

# Funding drought hits experimentally based South African researchers and their graduate students

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This year started with some researchers at academic institutions in South Africa scrambling to find funds to support their research programmes and graduate students. Their applications for research funding under the competitive funding schemes of the National Research Foundation (NRF) had been turned down, despite favourable referee reports on the quality of the proposed science, because of budget limitations. The shift in the funding priorities of the Department of Science and Technology (DST) and the NRF over the last 5 years is leaving researchers in specific disciplines, as well as their graduate students, 'high and dry'.

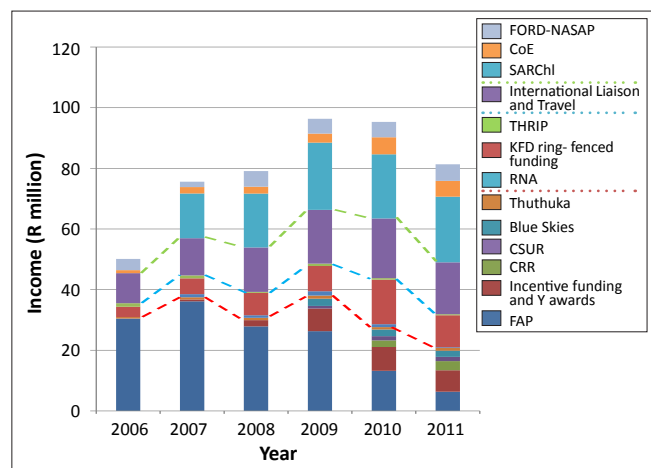
At first glance this shift seems strange, as the current strategic objectives of the DST include increasing the number of rated researchers, strengthening research activities at universities to produce world class research and increasing the number of PhD students in South Africa.<sup>1</sup> Some universities have also seen an increase in the total funding for research. For example, research funding (excluding equipment) in the University of Cape Town (UCT)'s science faculty rose from R50.1 million in 2006 to R96 million in 2009, but then dropped again to R81 million in 2011 (funding figures provided by the Research Office, UCT) (Figure 1). However, a large proportion of the growth in research funding came from the introduction of new initiatives by the DST, such as the South African Research Chairs Initiative (SARChI), Centres of Excellence (CoE), and a smorgasbord of thematic areas under the heading of 'National Grand Challenges', including 'Space Science and Technology', 'Global Change', 'Farmer to Pharma', 'Energy Security' and 'Human and Social Dynamics'. Whilst these initiatives are welcome, they should not be at the expense of support for the basic sciences across all disciplines that should be the foundation of the national research effort.

Besides the introduction of these new initiatives by DST, the NRF itself has shifted its funding policy in the last 5 years, which has further exacerbated the problem. The Focus Area Programme

**TABLE 1:** A summary of funding instruments administered by the National Research Foundation (NRF), either via funding from, (1) discretionary grants from the core parliamentary grant or (2) ring-fenced and contract programmes administered on behalf of the Department of Science and Technology, under the Knowledge Fields Development (KFD), Grants Management and Systems Administration (GMSA) and Human and Institutional Capacity (HICD) programmes.

