poor from such risks (WP 3B – led by Steve Woolgar of Oxford)
- ◀ Model the impact of new research-based technologies on the poor through dynamics such as employment, lowering costs, and impact on public services (Work Package 4 – led by Susan Cozzens of Georgia Institute of Technology and Aris Kaloudis of NIFU STEP)
- ◀ In a horizontal activity, involve policymaker and practitioner stakeholders in three representative world regions – in Europe, in Southern Africa and in the Caribbean and Latin America - in the process of developing and implementing options identified in the Project. In particular we will use the insights developed in WPs 1-4 to test with stakeholders the opportunity to develop and apply tools to assess:
  - S&T policy options to achieve wider social inclusiveness for developed and developing countries and
  - the possible distributional impacts of research programmes (Work Package 0 led by Peter Healey of Oxford and Lídia Brito of Maputo)

The ResIST partnership consisted of Germany (ISI FhG, Karlsruhe), Malta (University of Malta), Mozambique (University of Maputo), the Netherlands (University of Amsterdam), Norway (NIFU-STEP, Oslo), Portugal (Centre for Social Studies (CES), University of Coimbra), South Africa (CREST, Stellenbosch University), Turkey (Ankara Branch of the Middle East Technical University), the United Kingdom (Universities of Oxford and Leeds) and the United States (Georgia Institute of Technology). The James Martin Institute at Oxford was the coordinating institution.

### ***1.3 Empirical analysis of South Africa's international research collaboration (DST)***

In addition to various country profiles, this ongoing project aims to develop a “scientific collaboration index’ (SCI) which can be used by the department in its strategic planning and decision-making.

The aim of such an index – which will be based on the profiles as they are developed – is twofold:

- First, to rank-order all countries with whom South African scientists collaborate according to various indicators, e.g. volume of overall paper output, annual growth in collaborative papers, and output weighted according to journal impact factors of journals in which these papers appear. The construction and further refinement of such an index would enable us to assess South Africa’s collaborations with various countries over time and to identify the relative “ranking” of each country in terms of the overall collaborative enterprise.
- Second, this index will be refined to two levels: at the level of scientific field (this could be done at various levels of analysis but most likely at the level of 18 – 20 meso-level fields) as well as by scientific institution. These refinements will enable us to rank other countries and institutions by scientific field at any given time and over time. Practically, it would also mean that we would be in a position to show with which institutions in which countries and by field South African scientists collaborate most and whether and how these collaborations change over time.

### ***1.4 The African Research Innovation and Technology Policy e-Library (SARIMA)***

The eLibrary is a database facility developed by a consortium of research agencies including ResearchAfrica, SARIMA and CREST. The facility supports the science, technology and innovation initiative of the NEPAD Programme, which is outlined in its Consolidated Plan of Action.

The database is aimed at making available electronic documents on science, technology and innovation policies with a focus on African countries and institutions. The collection of documents is derived from two sources: firstly, electronic documents produced by relevant institutes and government ministries and agencies (regional and international), and secondly, scanned versions of important science, technology and innovation documents which are not electronically available in the public domain. In most cases the documents have been collected through desk-top research.

The database is an attempt to address the lack of a relevant single repository of such science and innovation policy documents on the African continent. Therefore, the scope of the material in the database includes national science, technology and innovation policies, legislations, Acts and strategy documents, annual and technical reports, and reviews. Due to the growing significance of sectoral systems of innovation, the database includes sector policies such as agriculture and biotechnology, information and communication technologies, health and higher education. The focus on higher education is particularly important given the growing mergers of the science, technology and higher education into a single ministerial function in some African countries. The database also includes scholarly documents on science and technological innovation on the continent.

The target audiences include science and technology ministries in Africa, policy-makers, politicians, researchers, policy advocates, and donor communities seeking information to promote science and technology development in Africa. The languages of the documents are not restricted to English but also include others such as French and Portuguese.

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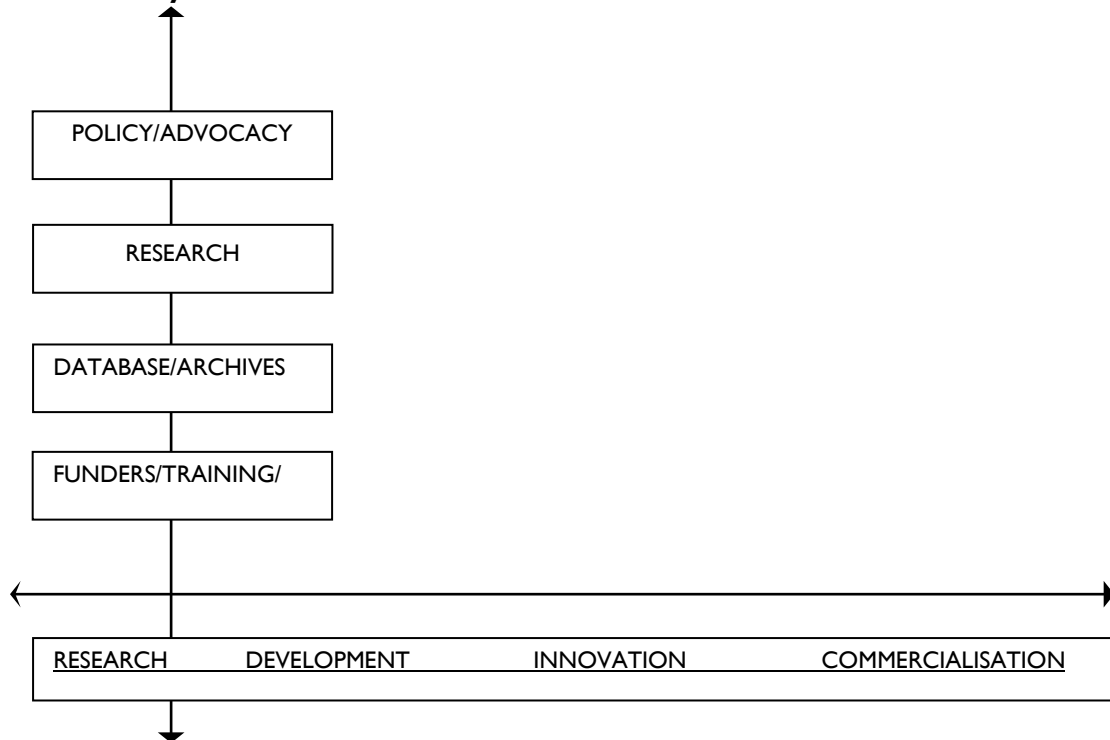


## II. Research systems in Africa

### 2.1 Mapping the South African Research and Innovation Domain (SARIMA)

SARIMA had identified a need for a comprehensive and detailed description (mapping) of the major actors and activities in the South African research and innovation (R & I) system. The following framework (Figure 7 below) was suggested as guiding the work of the study.

