Rating the NRF's rating system

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THE LATEST REVIEW OF THE NATIONAL Research Foundation (NRF), chaired by Wieland Gevers, and released surreptitiously by the foundation in December 2005, reported widespread dissatisfaction with the NRF's rating system, and recommended that its use be reconsidered.[1] Perhaps the most important failing identified by the review panel is that only a small proportion of the approximately 15 315 scholars in South Africa's higher education sector are rated—in 2006, just below 11% (1 680). A further 73 rated individuals have retired or resigned their posts, making a total 1753 researchers with valid ratings. Of these, there are 877 rated researchers in the natural sciences (50%), 550 in the social sciences and humanities (31%), 180 in health sciences (10%), and 156 in engineering science (9%)(www.nrf.ac.za).

Johann Mouton, from Stellenbosch University's Centre for Research in Science and Technology, has kindly provided us with unpublished data on publications by South African researchers who published more than two articles in journals accredited for subsidy purposes by the Department of Education between 1990 and 2005. Of 25 519 authors, only 7545 (30%) are in the natural sciences and, by contrast, 12 259 (48%) are in the social sciences and humanities, 4338 (17%) are in health sciences, and only 1377 (5%) are in engineering.

These authors include postgraduate and postdoctoral students who are not eligible for rating, and, because the database spans 16 years, scholars who have now left the sector are also listed. Nevertheless, comparison of the two sets of figures suggests that the rating system is better entrenched among natural and engineering scientists, which is to be expected, as the rating of natural scientists was introduced in 1984, whereas rating in the humanities and social sciences commenced only in 2002. Many researchers who publish actively in the social sciences, the humanities and health sciences appear to have omitted to apply for rating, perhaps because they do not buy into the system, or have adequate alternative sources of funding for their research. [There are other possibilities too: (1) the application system is not user-friendly? (2) their research is often cheaper than that in the natural sciences? (3) the Department of Education-accredited journals in the social sciences and humanities may not all be of an appropriately high standard (that is, the problem could lie with the standards set by the DOE for journal accreditation for subsidy purposes)?]

Even early on, it became clear that the rating system was not applied consistently across disciplines. In 1992, the Foundation for Research Development (FRD) announced the names of South Africa's fifty A-rated scientists for the first time.[2] The three strongest disciplines were physics and chemistry (10 representatives each), and mathematical sciences (8 researchers). By contrast, there were six earth scientists, five engineers, four animal scientists, three molecular biologists and one each in health sciences, botany, archaeology, and astronomy. A study commissioned by the FRD (the precursor of the NRF) itself, to measure the strengths and weaknesses of South African science, found that its strengths lay in disciplines related to botany, zoology, astronomy, health and earth sciences. The fields in which it was weak included those in which it had most A-rated scientists.[3] It can be argued that this correlation is irrelevant, given that A-rated scientists form only a small proportion of researchers in any discipline. But if they genuinely have little effect on the quality of research performed in that discipline nationally, then funding them does not really support the NRF's *raison d'être*—the training of high-quality research manpower.

The progress of the rating system

The rating system was first adopted by the CSIR in 1984. The purpose of the innovation was, on a competitive basis, to extend financial support to research that fell outside the CSIR's cooperative scientific programmes, as before this time only very limited funds from its university grants division were available, for non-thematic research. So, in the main, it was initially welcomed by the scientific community. At first, there was a near-exponential link between a scientist's rating and the grant awarded to her/him. Grant applications were considered by an awards committee and grants were effectively conferred on the basis of a fairly loosely motivated request for money. A- and B-rated scientists were eligible for monies to fund staff who could assist their endeavours, whereas C-rated scientists were provided only partial support (their host institution being required to provide the balance).

The relationship between rating and funding became progressively more linear with time, and a formula was used in awarding grants. Initially, monies were awarded in a top-down manner (in terms of the ratings by applicants), as the programme was phased in over a number of years—the underlying philosophy was that the most important element contributing to good research is the quality of the researcher. Monies were awarded regardless of the quality of work proposed (there was no peer-review of project proposals). The great advantage of the system was that, apart from applying for rating every few years, researchers were relieved of the time-consuming procedures associated with writing grant applications: all they had to do, effectively, was to be rated every five years.

In 1990, the CSIR's research funding agency division became the FRD. In 1996, it introduced formal grant applications, which were assessed using a multi-criteria decision-making process. One of the criteria was the rating of the principal applicant, which contributed up to 37.5% of the total number of points allocated, while the other rated co-applicants in the research team contributed up to a further 12.5% towards the total. There was no written peer-review of the grant application: a panel of appropriate local experts met to pass judgment on the scientific excellence and feasibility of the work proposed.

In 1999, the NRF was formed, and it combined the agency functions of the FRD and those of the Centre for Science Development (which had previously dealt with grants for the social sciences and humanities). The new body abandoned previous systems and developed the one in place today, in which grant applications are submitted to written peer-review: reviews are assessed and grant awards are recommended by a panel of appropriate local experts. A scientist's rating currently makes no direct contribution to the assessment of a candidate's grant application to the NRF. A rating is needed, however, for the applicant to obtain a five-year grant—

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unrated applicants are confined to two-year grants, of which they can receive three before having to be rated. It is interesting to note that over 34% of grants in 2005 (the latest year for which data are available) were made to unrated principal grant holders (www.nrf.ac.za).