Funding type	Funding instrument	NRF programme	List of funding instruments taken from the NRF website or UCT Research Office website†
Discretionary grants	Focus Area Programme (FAP)	KFD	Nine Focus Areas were phased out by 2011, although students in the pipeline will be funded until 2014
	Blue Skies Research	KFD	<a href="http://www.nrf.ac.za/funding_overview.php?fid=30">http://www.nrf.ac.za/funding_overview.php?fid=30</a>
	Research in Community Engagement	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=49">http://www.nrf.ac.za/projects.php?pid=49</a>
	Competitive Programme for Rated Researchers (CRR)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=50">http://www.nrf.ac.za/projects.php?pid=50</a>
	Competitive Support for Unrated Researchers (CSUR)	KFD	<a href="http://www.nrf.ac.za/files/2011%20CSUR%20Manual(1).pdf">http://www.nrf.ac.za/files/2011%20CSUR%20Manual(1).pdf</a>
	Incentive Funding for Rated Researchers	KFD	<a href="http://www.nrf.ac.za/funding_overview.php?fid=114">http://www.nrf.ac.za/funding_overview.php?fid=114</a>
	International Science Liaison (ISL) and Short-term Travel	GMSA	<a href="http://www.nrf.ac.za/risa.php?fidid=3">http://www.nrf.ac.za/risa.php?fidid=3</a>
	Knowledge Fields Development Grants Thuthuka	KFD HICD	<a href="http://www.nrf.ac.za/projects.php?pid=52">http://www.nrf.ac.za/projects.php?pid=52</a> <a href="http://www.nrf.ac.za/funding_overview.php?fid=28">http://www.nrf.ac.za/funding_overview.php?fid=28</a>
Ring-fenced and contract programmes	Research Niche Areas (RNA)	HICD	Currently being phased out
	African Origins Platform (AOP)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=112">http://www.nrf.ac.za/projects.php?pid=112</a>
	DST Community University Partnership Programme (CUPP)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=56">http://www.nrf.ac.za/projects.php?pid=56</a>
	Drug Discovery Training Programme	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=46">http://www.nrf.ac.za/projects.php?pid=46</a>
	Indigenous Knowledge Systems (IKS)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=45">http://www.nrf.ac.za/projects.php?pid=45</a>
	Multiwavelength Astronomy (MWA)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=54">http://www.nrf.ac.za/projects.php?pid=54</a>
	National Astrophysics and Space Science Programme (NASSP)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=55">http://www.nrf.ac.za/projects.php?pid=55</a>
	Society, Ecosystems and Change (SEACChange): Marine and Coastal Research	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=42">http://www.nrf.ac.za/projects.php?pid=42</a>
	South African Biosystematics Initiative (SABI)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=41">http://www.nrf.ac.za/projects.php?pid=41</a>
	South African National Antarctic Programme (SANAP)	KFD	<a href="http://www.nrf.ac.za/projects.php?pid=39">http://www.nrf.ac.za/projects.php?pid=39</a>

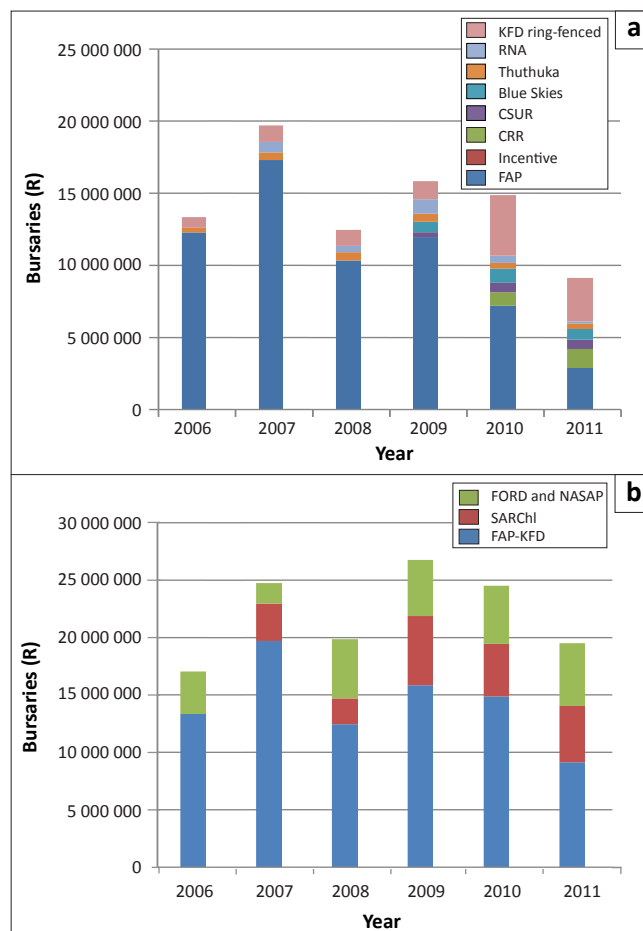
†, URLs are provided as links to further information.