**Figure 7: A heuristic framework for mapping the SA Research and Innovation System**



The diagram above reads from left to right, matches a supply of new ideas entering the system to a demand for new ideas that lies in the commercial sector. According to the brief the institutions and organizations undertaking, promoting, supporting and utilising research and innovation must be identified and properly documented. The required mapping of the actors and activities should also focus on both the vertical and horizontal linkages. The project would identify at all levels the actors by stages in the research and innovation value chain, from research and development to commercialization, as well as the kinds of activities that such actors are involved in.

## 2.2 S&T profiles of Selected African Countries (DST)

CREST and High Impact Innovation (HII) were commissioned by DST in July 2006 to undertake a comprehensive study on science and technology in Africa with the following specific brief:



Given the apparent lack of African S&T country profiles, and following the recommendations of the 2004 study to have a dedicated exercise on Africa, as well as consultations within the DST, in particular with the Africa Co-operation Unit, the need was identified to commission a study that will focus on African countries with the view to:

- Determining African S&T country profiles of existing and prospective bilateral partners of South Africa.
- Determining African S&T regional profiles (i.e. West Africa, East Africa, Central Africa, Southern Africa and North Africa).
- Determining the interface between country, regional and continental S&T priorities.
- Determining the range of international (including sub-regional) funding instruments that could be leveraged to support science and technology on the continent.
- Providing an analysis of existing studies on African S&T (World Bank, OECD etc.).

Two key paragraphs in the original brief document provide the main rationale and background to this study:

The South African government recognizes the importance of research and innovation in achieving its economic and social goals. To achieve these goals, international linkages and collaboration in S&T will play a central role. This is mentioned in a number of policy documents such as the White Paper on Science and Technology, the National Research and Development Strategy, and the National Biotechnology strategy. These reports all underline the role of international science and technology collaboration as an essential activity for transfer of ideas and knowledge, and crucial for the development of human capital and economic competitiveness.

The National Research and Development Strategy strongly recommend the strengthening of Science and Technology networks and connections. It states that, if South Africa wishes to develop and retain world-class scientists, it is imperative that we tap into the international human and financial resources to address our needs. The strategy points out that it is necessary that as a nation we invest in the development and continental research networks to ensure that effective collaborations are built with our African counterparts. Scientific knowledge is advanced and disseminated through international interfaces during conferences, seminars and workshops, exchange of scientists and collaborative research efforts.

On completion, this joint research venture between CREST and HII produced a wealth of individual reports:

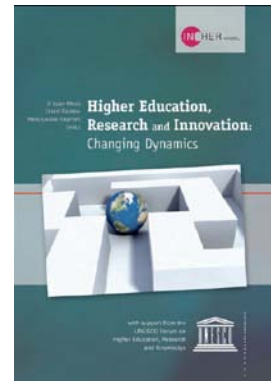
- Twenty-two country S&T profiles
- Five regional S&T profiles
- A report on the interface between country, regional and continent-wide scientific priorities
- A report on international funding instruments
- A comprehensive bibliography of existing studies on S&T in Africa.

## 2.3 Study on National Research Systems - A Meta-review (The UNESCO Forum on Higher Education, Research and Knowledge)

At its workshop held on the 6<sup>th</sup> of 7<sup>th</sup> of April 2006 at UNESCO, Paris, the objectives of a proposed study on national research systems were identified as follows:

....to learn more about research systems in developing/poor countries, and to help strengthen research and research capacity. Thus, the project supports research on and for development so that developing/poor countries may articulate and have ownership of these systems which are key assets for their development.

At a subsequent meeting, it was decided that a “follow up group be established (consisting of) Prof Mouton, CREST/South Africa, Dr Roland Waast IRD/Paris, Dr Lazar Vlasceanu UNESCO CEPES/Romania, Dr Carthage Smith ICSU/Paris with support to be given by Dr Christina von Furstenberg (Social Sciences) and Dr Tony Marjoram (Science) who are members of the UNESCO Forum Coordinating Committee. It was also decided to invite Drs Mouton and Waast “to undertake a literature search of major reports on the subject of National Research Systems, dividing the task according to their areas of experience”. And finally, it was suggested that “a report on the findings of this search /mapping exercise be presented at the UNESCO Forum’s Global Colloquium (29 November – 1 December 2006) which will deal with current challenges for universities (especially in developing countries) as part of national research systems”. The final study culminated in 2008 in a set of 56 country reports and four additional cross-cutting reports.



## 2.4 The State of Public Science in the SADC countries (SARUA)

CREST was awarded a contract under commission by the Southern African Regional Universities Association (SARUA) in April 2008 to undertake a study on “The state of public science in the SADC region”. The overall goals of the study and research design and methodology of the research are outlined below. The main goals of the study were as follows:

- To describe and understand the nature and state of scientific institutions in the region.
- To describe in some detail the modes of knowledge production (basic research, contract research, consultancy research and so on) prevalent in the region.
- To document the nature and extent of international funding agencies in their support of research in the region.
- To analyse and describe the nature and extent of scientific collaboration within the region.
- To describe and understand the main forms of dissemination of scientific information in the region and specifically the role of local and indigenous journals in this regard.