From 2008 onwards, the NRF is considering the resurrection of the system employed from 1996 to 2002, in a procedure similar to the one then in operation in which the NRF rating of applicants will represent up to 50% of all points allocated. Once again, no written peer-review of grant applications of rated researchers is envisaged: a panel of appropriate local experts will judge the scientific merit and feasibility of the work proposed.

All other things being equal in a grant application (such as the quality of proposal, and track record of a candidate in training graduate students), the use of this system to allocate funds for research means that a highly rated applicant will get more monies to support research than an applicant with a lower rating. If there is any relationship between the number and quality of outputs generated over the course of a grant and the money awarded to the grant holder—and if there is any link between a scientist's rating and his/her outputs—this system will effectively allow highly rated scientists to improve or maintain their high rating with relative ease. Those with low ratings will battle to maintain—let alone improve—their rating.

Rather like grades awarded by South Africa's Joint Matriculation Board, the evidence suggests that the standard required to attain a rating might have changed over time. In 1986, for example, 39% of applicants failed to qualify for any rating. This figure had fallen to 16% of applicants by 1997, and only 6% by 2003. An alternative explanation of this trend is that applications are now better-screened—both by the NRF and by the institutions to which the applicants are affiliated. Apparently, the NRF returns applications which they consider unlikely to qualify for rating, and institutions discourage applicants from applying until they are ready to do so successfully.

The problem with the rating system is that many researchers, particularly in the health sciences, social sciences, and humanities, have no faith in it. Despite the use of both foreign and local reviewers, decisions on ratings are made by 21 discipline-based committees comprising one's peers within the country, which are responsible for interpreting these reviews. And in South Africa, each of these committees represents a very small community, so the possibility for vested interests to prevail is high. In addition, 25% of reviewers used in natural and engineering sciences in the years 2003–2006 were South African; and for the social sciences and humanities this figure was even higher at 39% (www.nrf.ac.za). To quote the Gevers report: 'the problem of subjective judgments seeping into the rating process was also raised more generically, affecting the natural sciences along with other disciplines, as a function of the inevitable prejudices and biases which shape judgments of peers, often subliminally—a problem which all rating systems have to confront.'[1] The danger of such prejudices and biases is likely to be greater where the pool of experts is as small as it is in South Africa and where funding is so limited.

Within the natural, health and engineering sciences, the internationally accepted method of assessing researchers is based on citation analyses. A large body of literature is devoted to the advantages and disadvantages of employing this approach. Notwithstanding the associated biases, it is widely regarded as the most objective option available. The irony is that the NRF's system of rating researchers rather than cited articles could theoretically be of greatest benefit to the humanities and social sciences, where the publication of books rather than journal contributions is often considered to be the gold standard—yet it is in these disciplines that it appears to have least support within the country. Two key questions remain: what purpose does the NRF rating system achieve in practice, and why was the rating system extended to the social and human sciences only a year before it was abandoned as a criterion in awarding grants?

The role of the universities

Antipathy towards the rating system appears not to be based so much on its use by the NRF as on its abuse by universities. In this context, we canvassed the science faculties of the country's 22 tertiary institutions about their use of NRF ratings.

Only nine (the universities of Cape Town, the Western Cape, Zululand, Johannesburg, and the Free State; Rhodes, Stellenbosch and North-West universities and the Central University of Technology) responded, of which seven used NRF ratings for some kind of internal assessment (officially or unofficially). Two-thirds took ratings into consideration when awarding institutional research grants, and five out of the nine did so when awarding additional research support in the form of equipment or post-doctoral support. This use of the rating system is unfortunate, because it could mean that the research endeavours of C-rated scientists suffer at the hands of both the NRF and their host institution. Only two of the responding institutions did not use ratings in making decisions about either appointments or *ad hominem* promotions at the senior level (associate professor and above), and less than half (four out of nine) used them in making junior appointments (at the level of lecturer or senior lecturer). Most sinister of all, just over half (five out of nine) used them in determining salaries or bonuses.

Despite the rating system quite clearly being inconsistent across disciplines, universities that use ratings to determine remuneration use them across disciplines, thus effectively forcing their staff to become rated if they wish to be remunerated in the way they deserve, even if the individuals disagree with the system and/or the way it in which it has been misused.

Another irony is that using ratings as a basis for remuneration does not appear even to have been effective as an incentive for increasing an institution's number of rated researchers, if one compares the two institutions with the highest numbers of them, the universities of Cape Town and Stellenbosch. In 2003, Stellenbosch had 199 rated researchers to UCT's 213: only a seven per cent lead by UCT. Stellenbosch then introduced a remuneration system for academic staff linked to NRF ratings, while UCT adopted a standard level of remuneration for each post level, irrespective of NRF rating. Three years later, in 2006, the gap between the two institutions had widened to a 17% lead by UCT (271 rated researchers versus 231 at Stellenbosch).