**FIGURE 1:** A breakdown of the income for student support and research running expenses of National Research Foundation (NRF) research grants in the Faculty of Science at the University of Cape Town for the period 2006–2011. The area below the red dotted line includes research grants for graduate student support and running expenses, accessible to all academic staff independent of research area (i.e. Focus Area Programme (FAP), Incentive funding, Competitive Programme for Rated Researchers (CRR), Competitive Support for Unrated Researchers (CSUR), Blue Skies Research and Thuthuka). The area below the blue line includes grants available through THRIP, Research Niche Areas (RNAs) and in strategic areas defined by the Department of Science and Technology and administered by the Knowledge Fields Development (KFD) directorate at the NRF. The area below the green line refers to international liaison and travel grants, whilst the area above the green dotted line refers to funding in the South African Research Chairs Initiative (SARChI), Centres of Excellence and FORD-NASAP (Ford Foundation and National Astrophysics and Space Programme) programmes. The drop in funding from R96 million in 2009 to R81 million in 2011 is largely as a result of a drop of R15 million in FAP funding. Figures have not been corrected for inflation.

(FAP), in which many researchers received funding for their research and support for their graduate students, was based on budgets motivated in a peer-reviewed grant process. However, the FAP has been phased out over the past 5 years – starting in 2007 – and was terminated at the end of 2011. For example, in UCT’s science faculty, the total amount of FAP funding for student support and research running expenses dropped from R30.4 million in 2006 to R6.3 million in 2011, and ceased in 2012 (Figure 1). The FAP has been replaced by a number of new funding instruments under the administration of the Knowledge Fields Development (KFD) directorate, including Incentive Funding, Competitive Programme for Rated Researchers (CRR), Competitive Support for Unrated Researchers (CSUR), Blue Skies Research, various ring-fenced programmes in KFD (Table 1), and the Thuthuka Programme grants (referred to henceforth as the FAP-KFD sector). These new instruments have not compensated for the loss of FAP funding – overall funding in the FAP-KFD sector fell from R34.3 million in 2006 to R31.3 million in 2011 in UCT’s science faculty (Figure 1).

Here I present an analysis of research grants awarded to the same faculty to understand how the shifts in NRF funding policies have affected graduate students and running expenses of experimentally based scientists at the departmental level between 2006 and 2011. Income for student grant-holder scholarships and for running expenses was analysed for the FAP-KFD sector and compared to income streams for student support and running expenses



FAP (Focus Area Programme); CRR (Competitive Programme for Rated Researchers); CSUR, Competitive Support for Unrated Researchers; RNA (Research Niche Areas); KFD (Knowledge Fields Development).

**FIGURE 2:** A breakdown of grant-holder linked student bursaries granted by the National Research Foundation to the University of Cape Town’s Faculty of Science for 2006–2011 (a) according to the specific funding programme in the FAP-KFD sector and (b) including Ford Foundation and National Astrophysics and Space Programme (FORD-NASAP) grants to the Department of Mathematics and Applied Mathematics, South African Research Chairs Initiative (SARChI). In 2006, 170 grants supported grant-holder linked bursaries via programmes in the FAP-KFD sector, compared with 80 in 2011. In 2011, an additional two grants were offered by the FORD-NASAP programme and seven were linked to SARChIs.

for the SARChI awards (i.e. excluding overheads and staffing costs), and the total income stemming from the faculty’s single CoE (funding figures provided by the Research Office, UCT). Income streams were not adjusted for inflation.

The total allocation to grant-holder linked bursaries for MSc and PhD students (Figure 2a) for the FAP-KFD grants fell with the demise of the FAP from R13.3 million in 2006 to R9.1 million in 2011. However, this reduction was supplemented with the introduction of the seven SARChI grants shared between the Departments of Astronomy (1), Chemistry (2), Environmental and Geographical Science (1), Oceanography (1) and Zoology (2), which also have grant-holder bursaries to dispense (Figure 2b), as well as scholarships provided by the FORD and National Astrophysics and Space Sciences Programme to mathematicians. Although the total grant income for student support has been increased by 14%, this increase is largely in a small subset of disciplines. For example, in 2006, these grant-holder bursaries were directly

