A commentary on the intellectual health of the nation

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THE RECORD OF HIGH-QUALITY RESEARCH AT South African universities is not as impressive as we may have thought, according to some international rankings. Whatever we might think of these assessments, we have to take them seriously. We suggest ways in which our universities and other institutions of higher learning might raise the level of their game.

At the end of the apartheid era in 1994, South Africa was a nation with one of the highest levels of inequality in the world. During the first decade of democracy, our country's economy grew by an average of 3% per annum but the impact of this modest growth on narrowing the gap and reducing poverty and disease is uncertain. In his state of the nation address on 3 February 2006, President Thabo Mbeki revealed the Accelerated and Shared Growth Initiative of South Africa (ASGISA), a policy intended to contribute significantly to the government's plans to reduce poverty and unemployment. Further details were provided a few days later in a media-briefing by the deputy president, Phumzile Mlambo-Ngcuka, in which she emphasized the crucial importance of partnerships:

> Our vision is a vigorous and inclusive economy where products and services are diverse, more value is added to these products and services, costs of production and distribution are reduced, labour is readily absorbed into sustainable employment, and new businesses are encouraged to proliferate and expand.[1]

If the fruits of increased growth are to be shared in a way that reduces poverty, unemployment and disease, then the severe inequalities that still plague our country will have to be addressed. These 'binding constraints', which are identified in the ASGISA documents, include: the shortage of suitably skilled labour, limited new investment opportunities, and the regulatory burden on small businesses. Since the deputy president has responsibility for implementing the policy, her success will be largely determined by the contributions of various governmental and non-governmental partners. In this context, it is our contention that the higher education sector is one of the most crucial partnerships, if not *the* most crucial partnership, and that government leaders should be strengthening and counting on university scholars for augmenting their leadership.

Raghunath Mashelkar, director general of the Council for Scientific and Industrial Research in India, a country with huge inequalities and one of the world's fastest growing economies, has been explicit about his government's stance on the role of higher education:

> Future positioning in the global economy will depend entirely on a country's ability to excel in tertiary education.[2]

While there is a lack of compelling global data to document a possible cause–effect relationship between the quality of higher education and the economic and social conditions in a country, there is clearly a strong association.[3] Given this state of affairs, there is now an urgent necessity to ask questions about the intellectual health of our nation.

For over 20 years in South Africa, we have had in place an elaborate and thorough international peer-review process, administered by the National Research Foundation (NRF) for rating *individuals* according to the quality and impact of their scholarly contributions.[4] Funding allocations for research were strongly related – but now far less so – to individual research ratings rather than on the actual research topics themselves. This South African focus on the research credentials of individuals is most unusual, possibly unique. In the United Kingdom, the focus of their Research Assessment Exercise is on the credentials of a limited number of the most prominent researchers at the *departmental* level within institutions.[5] More typically, as in the United States, support for research is founded primarily on assessments of research proposals.

The benchmarks for the NRF ratings are based on international standards, and provide a yardstick for individuals, for South African universities and other institutions of higher learning, to compare one another, and to gauge the country's wider research standing. However, perhaps we have been misled by these ratings to look inward, to become complacent, and to overestimate the international impact of South African scholarship and thus the state of the nation's intellectual health. A series of recent studies, that compare the international status of *institutions,* suggest that this might indeed be the case.

The Institute of Higher Education at the Shanghai Jiao Tong University (SJTU) in China has for the past four years published its rankings of the top 500 universities in the world, having carefully studied the output of more than 2000 institutions.[6] Their evaluations are remarkably detailed and meticulous, tracing university records back to the early 1900s, and they used a multi-criteria analysis with heavy emphasis on scholarly output. These criteria include: quality of education, quality of academic staff, research output and the size of the institution (Table 1). The measures, which are all objective, include publications in the prestigious journals *Nature* and *Science* as well as the citations of research articles. Harvard University in the U.S.A. ranks first, Cambridge