The study would also attempt to assess the overall robustness of public science in the SADC countries (with a specific focus on university research) with regard to the following issues:

- ◀ A qualitative assessment of the funding base of public science in the region
    - How broad is the funding base?
    - How dependent are scientists on specific funding sources and specifically international donor and funding agencies?
  - ◀ The robustness of research institutes in the region: This includes a focus on their “inscription” within the national science system, recognition and reward mechanisms and the sustainability of institutes within regional and international networks. The specific objective is to establish whether academic and government-based researchers engage in building the institution of science in their universities and centres through long-term research programmes, addressing the challenge of the ageing of academics in many of these system as well as the levels of support for graduate students and post-doctoral fellows.
  - ◀ The visibility of academic science in the region. How do academic scientists disseminate their research findings and results? Where do they publish? What is the state of scientific journals in the respective countries? If they publish in international journals, who do they co-author with? Do they have access to and utilize other modes of scientific communication?
  - ◀ To what extent is science in the region addressing or attempting to address the most important development goals of the respective countries? This component would look more qualitatively at the kinds of topics that are receiving attention, the link between institutional research missions and national and regional goals as well as the ways in which scientists are attempting to disseminate their research results into application and policy.
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### III. Research evaluation and bibliometric studies

#### 3.1 The design and development of a monitoring and evaluation framework to benchmark the performance of women in the South African NSI (NACI)

The research brief for this project was formulated as follows:

The South African Reference Group on Women in Science and Technology (SET4W) invites submissions for the preparation of a mixed methods research study to design a suitable monitoring and evaluation framework to enable SET4W and NACI to regularly evaluate the performance of women in and the contribution of the respective genders to the input and output of the NSI, to highlight strengths and weaknesses in gender-specific research and to use this as a basis to advise the Minister of Science and Technology (p.3).



The main outcome of this project was an Monitoring and Evaluation (M&E) Framework that could be employed to regularly monitor and evaluate (1) the performance of women in the National System of Innovation (NSI). and (2) the contribution of the female and male scientists to the input and output of the NSI, as well as evaluating (3) the strengths and weaknesses of gender-specific research. This framework should be designed and developed in such a manner that its application can produce relevant and appropriate advice to the Minister of Science and Technology.

#### 3.2 Baseline report on women in science, engineering and technology - Populating a monitoring and evaluation framework to benchmark the performance of women in the National Science System (NACI)

The report builds on previous work conducted by CREST with regard to women in Science, Engineering and Technology (SET) in South Africa. In 2004 CREST was commissioned to develop a M&E Framework to benchmark the performance of women in the NSI. The initial study was commissioned by the Science, Engineering and Technology for Women (SET4W) Reference Group I, a sub-committee of NACI, DST. The purpose of the M&E framework would be to:



“...enable SET4W and NACI to regularly evaluate the performance of women in and the contribution of the respective genders to the input and output of the NSS, and to use this as a basis to advise the Minister of Science and Technology.”

(Initial Terms of Reference, p.3)

The final report and framework, incorporating scenarios for implementation, was released in 2005 (A *Monitoring and Evaluation Framework to Benchmark the Performance of Women in the NSI: Report to the SET4W Reference Group*). The baseline report is a first attempt at populating this framework with data that is currently readily available within the NSI.

The baseline report also has to be read against the background of the most recent study on women in science, which was undertaken by CREST and released by NACI in 2004 as *Facing the Facts: Women's Participation in Science, Engineering and Technology* (NACI/SET4W, 2004). *Facing the Facts* is the first study in South Africa that provides a comprehensive picture of the participation and performance of women in SET. *Facing the Facts* already provides some baseline data and indicators against which the ongoing participation and performance of women in the NSI can be monitored.

### 3.3 Biotechnology Human Capital Needs Analysis (SAASTA)

Biotechnology is a body of techniques that use the biological living organisms, or derivatives thereof to make or modify processes for specific use. The White Paper on Science and Technology considers science and technology to be central to creating wealth and improving the quality of life in contemporary society. Furthermore, the South African government recognises its responsibility for creating an enabling environment for innovation, specifically as a means of achieving national imperatives of reducing the impact of HIV/AIDS, jobs creation, rural development, urban renewal, crime prevention, human resource development and regional integration. It is believed that biotechnology can play a major role in addressing these imperatives. Finally, the industrial application of biotechnology requires the acquisition of strong scientific, and engineering capabilities, and the deployment of new knowledge in the production process. This has necessitated the establishment of links or partnerships between science, engineering and technology institutions and private companies. Biotechnology is thus a highly networked endeavour.



Given the evolving nature of biotech, the human capital factor has long been a concern. Despite the existence of several regional innovation centres and centres of excellence in South Africa, where the innovation is facilitated, with biotech entrepreneurs, by well trained and experienced staff, there is generally a lack of adequate expertise and skills. This is a major constraint on the development of biotechnology in South Africa.

The project objectives were considered from three different viewpoints:

#### 1. The promotional aspects of biotechnology as a discipline:

- An investigation into the different institutions of higher learning that offer degrees / programmes that link up to biotechnology, which can train people to enter the biotech field;
- An investigation into the extent to which these institutions promote biotechnology among students and encourage students to pursue research and careers in biotechnology;
- An investigation into the extent to which these institutions assist students to enter the field of biotechnology and the nature of the assistance provided;

#### 2. The supply of biotech human capital

- An investigation into the numbers of students in biotechnology (and related fields) at these institutions;
- An investigation into the numbers of students who successfully completed their degrees in biotechnology (and related fields);
- An investigation into the numbers of biotechnology graduates who pursued higher (postgraduate) degrees in that domain;
- An investigation into the numbers of biotechnology graduates who entered the biotech sector after completion of their degrees;

#### 3. The demand of biotech human capital

- An investigation as to how many biotech professionals are not working in the biotech sector;
- An investigation as to how many biotech professionals are active in the biotech sector; and
- An investigation as to how many biotech professionals are actually needed.

#### 4. The supply demand balance and the impact on the promotion of biotech

### **3.4 Study on the Scarce Skills Development Fund (SSDF) programme of the NRF**

The NRF commissioned CREST in May 2009 to undertake a rapid impact assessment of the Scarce Skills Development Fund (SSDF). The management of the SSDF programme is performed in accordance with a Memorandum of Agreement (MoA) between the NRF and the Department of Labour (DoL). This initiative is located within the Human and Institutional Capacity Development (HICD) Directorate of the NRF. Statistical trends over the years indicate that this initiative has grown significantly since its inception, filling a very important role in supporting postgraduate training in areas that are of national importance. The request for an evaluation was motivated by the desire to gain a better understanding of the impact that this initiative has had on the recipients of the scholarships.

The aims of the impact assessment are briefly outlined below:

- (1) The first aim of this study was to track the SSDF recipients in the HEMIS (i.e. Higher Education Management Information System) database of the Department of Higher Education and Training, in order (1) to determine the share of funded students who successfully completed the qualification for which funding was received, and (2) to calculate the average time taken to degree completion.
- (2) The second aim was – through a survey of SSDF-supported Doctoral graduates – to gain an understanding of the destination of these Doctoral students after graduation. For this purpose we used a questionnaire that was developed by CREST, under commission of the Academy of Science of South Africa (ASSAf), as part of a national tracer study of the destination of Doctoral students.
- (3) The third aim of this study was to investigate the individual attitudes of NRF Scarce Skills beneficiaries and to underline potential valuable impacts of this funding for these recipients. The contact details of twenty of these recipients that agreed to an interview were provided by the NRF which resulted in seventeen interviews.