We decided to attempt an assessment of the equivalence of the rating system with citation-based measures in a single field. We compiled data for a random sample of seven zoologists rated by the animal and veterinary sciences committee of the NRF over the past two years (Table 1). This is a small sample that may not be representative of all disciplines. Nevertheless, this small-scale study has the advantage of using only a short (two-year) time period, so that citations can be compared realistically, both of all peer-reviewed papers by each candidate; and of those published during the seven-year review period. Cumulative citations over an entire career are perhaps the best quantitative estimate of a researcher's standing, but as the NRF criteria place particular emphasis over the past seven years, publications over this

Table 1. Rating, publication and citation records of seven zoologists evaluated by the NRF's animal and veterinary sciences committee in 2005 and 2006, based on papers published in ISI-listed journals as at the end of the year prior to the committee's adjudication, and citations associated with those papers as at mid-2007. Ranks in each category are citation-based.

Candidate	Rating	Papers over previous 7 years	Citations	Rank	Papers over career	Citations	Rank
1	A2	52	336	2	110	1013	1
2	B1	35	358	1	89	981	2
3	B2	38	314	3	89	939	3
4	B2	21	79	7	39	384	7
5	C1	25	159	4	54	407	5
6	C2	23	151	5	52	460	4
7	C2	21	103	6	37	400	6

period plus their associated citations are listed separately. Even within a single discipline (within which citation rates are relatively constant as opposed to comparisons among disciplines), equivalence is by no means obvious: the A2 and B1 candidates are not clearly distinguished; nor is one of the two B2 candidates distinguished from the C1 and C2 candidates.

When it was introduced in 1984, the rating system served a purpose in kick-starting research in basic science in South Africa. Its major selling point was that it relieved researchers of the tedium of writing grant proposals. This perk fell away in 1996, and currently the principal use of the rating system seems to be by university administrations, to the great dissatisfaction of many academic staff. It is an idea whose time is long past, and is currently undermining academic collegiality in South Africa, primarily on account of the way it is misused by the universities themselves. It should be abandoned before further damage is done.

1. The review is available from the NRF website at www.nrf.ac.za/publications/reviews/NRFInstitutionalReviewReport2005; see also the Constitutional NRF Response on the Review at www.nrf.ac.za/publications/reviewsNRFInstitReviewResponse2005
2. The FRD top-rated scientists in South Africa. *S. Afr. J. Sci.* **88**, 125 (1992).
3. Pouris A. (1989). Strengths and weaknesses of South African science. *S. Afr. J. Sci.* **85**, 623–626.

Elephant contraception: silver bullet or a potentially bitter pill?

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Elephant contraception is increasingly being identified as a solution to the problem of growing elephant numbers in conservation areas. As a result, it is now being incorporated into elephant management and policy in South Africa. We point out that elephant contraception may have numerous physical, social and ecological side-effects. These side-effects should be identified in advance and their implications incorporated into elephant contraception programmes, in line with the protocols of adaptive management. This provides the opportunity to learn from the process, and may help avoid some of the mistakes made in the course of elephant culling.

Conservation efforts across Africa have resulted in growing elephant populations. This has led to concerns regarding impacts that these elephants may have on biodiversity.[1,2] In response, South Africa recently announced that if other approaches fail, it might resume culling (www.environment.gov.za). Zimbabwe, however, is already planning to cull, to reduce elephant numbers. These announcements have provoked reaction from elephant interest groups. Thirty years ago, culling was seen as the most effective way to manage large elephant populations. Today, however, we are seeing some of the negative consequences of this approach. These include abnormal behaviours that encompass depression, unpredictable asocial behaviour and higher aggression.[3,4]

Contraception is an emerging alternative to culling. Although shown to be effective on a small scale, its practicality is debatable.[5,6] Two key constraints are that three quarters of the female population needs to be contracepted to stabilize population numbers,[3] and that current technology requires frequent darting (two within two weeks, followed by annual re-darting) of the cows.[5] It must also be recognized that contraception cannot reduce elephant numbers in the short term – it will require sustained contraception over a number of years to achieve this. Despite these constraints, elephant contraception is now being incorporated into South African government policy (www.environment.gov.za), and other elephant range countries may follow this lead. A concern that is being overlooked, however, is that elephant contraception may go beyond controlling reproduction. It could generate unexpected physical, social and ecological consequences. Our understanding of contraception for elephants is now at the stage that elephant culling was 30 years ago, before the adverse effects were recognized. Learning from the culling experience, we feel that at this stage it is important to highlight some potential consequences of contraception, based on current understanding of elephant biology. These, and any further predictions, need to be incorporated into any government decision-making around contraception, including identifying research needs.

One possible side effect of contraception is an increased risk of physical harm to adult elephants. Reproductively active female elephants normally come into oestrous about once every four years. In contrast, contracepted females come into oestrous every three months. Thus, they can attract male attention as much as four times a year. Males (weighing up to 6000 kg) are inclined to chase and mount these females (smaller at 2000–2800 kg) up to 16 times more frequently over the four years. This increases the chances of injury to females. Furthermore, more frequent oestrus of females may lead to increased male–male aggression over mating opportunities, and the number that could be killed during fights.

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