Table 1. The criteria used by the Institute of Higher Education at the Shanghai Jiao Tong University in China to rank the top 500 universities in the world.[6]

Criteria	Indicator	Code	Weight (%)
Quality of education	Alumni of an institution winning Nobel prizes and Fields medals	Alumni	10
Quality of faculty	Staff of an institution winning Nobel prizes and Fields medals	Award	20
	Highly cited researchers in 21 broad academic categories	HiCi	20
Research output	Articles published in *Nature* and *Science*	N&S	20
	Citation Index articles in science, arts & humanities	SCI	20
Size of institution	Academic performance with respect to size of institution	Size	10
			100

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Table 2. The top 10 research universities in the world according to the Institute of Higher Education at the Shanghai Jiao Tong University.[6*]

Rank	Institution	Alumni 10%	Award 20%	HiCi 20%	N&S 20%	SCI 20%	Size 10%	Total 100%
1	Harvard	100	100	100	100	100	74	100
2	Cambridge	96	92	54	60	67	67	73
3	Stanford	40	71	88	70	71	65	73
4	UC Berkeley	71	75	71	72	72	53	72
5	M I T	73	81	67	66	62	54	70
6	Caltech	57	69	59	65	50	100	66
7	Columbia	78	59	56	54	70	46	62
8	Princeton	61	75	60	44	47	58	59
9	Chicago	73	80	50	44	54	42	59
10	Oxford	62	58	48	54	66	46	58

*The six criteria and their weighting are summarized in Table 1.

University in the U.K. is second, while the remaining eight places in the top 10 are filled by seven American universities and one British institution (Table 2). There are only four South African universities ranked among the top five hundred. These include the universities of Cape Town (ranked between 200 and 300), Witwatersrand (300 to 400), plus KwaZulu-Natal and Pretoria (both ranked between 400 and 500). The SJTU scores have been summarized in Table 3, where we have selected some of the universities from Australia and New Zealand for comparative purposes.

In October 2005, the *Times Higher Education Supplement* (*THES*) in the U.K. published a list of the top 200 institutions in its 'World University Rankings'.[7] No African universities featured on their list. The *THES* ranking placed very little emphasis on research output *per se* (the weighting is just 20%), while there was a large bias introduced by a highly subjective criterion called 'peer review'. Of the 2375 'research-active' academics surveyed – by a consultancy firm specializing in the ranking of international MBA programmes – only 31 of these were from Africa (personal communication between C.L.V. and the author of the article). Despite these apparent methodological flaws, the top ten in the *THES* list included eight of the same institutions ranked in the SJTU rankings (Table 2). Their comments about African universities are somewhat contradictory, however. The statement that 'No African university comes even close to getting into our top 200' is followed up, on the next page, with the conclusion that 'Taiwan, India, South Korea, South Africa and Mexico contain many more universities on the brink of entering the world top 200 than does China'.[7]

Another ranking of the world's universities was published in 2004 by the Zentrum für Wissenschafts und Technologiestudien (Centre for Science and Technology Studies), an agency of the Swiss federal government.[8] Their 'Champion's League' table ranked 683 institutions, evaluating journal publications for the period 1998–2002, and was based on four criteria: total publications (as an indicator of size); the number of publications in certain subfields (an indicator of influence); publications in qualified subfields as a percentage of all publications in those fields (an indicator of concentration); and citations per research publication (an indicator of impact). The data were drawn from three citation indices and weighted as follows: science (84%); social sciences (11%); and arts and humanities (5%). Interestingly, and curiously, top of their table was the University of London, in which they seemed to conflate University College London, Imperial College and the London School of Economics as a single institution. South African universities featured poorly on the 'Champion's League' table: Cape Town (342), Witwatersrand (349), Natal (474), MEDUNSA (611), and the Free State (629). No other African universities were ranked.