### **3.5 Benchmarking research at Stellenbosch University (SU)**

The overall goal of the study can be formulated as follows:

To establish Stellenbosch University's position (strengths and weaknesses) in a number of research fields relative to the main research universities in South Africa as well as other universities currently ranked highly in international rankings.



More specific objectives that follow from this overall goal are:

1. To document SU's research output performance in selected research fields, journal index categories and in terms of trends in research collaboration over the past 17 years (1990 – 2006) and in comparison with national trends
2. To present a demographic profile of SU's research output in selected research fields for the period 1990 – 2006 and in comparison with national trends
3. To present citation profiles for SU in selected research fields for the past 10 years (1997 – 2006) by 5-year rolling citation windows
4. To compare SU's performance with 4 top research universities in South Africa and 10 other (appropriately selected) international research universities in the selected fields
5. To undertake a strength and weakness analysis of SU in the selected fields



6. To model SU performance in terms of these analyses and develop a set of alternative scenario's as far as SU's likely future performance will be.

In the final analysis, the study aimed to contribute to informed strategic decision-making about the future trajectories for SU research.

### 3.6 SA Knowledgebase and institutional research profiles (CHE)

The HEQC has been supporting (together with Stellenbosch University until 2004) the ongoing development and maintenance of SAKnowledgebase. SAKb is a database of research production in South Africa which aims to deliver a comprehensive, accurate and up to date database of article output from 1990 onwards. The database collects bibliographic information (excluding citations) on articles with South African author addresses, which appeared in journals accredited by the South African Department of Education (DoE). Information on the article title, article keywords, authorships, journal title, journal publishing detail and journal field in SAK is captured from two bibliographic indexes – the *Index of South African Periodicals* (ISAP) and the internationally acclaimed *Web of Science*. The continued development and updating of SAKb is essential since it is the main source of data for the institutional research profiles produced for the HEQC. Based on this work, CREST conducted a series of institutional research profiles:



- Durban University of Technology
- Central University of Technology
- Nelson Mandela Metropolitan University
- North-West University
- Rhodes University
- Stellenbosch University
- Tshwane University of Technology
- University of Cape Town
- University of Fort Hare
- University of KwaZulu-Natal
- University of Pretoria
- University of the Free State
- University of the Western Cape
- University of the Witwatersrand
- Vaal University of Technology



### **3.7 Tracking public R&D expenditure – a bibliometric analysis of South African output (NACI)**

In the original Terms of reference for this study the aim was stated as follows: to conduct a department level analysis of higher education production (both in ISI and SA Knowledgebase) in order to:

- Update recent comparative output trends at the level of disciplines
- Identify those centres that rate amongst the top groups in the world

It was also further stated that the bibliometric component should include all sciences and cover the period 1999 to present and should also be linked to the NACI decade book.

Given the time and cost constraints, CREST – in partnership with the Centre for Science and Technology Studies at the University of Leiden – adjusted the brief slightly and in the following ways. First, the request to do this analysis at the departmental or programme level was deemed simply too extensive to conduct within the time frame of the study. Second, the reference to “top groups” in the world raises a number of methodological questions on the one hand and on the other would also implied a hugely time-consuming study.

For these reasons, the analysis was confined to main research performing institutions. This meant an analysis of the following “units” in the South African system:

- Universities and universities of technology (22)
- Science councils (7)
- National research facilities (6)
- Government based research institutes (ca. 5)

The requirement to compare these 40 institutions with the “top groups” in the world also needed to be changed. Besides the obvious conceptual issues around what counts as “top groups”, these group differences are very field-dependent and would have required huge amount of programming and therefore also costs. The revised proposal – of which the detail is outlined below – involved comparing these 40 institutions with main institutions (other universities and research laboratories) within 20 selected fields (in order to create some more homogeneity in comparison). The procedure for identifying these twenty fields is described below. In addition, we also two further “benchmarking” steps were proposed:

- To compare the relative position of the (top) South African institutions with institutions in 5 benchmarking countries which have been selected for their presumed similarity to the South Africa (e.g. Portugal, Argentina).
- To compare the relative position of the (top) South African institutions with institutions in 5 benchmarking countries which have been selected because these are countries (presumably) to which South Africa might aspire in S&T terms (e.g. Spain).

### **3.8    *A profile of researchers and research production in health research in South Africa (DST)***

CREST's in-house database on South African science production allowed CREST to do a detailed bibliometric (but not citation) analysis of article output in health research in South Africa for the period 1990 – 2004. This analysis included the following:

- Overall and annual article output overall by year for the period 1990 – 2004
  - Overall and annual output disaggregated by main performing units and sub-field
  - Overall and annual output by main journal and sub-field
  - Identification of the most productive authors in the fields of health research and their demographic and institutional profiles.
  - Disaggregation of output in terms of publishing in local and overseas journals.
  - Analysis of co-authorship patterns as an indication of overseas and local scientific collaboration.
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### III. Sociology of science studies

#### 4.1 A strategic approach to research journals published in South Africa (ASSAf)

The following are the key questions that were addressed in this study:

1. What is the overall proportion of ISI versus non-ISI journals articles for this period and – more importantly – what is the trend over time? The latter question would address whether there has been a shift towards ISI-publications in recent years as part of a broader trend towards greater internationalization of South African science.
2. What is the overall proportion of overseas (ISI and non-ISI) versus local (South African) journals for this period and again over time? There are currently just over 20 South African journals (mostly in the natural sciences) indexed in ISI, but the vast majority South African journals are not ISI-journals. A finer analysis of “overseas” versus “local” is therefore necessary given the low number of SA journals that are recognized as ISI-journals.
3. Related to the previous issue, is the matter of changes in ISI-listing. The ISI every year adds new journals to its list and at the same time drops current journals (with low impact factors) from its lists. Our information shows that at least 4 SA journals were dropped at the beginning of 2004. If information is available on “membership” of SA journals of the ISI over time, an analysis of this trend would be interesting as it has obvious policy implications.
4. The analysis of ISI versus non-ISI and of overseas versus local will furthermore be further broken down by main scientific field (i.e. Natural sciences, Engineering, Social and Economic Sciences, Health Sciences, Arts and Humanities).
5. Which are the most “popular” (most frequently published in) journals in South Africa? This question can be addressed in different ways: (1) An overall listing of journals in which the largest number of articles were published for this period and BY year? (2) A similar listing by frequency of articles BUT broken down by the same categories referred to above: ISI versus non-ISI; overseas versus local; scientific field (overall) as well as cross-tabulating these different categories, e.g. ISI/non-ISI by scientific field and overseas/local BY scientific field and by YEAR (in both cases).
6. Are there systematic trends (even biases) in publication patterns in certain fields, institutions and (top) authors as far as certain journals are concerned? This question touches on a range of related issues referring to WHERE scholars publish. More specifically, the following questions were addressed:
  - a) In which journals (all the categories referred to above) do the top authors (most productive 20 – 25%) in each field tend to publish?
  - b) Do the top authors in each field tend to publish (over this 14 year period) in the same (small) cluster of journals? Are there field-specific differences in the variation of journal publication?
  - c) Is there a clear pattern (correlation) between institutional affiliation and publication in certain South African journals? Stated differently, do academics from University X tend to publish more in journals that are produced and edited at their institutions? Or – another issue – is there any form of clustering of publication in certain journals By institution?
  - d) What are the trends as far as number of articles per year (possibly per issue) are concerned for South African journals? This question address the matter of whether



there are any patterns as to the mean number of articles per year for journals over the time period It can also be broken down by scientific field.

- e) What are the trends in co-author collaboration for this time period and by scientific field? Much has been written about scientific collaboration and co-authorship as a reliable indicator thereof. As long as one accepts the limitations and specific meaning that “collaboration” has in this case, this is a useful indicator.
  - f) What are the trends in co-authorship amongst South African authors (predominantly within the HE sector, but we have limited information on the science council sector)?
  - g) What are the trends in co-authorship between SA authors and overseas authors? As far as the latter is concerned, we are only able to indicate that the overseas author is a foreign, non-SA author. We cannot in most cases identify the country or institution. Both these analyses can be done by scientific field and by year. We will investigate inter-institutional collaboration but the data might only make analysis between the top 10 -12 universities possible.
7. Most of the analyses outlined thus far (publication by ISI versus non-ISI; local versus overseas; collaboration patterns, top authors, scientific field and so on) were further broken down by the gender, race and age (interval) of the authors. In all three of these cases the analyses were based on a subset of SAK (varying between 40 – 50% of all authors) since no complete demographic information were available.

## 4.2 Books as research publications (ASSAf)

ASSAf requested CREST to submit a proposal for a study that would address a number of issues related to the current DoE policy on the accreditation of books/book chapters as part of its research outputs funding. The following specific issues were covered in the study:

1. How closely do chapters in books meet comparable quality control criteria to those exercised by the average journal in the ISI lists? In particular, how does peer review as typically carried out in the case of books and other quality control measures applied by publishers and book editors differ from the peer review methodology generally used by journal editors (originality; reproducibility of methods; independent, same-area peer review; editorial discretion, etc)? What methodologies and quality criteria could be developed that would be appropriate in the context of different form of scholarly book publication?
2. How much “re-publication” or “pre-publication” of substantive journal article content occurs in book chapters? To what extent could such practices be regarded as legitimate in certain disciplines or situations or generally?
3. How well do books achieve the defined purposes of research outputs in terms of impact analysis e.g. citation analysis; book reviews; sales and re-printings; any other measures? What do new technologies offer in terms of methodologies for evaluating the scholarly impact of books (for example, Google Scholar)?
4. How much should book chapters be “weighted” in terms of the DoE policy framework (Journal article = 1.0)? How do book chapters compare with journal articles in terms of level of scholarship, impact, and usefulness to other scholars?
5. How are the “target audiences” of scholarly books to be identified, as DoE policy is that the target of accredited book chapters should be peers and “other knowledge producers”? How



valid and appropriate is this criterion when it comes to books, particularly in relation to those disciplines in which high quality scholarly work can also be accessible to informed practitioners/educators/general readers?

6. How many book chapters are really not “original, fully described additions to existing knowledge” but rather authoritative analyses, syntheses, and/or consolidations, in effect or potentially assisting others to map out new routes to new knowledge?
7. Does on-line publishing of books (already) enhance dissemination and access, and how does the print-book publishing route compare as a form of knowledge dissemination with open-access, digital distribution?
8. How do different disciplinary areas compare in their (volume) use of books as opposed to journals, as selected standard dissemination routes?
9. What are the time delays in book as opposed to journal publishing? What factors influence this, and what are the current trends?
10. What are the indications for the future role(s) of books as vehicles for the dissemination of scholarly knowledge? What can we learn from international policy documents and reports, to assist in setting effective evaluation criteria for scholarly books?

#### **4.3    *Electronic knowledge resources for university research and scholarship (2010, ASSAf)***

CREST was approached by the Scholarly Publishing Unit (SPU) at ASSAf to conduct an investigation into the electronic information needs of academic staff, postgraduate students and researchers within Research Councils in South Africa. The investigation is a strategic priority of the Minister of Science of Science and Technology, and the results will inform the Department of Science and Technology (DST) about the information needs of established and developing researchers, as well as providing the DST with a list of relevant databases which may be considered for special licensing support. Scenarios for the funding of a set of national or institutional licences for core e-journals need especially to be explored, as well as possible stakeholders in such an endeavour.

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## V. Knowledge production in higher education

### 5.1 The production and utilization of knowledge in higher education institutions in South Africa: a transformative agenda? (Carnegie Corporation of New York)

4The overarching aim of the project – commissioned in 2003 - was to analyze and assess to what extent South African universities and technikons were engaged in a transformative agenda in the production and utilization of scientific knowledge.

Strategic project objectives:

- Objective 1: To establish the extent to which the production of scientific knowledge at SA universities and technikons has changed over the past seven years? More specifically, to find out whether more women and black scholars are participating in research and, if so, is this true of all fields of research?
- Objective 2: To establish the extent to which the knowledge produced at SA universities and technikons is used, particularly in the interest of new national goals? This question is aimed at assessing the nature of linkages between universities and various other constituencies (government, business and industry) and to what extent the knowledge that is produced within the higher education sector find its way into applications, policy, technology and so on.



### 5.2 The post-doctoral system at Stellenbosch University (SU)

CREST was approached during April 2005 with the request to undertake an in-depth study into the system of post-doctoral fellows at Stellenbosch University. The study was commissioned by the Division for Research Development and the office of the Vice-Rector: Research.