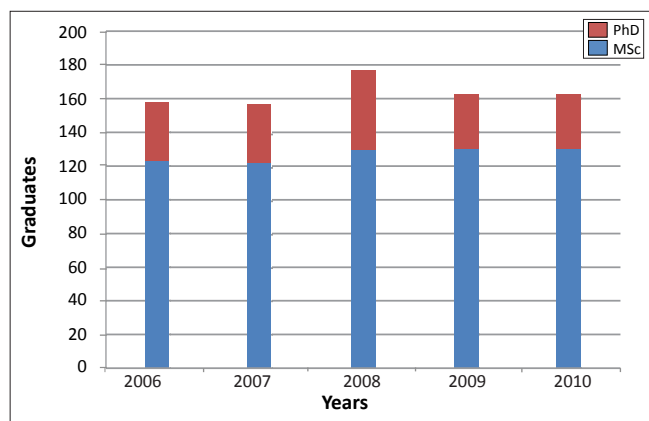


**TABLE 2a:** A comparison of total funding available for research running expenses under the Focus Area Programme–Knowledge Fields Development (FAP-KFD) stable, (1) with and (2) without the South African Research Chairs Initiative (SARChI) and Centres of Excellence (CoE) programmes between 2006 and 2011 in the University of Cape Town’s science faculty. Whereas some departments have received a substantial injection of research funds, the Departments of Geological Sciences, Chemistry, and Molecular and Cell Biology are in the red with respect to research funding compared to 2006. The number of SARChI chairs per department is also noted.

Department	Increase in funding (%) from 2006 to 2011	
	(1) Including FAP-KFD, SARChI chairs and CoEs	(2) FAP-KFD grants only
Astronomy (1 SARChI chair)	493	674
Statistical Sciences	209	209
Oceanography (1 SARChI chair)	166	111
Environmental & Geographical Science (1 SARChI chair)	145	23
Botany	123	123
Zoology (2 SARChI chairs, 1 CoE)	107	–
Physics	103	103
Computer Science	50	50
Archaeology	10	10
Mathematics and Applied Mathematics	0	0

**TABLE 2b:** A comparison of total funding available for research running expenses under the Focus Area Programme–Knowledge Fields Development (FAP-KFD) stable, (1) with and (2) without the South African Research Chairs Initiative (SARChI) and Centres of Excellence (CoE) programmes between 2006 and 2011 in the University of Cape Town’s science faculty. Whereas some departments have received a substantial injection of research funds, the Departments of Geological Sciences, Chemistry, and Molecular and Cell Biology are in the red with respect to research funding compared to 2006. The number of SARChI chairs per department is also noted.

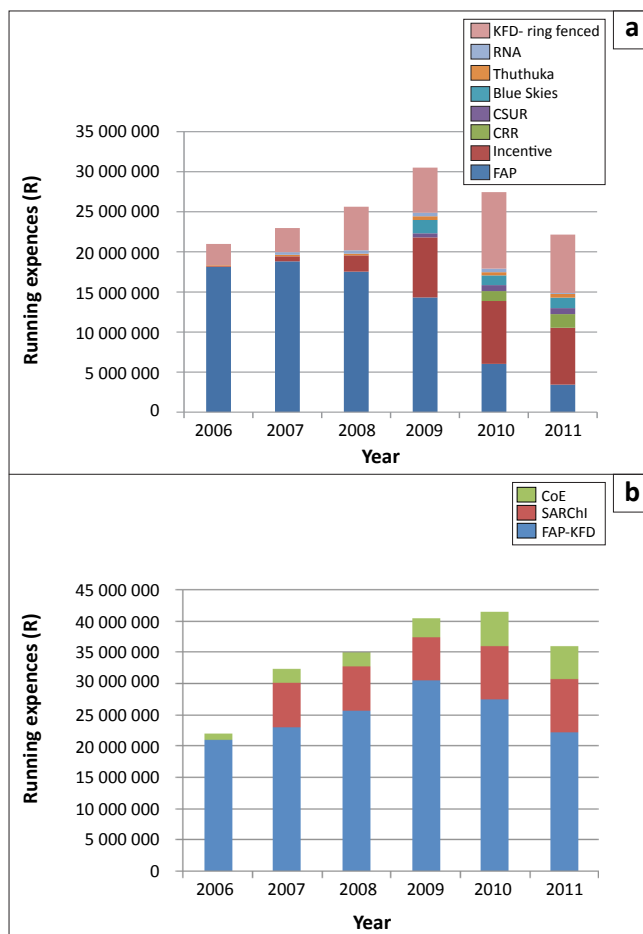
Department	Decrease in funding (%) from 2006 to 2011	
	(1) Including FAP-KFD, SARChI chairs and CoEs	(2) FAP-KFD grants only
Geological Sciences	-60	-60
Molecular and Cell Biology	-21	-21
Chemistry (2 SARChI chairs)	-15	-50
Zoology	–	-28