In January 2007, Webometrics published its rankings of the top 3000 world universities,[9] which is based on 'the number of online publications and link citations for each institute, as reflected by the top internet search engines. [The] main focus is [more] on the universities' commitment to web publishing and Open Access initiatives than to quality ranking.'[10] Not surprisingly, universities in the U.S.A. occupy the top slots. Webometrics considered nearly 11 000 universities, 323 of which are in Africa and only one African university (Cape Town) is listed in the top 500.

There is no doubt that all of these ranking systems have their idiosyncracies, biases, special points of focus and methodological flaws. The world's top-ranked universities in the mainstream of academia – in North America, Europe and Asia – can view these rankings with a certain degree of indulgence and detached interest. In contrast, South African universities, until recently politically isolated and geographically distant from the academic mainstream, and which are relatively inbred, cannot afford this luxury. These rankings, for better or for worse, represent the international view of our universities and we have no choice but to take them seriously.

However we look at the matter, the record of high-quality, high-impact research at South African universities is not as impressive as we may have thought through our own introspective analysis of the NRF ratings. Is it possible that complacency and perhaps a measure of self-delusion have led to a waning of the international status of our institutions of higher learning? Is it unrealistic to believe that our universities can compete on the world's stage? Given the socio-political trends in the country – HIV/AIDS, rampant crime, and severe shortcomings in primary and secondary education – should we even be thinking about our global ranking? There is a tension between implementation of policies on redress and employment equity, on the one hand, and the reality of a pool of researchers that, although it is changing in composition,

Table 3. Universities ranked between 200 and 500 by the Institute of Higher Education at the Shanghai Jiao Tong University,[6] comparing five African institutions with five from Australia and New Zealand.*

Rank	Institution	Alumni 10%	Award 20%	HiCi 20%	N&S 20%	SCI 20%	Size 10%	Total 100%
200–300	Adelaide	19	0	11	11	36	25	16.0
200–300	Auckland	17	0	11	14	36	18	15.7
200–300	Cape Town	24	0	11	13	30	18	14.9
300–400	Otago	0	0	11	11	34	25	13.6
300–400	Witwatersrand	24	0	0	9	26	15	10.8
300–400	Tasmania	0	0	8	7	24	21	9.8
400–500	KwaZulu-Natal	0	0	8	10	23	12	9.3
400–500	Canterbury	0	0	8	5	24	17	9.1
400–500	Pretoria	0	0	0	9	27	13	8.5
400–500	Cairo	25	0	0	0	23	13	8.3

*The six criteria and their weighting are summarized in Table 1. The scores in the six categories have been rounded to the nearest integer.

remains predominantly white and male. In our efforts to enhance the credentials of South African universities internationally, should our ambitions be tempered by the realities of our geographical location, and the country's pressing need for houses, and for the urgent mitigation of poverty and disease? Realistically, we will never be competitive with universities such as Harvard (which has an endowment of $25.9 billion) or with Cambridge (with an endowment of $2.7 billion), but we can and should be doing much better with what we have.

A sporting analogy

The sporting analogy of not trying to box out of our weight class springs readily to mind, but consider the example set by Australian sportsmen and women, which is astonishing to say the least. In 1976 the Australian team limped home from the Montreal Olympics with just a single silver medal and four bronze medals. Yet in 2004, at the Games in Athens, they claimed 49 medals: 17 gold, 16 silver and 16 bronze. Only three superpowers – the U.S.A., China and Russia – won more medals. In less than three decades their athletes had vaulted over many other countries, and their success was not just confined to the Olympic sports. How did they do it? The answer, in short, is determination and commitment, which was and is based on scholarship and sound scientific research.[11]

In 1981 the Australian Institute of Sport (AIS) was established in the capital Canberra, near to the seat of government. The success of Australian sport in general and the AIS in particular has been based on the foundation of five key pillars: adequate financial resources (now about one billion rand per annum); enthusiastic government support; scholarship programmes for talented student athletes; significant expansion of physical infrastructure; and, most importantly, widespread development of intellectual capital. The fact that South Africa's three major sporting codes – cricket, rugby and soccer – are currently struggling to make an impact with World Cup tournaments looming in 2007 and 2010, also suggests there is much to be gained by drawing from the lessons of these sporting analogies and particularly the painful lessons we have learned and are repeatedly receiving from the Australians.