The Terms of Reference for the study on the post-doctoral system at SU informed the research design and methodology. A research design was drafted that would reach the required outputs of the project within the time frame. The project involved three distinct phases:

- Situation analysis
- Data management
- Questionnaire survey of post-docs (Current and previous)

1. The situation analysis was aimed at establishing the following:

- A systematic review of current trends and issues in the international literature on post-doctoral studies.
- A review of studies conducted on post-doctoral research at South African universities
- A review of existing policies and procedures on post-doctoral research at Stellenbosch University
- Continuing discussions with key stakeholders (incl. the post-doctoral society) at SU on the expected outcomes of the study.

2. Concurrent with the situation analysis, CREST engaged in data management activities that comprised of two further activities:

- Verification and expansion of the current MS Access database of post-docs at SU

- ◀ Gathering of basic biographical and contact information on previous post-docs (1999-2004) at SU
- 3. The third phase of the project consisted of a survey of both current and previous post-docs. This phase involved the following:
  - ◀ Design and development of a structured questionnaire targeting post-doctoral fellows
  - ◀ Piloting of the draft versions of the questionnaire amongst different stakeholders
  - ◀ Field research – distributing questionnaires to post-docs on campus and mailing to previous post-docs
  - ◀ Capturing and verification of completed questionnaires
  - ◀ Statistical analysis and sharing preliminary high level results with the Division for Research Development

In addition to the research component, the Terms of Reference also required that CREST would make recommendations about the future management of the post-doc system at Stellenbosch University.

### **5.3 The South African PhD and the Knowledge Economy: The state of the art (ASSAf)**

The ASSAf panel on the South African PhD requested CREST to conduct five studies as part of the overall project on the PhD in South Africa in 2008. These five studies were:

- ◀ Study 1: Destination studies of PhD students across fields and institutions
  - ◀ Study 2: Refining existing CREST data to address key panel questions in regard to efficient, productivity, trends, field performance, comparative performance, supervisory and institutional capacity
  - ◀ Study 4: Survey employers of PhDs across sectors
  - ◀ Study 6: Establish through attrition studies the reasons for students dropping out of doctoral programs
  - ◀ Study 8: Identifying the structural, legal, policy and organizational blockages in postgraduate education and training that might impeded the escalation in the number of PhDs in South Africa
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## Publication output

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- Mouton, J. (1995). *The state of methodology in South Africa. The analysis of research in the human sciences in South Africa*. Pretoria: HSRC.

## Papers and presentations @ conferences, seminars and workshops (International)

### 2010

- Boshoff, N. (2010). Use of scientific research findings and sources of practice knowledge of South African winemakers. *Second International Conference on Science in Society*, Madrid, Spain (11-13 November 2010).
- Boshoff, N. & Prozesky, H.E. (2010). Bibliometrics as a tool for measuring gender-specific research performance: An example from South African invasion ecology. *Second International Conference on Science in Society*, Madrid, Spain (11-13 November 2010).

### 2009

- Mouton, J. (2009). Policies and instruments to revitalize and strengthen research at African universities. *UNESCO Africa Symposium: Designing and Sustaining Systems of Higher Education, Research and Innovation for African Development*, Paris, France (4 July 2009).
- Mouton, J. (2009). Social sciences research in sub-Sahara Africa. *World Social Science Forum*, Bergen, Norway (10 – 12 May 2009).
- Waast, R. & Mouton, J. (2009). Mapping and analyzing research systems: How to 'breathe dynamics' into a template. *UNESCO International Experts' Workshop on "Research in diverse social contexts: Tensions, dynamics and challenges"*, Paris, France (19 – 21 March 2009).
- Mouton, J. & Waast, R. (2009). Reviewing national research systems: Notes on the country mapping template. *UNESCO World Conference on Higher Education*, Paris, France (8 July 2009).

### 2008

- Boshoff, N. (2008) Intra-regional and international research collaboration of Central African countries. *Joint 4S-EASST Conference*, Rotterdam, the Netherlands (20-23 August 2008).

### 2006

- Mouton, J. (2006). Formative evaluation. Presentation to the *Evaluation Council of the Carnegie Corporation of New York*, New York, USA (31 January 2006).
- Mouton, J. & Teng-Zeng, F.K. (2006). National Research and Innovation Systems within the context of Socioeconomic Development and Transformation in Africa. *Africa Prime Workshop*. Lund, Sweden (23 January 2006).
- Teng-Zeng, F.K. (2006). Science and Technology Indicators in Africa: Historical Development and Challenges. *International Conference on Science, Technology and Innovation Indicators: History and New Perspectives*, Lugano (15-17 November 2006).

### 2004

- Mouton, J. (2004). Modes of dissemination and effective research utilisation: Findings from a South African survey. *EASST Conference*, Paris, France (28 August 2004).



- Mouton, J. (2004). Measuring the impact of research: Lessons from programme evaluation? CSICC Colloquium on the Impact of science on society. *University of Montreal*, Montreal, Canada (17 June 2004).
- Mouton, J. (2004). Science for transformation: Research agenda's and priorities in the South African science system. *Georgia Institute of Technology*, Georgia, USA (14 June 2004).
- Boshoff, N. (2004). Patents and knowledge production, dissemination and utilisation: A case study of research projects in South Africa. Paper presented at the *Joint 4S-EASST Conference*, Paris, France (25 - 28 August 2004).
- Teng-Zeng, F.K. (2004). Science and technology indicators in Africa: A review of the evidence and emerging policy trends. Paper presented at the *Joint 4S-EASST Conference*, Paris, France (25 - 28 August 2004).

## 2000

- Boshoff, N. (2000). South African science in transition. The view from below: A survey of research establishments. Presentation given at the *Institut de recherche pour le développement (IRD)*, Paris, France.
- Mouton, J. (2000). Science in transition: Interim Report South Africa. Presentation given at the *Institut de recherche pour le développement (IRD)*, Paris, France.

## 1998

- Mouton, J. (1998). Patterns of research collaboration in academic science in South Africa. Presentation given at the *European Association for the Study of Science and Technology*, Lisbon, EASST, Lisbon, Portugal (29 September – 3 October 1998).
- Mouton, J. (1998). Between adversaries and allies: The notion of strategic science in post-apartheid South Africa. Presentation given at *Seminar: Science and Society in South Africa*, University of Sussex, UK (14 and 15 September 1998).