When assessing South Africa's achievements in scholarship and research, we should obviously judge ourselves in comparison with institutions that are similarly resourced and have similar opportunities. Table 3 seems to suggest that we are performing as well as our antipodean counterparts, and this is certainly true if we compare ourselves with New Zealand. However, the best Australian universities are considerably better rated than those in South Africa: the Australian National University and Melbourne are in the top 100 in the world, whereas Sydney and Queensland are ranked between 100 and 150.[6] If we compare the three countries on the basis of key economic indicators,[3,12–14] then substantial differences between the countries emerge (Table 4).

Table 4. Key economic indicators for Australia, Brazil, India, New Zealand and South Africa.[3,12–14]

Parameters	Australia	Brazil	India	New Zealand	South Africa
Population (million)	20.4	184.2	1087	4.1	42.6
Gross domestic product (GDP) (US$ billion)	672	1558	3076	104	548
GDP/capita (US$)*	32 940	8 460	2 830	25 370	12 860
Research & development (R&D) (US$ billion)*	11.4	14.5	24.0	1.2	4.0
R&D/GDP as a percentage	1.69 %	0.93 %	0.78 %	1.16 %	0.73 %
Full-time equivalent R&D personnel per 1000 population	5.25	0.64	0.33	5.12	0.49

*GDP is expressed on the basis of Purchasing Power Parity, while R&D includes both governmental and industrial expenditure.

The Australians are clearly well ahead of South Africa and ahead of New Zealand on each of these important parameters. Their gross domestic product (GDP) per capita is almost three times that of South Africa and 30% higher than New Zealand's. When seen in the context of total research and development (R&D) expenditure as a percentage of GDP, the Australians are again outspending us and New Zealand by significant margins. Among developing nations, South Africa is comparable to India but trails Brazil in both the R&D to GDP ratio and the number of researchers per 1000 population. This latter statistic obviously has important implications for ASGISA. Since much of a country's R&D expenditure contributes to the competitiveness of a nation's institutions of higher education, it appears that the intellectual health of Australia will continue on a strong upward trajectory.

In contrast, the decline in the research output by South African academics in the past decade has been well documented.[15–17] One component of the subsidy formula through which our universities are funded by the Department of Education to conduct research is based on journal outputs. On the face of it, this would appear to be a reasonable basis for creating an incentive to reward research productivity. In reality, however, this has become the most powerful perverse incentive, mitigating strongly against long-term, high-quality research and encouraging South African researchers to publish as many short, inconsequential papers in the least demanding journals as possible (the 'least publishable unit'). A commitment to quality publications in outstanding, high-impact, but demanding international journals with high rejection rates is sacrificed in order to achieve short-term gains in subsidy earnings. Who could reasonably expect anything else? A ground-breaking paper from a South African author in *Cell,* for example, with an impact factor in 29.4, which attracts hundreds of citations – and earns international recognition for the authors, their institution and for South Africa – will earn the same subsidy (now estimated to be more than R80 000) as a short report of dubious validity and value in a fifth-rate journal. That journal may have a very low or non-existent impact factor (sometimes edited by the contributing authors themselves) and may not even be recognized by the Institute of Scientific Information (ISI). The Academy of Science of South Africa (ASSAf) has expressed its concern about the continued skewed emphasis on and support for lesser-known and parochial journals by the South African Department of Education and has recommended a more strategic approach to research publishing in this country.[18]

Relevant to these remarks, a recent critique of the current state of South African sport contends that we (South Africans) are too complacent and 'mentally lazy' to exert the effort required, and thus that we are willing to accept second best:

> Too many people, including administrators, coaches and sportsmen and women, (have) a very large comfort zone with excessive rewards that blunt an ambition which is too easily satisfied. To be the best in the world requires that we ascend to rather higher levels of ambition, intellectual curiosity, mental and physical preparation, and the capacity for persistently deferred gratification.[19]

Despite the diminished levels of scholarly

aspiration that no doubt exist among some of our academics, many scholars from South Africa are still internationally competitive and some are acknowledged as being at the forefront in their respective fields of research, making pivotal contributions. It is possible for relatively under-resourced universities in developing countries to conduct research that is world class.[20] For example, a team of scientists from the University of the Witwatersrand, led by Deborah Glencross, has developed an innovative technique to perform CD4 cell-count testing on HIV-positive patients undergoing antiretroviral drug therapy.[21] Not only is the method superior to the existing technologies, it is 80% cheaper and will lead to savings of more than R3 billion per annum when fully implemented, contributing directly to poverty reduction.[22] However, despite such documented successes, as a nation we generally seem to have lost the organizational ability or the will to capitalize more effectively on our talents and to exploit an abundance of scholarship to help chart the future development of our country.

In an address to delegates at a meeting of the South African Society for Biochemistry and Molecular Biology in January 2005, Chris Brink, rector of Stellenbosch University, described how the country had already benefited from one 'miracle', namely the peaceful political transition to full democracy in 1994. He observed that the nation was experiencing a second 'miracle', the transformation of the country's economy. While acknowledging that these were not really 'miracles' but were earned through intellectual effort, planning and hard work, he said he hoped for a third miracle, which he referred to as the 'scientific miracle'. He called, specifically, for an investment in the natural sciences – mathematics, physics, chemistry and biology – and urged a commitment to grow that investment. To this listing we would adamantly add the urgent need to develop the social sciences and humanities, which are fundamental to the intellectual health of our nation. We need to imbue young people with a sense of excitement about enquiry and the benefits of an inquisitive mind. When J.M. Coetzee of the University of Cape Town was awarded the Nobel Prize for Literature in 2003, he not only gave a boost to the humanities and all the country's aspiring novelists, but he earned valuable international recognition and kudos for his *alma mater* (cf. Tables 1 and 3) and for South Africans at large.

What's to be done?

Our universities and other institutions of higher learning must now raise the level of their game. What will be required to give the 'big push' to the research enterprise in our country? We submit five suggestions which, if properly implemented, should go a long way towards improving the intellectual health of our nation.

- First, we need to recognize that there will be no fundamental shift in the research climate and output unless there is a sustained and dramatic increase in research spending (cf. Table 4). These funds should be spent by both the government and private sectors. If, as our government has promised,[12] the R&D to GDP ratio were to be increased from 0.8% to 1.0% – a modest increase when seen in the context of developed economies – this would nevertheless release an extra R7.6 billion into the national research system. Such funds would go a long way towards solving the equipment backlog in our research institutions and improving the modest postgraduate scholarships awarded by the National Research Foundation and the Medical Research Council. Increasing R&D funding by itself will not be sufficient, however, which brings us to our next proposal.
- Second, the allocation of research spending should be directed solely towards individuals and institutions that have the ability to respond swiftly and resolutely to the challenge of lifting research to a new level. We acknowledge this might be controversial and will have the inevitable consequence that some institutions will be generously funded and others not at all. However, the principle of competition is one of the key reasons that America's system of higher education is the best in the world.[23] We cannot hope to achieve our research goals while pretending that we have 21 research universities in the country. Malegapuru Makgoba, vice-chancellor of the University of KwaZulu-Natal, has similarly argued that 'differentiation', which would favour the six to ten research-focused universities in the country, would strengthen South Africa's higher education system. Recent innovations from the Department of Science and Technology and the National Research Foundation, including the NRF Research Chairs, Centres of Excellence, and the Frontier Science programmes, should form the core of allocations in this competitive system.
- Third, an immediate consequence of implementing these first two proposals will unleash the potential to attract more young researchers to our universities. If we are to succeed, hundreds more young researchers must want to come to our universities and it must be made easier for them to do so. There is only a small window of opportunity remaining to 'pass the baton' to a new generation of top-rated researchers and our challenge, therefore, is to create an environment which encourages the brightest young minds in our country to pursue careers in academia. The ability to attract expatriate postgraduate students and post-doctoral fellows, and our recognition of the considerable benefits of an external peer-review system, will contribute significantly towards the global standing of our universities. By coming to study at South African universities, they 'vote with their feet' in acknowledging the excellence and international competitiveness of our institutions. Furthermore, they bring experience, a fresh perspective, and contribute in no small measure to increases in research productivity. The Department of Home Affairs, currently seen by many senior academics to be inefficient and obstructive, will have an important role to play in facilitating this initiative.
- Fourth, while recognizing the benefits of competition, there will also be opportunities for increased collaboration both within our country and with international partners. By sharing facilities and personnel, South African institutions working cooperatively and with role-model institutions from abroad will be able to compete successfully on the international stage and secure funding from international agencies such as the US National Institutes of Health, the Wellcome Trust in the U.K., and the European Union. Our international partnerships, facilitated by the peer-review system, will increase the regular exchange of students and academics, and bring the recognition that South African scholars are capable of producing work that is novel, meaningful and world class. In time, that recognition will contribute to our institutions moving up in the world rankings (Tables 1–3).
- Fifth, and finally, we must encourage a commitment to mentorship among all our senior academics so that we inspire a new generation of research scholars, promoting an ethos of enquiry, the belief that ideas matter, and the self-confidence to realize that, as a country,