## 1996

- Mouton, J. (1996) Discussant in session: Meta-scientific discourses. *Joint Conference of the International Social Studies Association and the European Association for Science and Technology*. Bielefeld, Germany (October 1996).

## 1995

- Mouton, J. (1995) The institutionalisation of social research in South Africa: The interdisciplinary challenge. Seminar on: Centres for Interdisciplinary research - A model for institutional innovation in science? *University Bielefeld*, Bielefeld, Germany (January 1995)
- Mouton, J. (1995) Values and tolerance in South Africa. *UNESCO Symposium on Tolerance*, University of Magdeburg, Germany (October 1995).



## Papers and presentations @ conferences, seminars and workshops (other)

### 2010

- Mouton, J. (2010). Doctoral production in SA: Key facts and programmatic consequences. *HESA Research and Innovation Conference*, Pretoria (12 March 2010).
- Mouton, J. (2010). Expansion of the SA journal list: Models, issues and recommendations. *DHET Workshop*, Stellenbosch (18 August 2010).
- Mouton, J. (2010). Knowledge production at SA universities Issues of size, shape and stratification. *CHET Seminar*, Franschhoek.

### 2009

- Mouton, J. (2009). Against method-mania: The logics of research. Keynote address at *UJ Winter School on Research Methodology*, Johannesburg.
- Mouton, J. (2009). Die kweekskool deur die oë van die ander. Seminar by *Teologiese Kweekskool*, Stellenbosch Universiteit.
- Mouton, J. (2009). Doctoral output and the SA knowledgebase. *NRF Seminar on the PhD in South Africa*.
- Mouton, J. (2009). Epistemologies of the social sciences. Seminar at *UJ Winter School on Research Methodology*, Johannesburg.
- Mouton, J. (2009). Evaluating educational interventions. *International Conference on Cognitive Education*. Cape Town.
- Mouton, J. (2009). NWU Research Profile. *Seminar on Research* at NWU, Potchefstroom.
- Mouton, J. (2009). R&D Indicators and the purposes they serve. *National Department of Agriculture Workshop*, DST, Pretoria.
- Mouton, J. (2009). Reviewing national research systems: A new mapping template. *NACI Indicators Workshop*, STIAS.
- Mouton, J. (2009). Some more PhD statistics. *Seminar at CHE*, Pretoria.
- Mouton, J. (2009). The state of public science in SADC countries. *SARUA Conference on SADC Countries*, Johannesburg.
- Mouton, J. (2009). UCT Research Profile. *Seminar on Research* at UCT, Cape Town.
- Mouton, J. (2009). Understanding contemporary philosophy of (social) science. Seminar at *Faculty of Education*, NWU, Potchefstroom.
- Mouton, J. (2009). What we know about the South African PhD and what this means for scaling-up production. *ASSAF Seminar*, Pretoria.

### 2008

- Mouton, J. (2008). R&D Evaluation: Concepts and issues. *National Research Foundation*.
- Mouton, J. (2008). The humanities and social sciences in South Africa today. *SU Faculty of Arts, Strategic Planning Seminar*.
- Mouton, J. (2008). The social sciences in 50 years: Conjectures and refutations. *UCT Psychology Department Seminar*.

- Mouton, J. (2008). The state of the humanities and social sciences in South Africa today: Statistical and bibliometric evidence. *ASSAf Project on Humanities*, DST, Pretoria.
- Mouton, J. (2008). The state of research and PG studies in South Africa today: Fact and challenges. *Monash University*.
- Mouton, J. (2008). The strengths of South African science. *DVC's of Research Seminar*, STIAS, Stellenbosch.
- Mouton, J. (2008). Understanding social sciences research: Concepts, principles and good practice. *US Business School*

## 2007

- Mouton, J. & Boshoff, N. (2007). Human capital and the South African knowledgebase. Presentation given at *NACI* (1 March 2007).
- Mouton, J. (2007). Challenges facing the humanities and social sciences in South Africa today. Presentation at the *University of Pretoria Faculty of Arts Research Day* (16 August 2007).
- Mouton, J. (2007). Managing supervision for quality. Presentation given at a *Council on Higher Education Seminar* (16 November 2007).
- Mouton, J. (2007). Postgraduate studies in South Africa: Myths, misconceptions and challenges. Presentation given at a *Conference on PG supervision* (24 April 2007).
- Mouton, J. (2007). Research output in the Faculty of Humanities. Presentation give at the *University of Cape Town* (3 May 2007).
- Mouton, J. (2007). Theology journals in South Africa. Seminar presentation at *Stellenbosch University* (14 March 2007).

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- Mouton, J. Tijssen, R.J.W. & Boshoff, N. (2006). A comprehensive analysis of South African research journals. Presentation at the *SARIMA Annual Conference* (11 May 2006).
- Mouton, J. Tijssen, R.J.W. & Boshoff, N. (2006). A comprehensive analysis of South African research journals. Presentation at the *RDF Workshop* in Stellenbosch (23 March 2006).
- Mouton, J. (2006). Introduction to Programme Evaluation. Seminar presentation at *Wits Business School* (21 February 2006).
- Mouton, J. (2006). UCT's research profile. Presentation to the *UCT Research Committee* (27 March 2006).
- Mouton, J. (2006). Understanding social sciences research: Concepts, principles and good practice. Presentation given at the *Africa Institute of South Africa Workshop*. Pretoria.

## 2005

- Boshoff, N. (2005). Lactic acid bacteria and winemaking: The fermentation of university-produced knowledge into practice. Paper presented at the *Annual Conference of the South African Sociological Association*, University of Limpopo, Polokwane (26 – 29 June 2005).
- Boshoff, N. (2005). Reflections on the study of research collaboration. Presentation given at *CREST M&D Colloquium*, Protea Hotel, Stellenbosch (14 March 2005).