we can and must compete on a world stage. Noel Annan, a doyen of the British academic establishment in the latter part of the last century, argued:

> The most precious gift that universities can offer is to live and work among books and laboratories. The most important lesson they can teach is how to use the intellect: a university is dead if the dons (professors) cannot in some way communicate to the students the struggle – and the disappointments at as well as the triumphs of that struggle – to produce out of the chaos of human experience some grain of order won by the intellect.[24]

Henry Rosovsky, dean at Harvard University, described how good professors, though trained to be critical of received opinion, know about the power of positive thinking:

> Research is an expression of faith in the possibility of progress, [a form of] optimism about the human condition. Persons who have faith in progress and therefore possess an intellectually optimistic disposition – i.e. teacher-scholars – are probably more interesting and better professors. They are less likely to present their subjects in excessively cynical or reactionary terms.[25]

A decade ago, the World Bank reduced its expenditure on higher education because this sector was seen as being regressive and inefficient. More recently, however, there has been a sea-change in thinking, and development economists now speak enthusiastically about the positive benefits of university-based research on a country's economy.[20] As our deputy president grapples with the challenges posed by ASGISA, and our finance minister confronts the imperative of expanding the economy by at least 6% per annum over the next decade, it is time for South African institutions of higher learning, and their scholars, to play a critical role in providing the intellectual leadership our nation requires if it is to succeed.

We are not on the ropes yet, but we should be under no illusions: in terms of our intellectual health and the priority given to scholarship in this country, we are seriously battered. We can either throw in the towel, give up the fight and regress, or we can exploit the resolve, for which the nation is known, to plan the recuperation of our intellectual health. We are not suggesting that our five recommendations will solve the problems of higher education reform in South Africa, but we must ensure that scholarship plays its role in the country's development and future prosperity, thus overcoming the huge human burdens of poverty and disease. If we are to win, we need to start now and to proceed with determination and urgency.

This essay has its origins in a workshop organized by the four authors at the University of Cape Town in December 2005. Participants included A-rated researchers and UCT Fellows, who came together to consider the university's response to the recently completed review by the Higher Education Qualifications Committee. We acknowledge the collective ideas and insights that our colleagues shared at the workshop.

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Note added in proof: The 2004/5 national survey on research and development reveals that the ratio of South Africa's gross expenditure on R&D to gross domestic product has risen to 0.87%, the highest yet recorded.