- Boshoff, N. (2005). Reflections on the study of research collaboration, with special reference to university-industry relationships. Presentation given at a *workshop on university, business and industry partnerships*, Central University of Technology, Bloemfontein (24 May 2005).
- Mouton, J. & Boshoff, N. (2005). Studie na die handelsmerk van die US. Presentation to the *Stellenbosch University Management Team*.
- Mouton, J. (2005). The homogenization of research demand: Research agenda's and priorities in the South African science system. Presentation given at a *CHET workshop*. Cape Town (3 March 2005).
- Mouton, J. (2005). Knowledge production for the South African society. Paper presented at the *Annual Conference of the South African Sociological Association*, University of Limpopo, Polokwane (26 – 29 June 2005).
- Mouton, J. (2005). Navorsing/Research @ Stellenbosch. Presentation to the *Stellenbosch University Research Committee* (4 April 2005).
- Mouton, J. (2005). Social aspects/shaping of technology: Some preliminary reflections. Presentation given at *NACI Seminar on Social Innovation*. Pretoria (25 October 2005).
- Teng-Zeng, F.K. (2005). Research Infrastructure and Innovation Systems in Africa: Enhancing Higher Education Sector Research. Paper presented at the *3rd Global Network for the Economics of Learning, Innovation and Competence-building system (Globelics) Africa Conference*. Pretoria (31 October – 4 November 2005)

## 2004

- Mouton, J. (2004). Challenges facing M&E in South Africa today. Presentation at the *Nelson Mandela Foundation Roundtable on M&E*.
- Mouton, J. (2004). Interdisiplinêre Navorsing: Feite, sosiologiese diskoerse en wetenskapbeleid. Presentation at the *Faculty of Arts and Social Sciences Strategic Planning Workshop*.
- Mouton, J. (2004). Managing public R&D in a state of transition. Presentation at the *Technikon Witwatersrand Research Day*.
- Mouton, J. (2004). Quality in research: Conceptual and methodological issues. Presentation at the *National Research Foundation Workshop*.
- Mouton, J. (2004). The field of STS. Presentation at the *National Research Foundation Workshop on Science and Technology Studies*.

## 2003

- Mouton, J. & Galant, J. (2003). A Guide to Good Practice in Research Quality Assurance. Presentation at the *RDF Workshop*.
- Mouton, J. (2003). The changing phase of research and postgraduate supervision in South Africa. Presentation at the *University of Pretoria: Faculty of Arts and Humanities: Research Day*.
- Mouton, J. (2003). The HE research landscape in South Africa: Some facts and challenges. Presentation at the *Education Association of South Africa Annual Conference*.
- Mouton, J. (2003). Method, morality and modes of knowledge: Ethical decision-making in an era of increasing complexity. Presentation at the *Pan African Anthropological Association*. University of Port Elizabeth.

- Mouton, J. (2003). SANPAD: A review of research themes and priorities. Presentation at the *SANPAD Conference*: Durban.
- Mouton, J. (2003). Transformative inertia, goal drift and blurred boundaries: HE research within the NSI. Presentation at the *SARIMA Annual Conference*: Johannesburg.
- Mouton, J. (2003). The utilisation of research: Main findings from the NACI survey. Presentation at the *NACI Conference on Knowledge Utilization*, Johannesburg.

## 2002

- Mouton, J. (2002). A framework for university-industry knowledge collaboration. Presentation at the *Human Sciences Research Council*, Pretoria.
- Mouton, J. (2002). Challenges facing South African R&D. Presentation at the *University of the Free State*, University Research Committee.
- Mouton, J. (2002). Challenges facing South African R&D. Presentation at the *Stellenbosch University*, Campus Research Forum.
- Mouton, J. (2002). Measuring research quality. Presentation at the *University of the Witwatersrand*, Research Forum.
- Mouton, J. (2002). Reflexive research praxis. Presentation at the *Durban Institute of Technology*: Research Day.
- Mouton, J. (2002). South African R&D: Fabricating the future. Presentation at the founding meeting of *SARIMA*, Hout Bay.
- Mouton, J. (2002). South African S&T indicators: A matter of credibility? Presentation at a meeting of *NACI*, Pretoria.

## 2001

- Mouton, J. & Boshoff, N. (2001). Eastern Cape regional collaboration study: A study on research capacity and research collaboration. Presentation at the *ECHEA Conference* at Port Elizabeth Technikon. CHET funded project.
- Mouton, J. (2001). A critique of whole school evaluation. Presentation at the *Western Cape Education Department*.
- Mouton, J. (2001). Current trends in research management. Workshop at the *University of Natal*.
- Mouton, J. (2001). Issues in project management. *Vaal Triangle Technikon*.
- Mouton, J. (2001). Issues in research management and research design. *Border Technikon*.
- Mouton, J. (2001). Post-apartheid science: South African science in transition. *Science in Africa Symposium*. Erinvale Estate, Somerset West.
- Mouton, J. (2001). Trends in R&D in higher education in South Africa. Presentation at the *SRHE Conference on Globalisation and its impact on Higher Education*. Cape Town.
- Mouton, J. (2001). Using large data sets in the social sciences. Presentation at the *University of Cape Town Spenser workshop*.

## 2000

- Mouton, J. (2000). A methodological manifesto. Keynote address at the *QRE Conference*, Rand Afrikaans University.
- Mouton, J. (2000). Challenges facing the South African Data Archive within the new NRF. Presentation given at the *National Research Foundation Workshop*.
- Mouton, J. (2000). Issues in medical research ethics. Seminar given at the *Medical Faculty, Stellenbosch University*.
- Mouton, J. (2000). Trends in R&D output in South Africa: A bibliometric analysis. Presentation given at the workshop on *Benchmarking R&D in Higher Education in South Africa*. Stellenbosch University.
- Mouton, J. (2000). Myths and misconceptions in/of science. Paper given at *Research Day, Natal Technikon*.

## 1999

- Mouton, J. (1999). International and national trends in public R&D. Presentation given at a workshop at the *National Research Foundation*, Pretoria.

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- Mouton, J. (1998). Evaluating the TSP. Methodological Reflections. Paper presented at the *United States/South Africa Forum on Systemic Educational Reform*, FRD, Pretoria.
- Mouton, J. (1998). Methodological issues in educational evaluation research. Presentation given at the *World Conference on Comparative Education programme*. Comparative Education. University of Cape Town.

## 1996

- Mouton, J. (1996). Shifts in modes of knowledge production: The Gibbons thesis. Presentation given at the *Seminar on "New modes of knowledge production"* organised by CENIS and the University of Cape Town, The Strand.

## 1995

- Mouton, J. (1995). Comparative research and data-archiving. Presentation given at the *Human Sciences Research Council workshop*. University of the Western Cape.
- Mouton, J. (1995). The end of social theory? Presentation given at the *Institute for Theological Research*, UNISA.
- Mouton, J. (1995). The epistemic imperative in social research. Presentation given at the *Human Sciences Research Association Conference*, Pretoria.
- Mouton, J. (1995). Methodological aspects of project management. Presentation given at the *Workshop on project management*, Tutu Trust, Cape Town.