Source: University of Cape Town.<sup>2</sup>

**FIGURE 3:** The total number of MSc and PhD students graduating from the University of Cape Town’s Faculty of Science, 2006–2010.

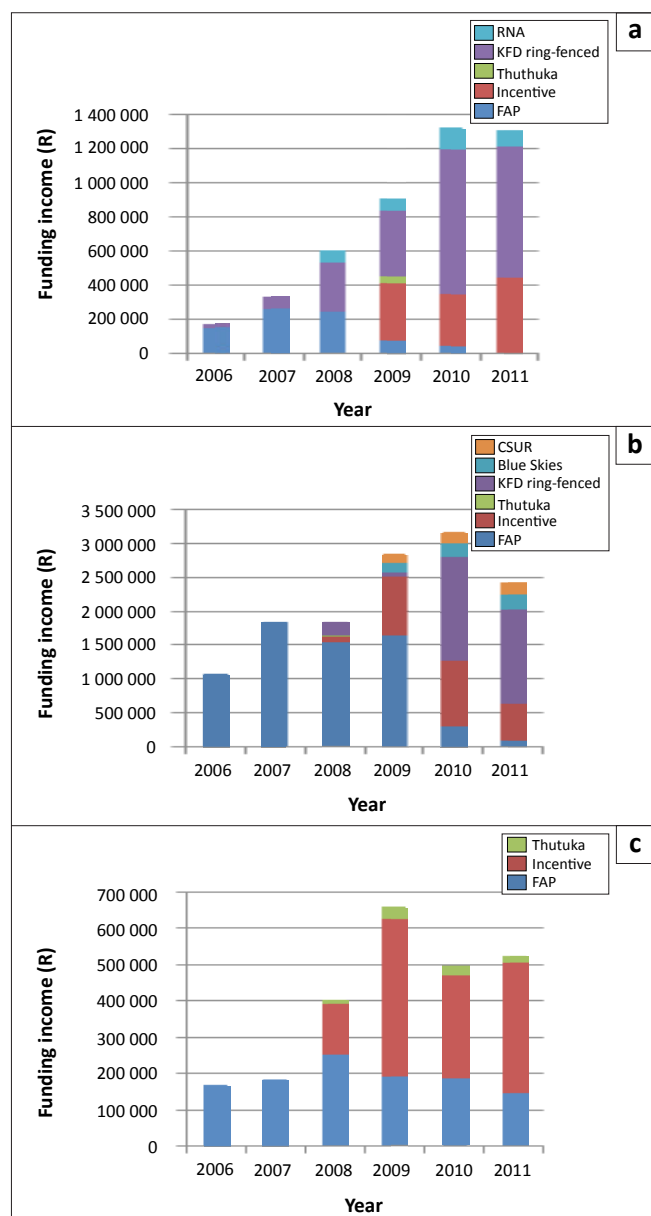
linked to 170 grants, compared with 87 (which includes the seven SARChI chairs) in 2011. Thus almost half of the academics who previously could dispense student grants as part of their graduate student recruitment drive, are no longer able to do so. Although the NRF has compensated by increasing the funds allocated to NRF Prestigious and Scarce



FAP (Focus Area Programme); CRR (Competitive Programme for Rated Researchers); CSUR, Competitive Support for Unrated Researchers; RNA (Research Niche Areas); KFD (Knowledge Fields Development); SARChI (South African Research Chairs Initiative); CoE (Centre of Excellence).

**FIGURE 4:** (a) An analysis of the running expenses component of National Research Foundation research grants (excluding SARChI chairs and CoEs) in the Faculty of Science, University of Cape Town for the period 2006–2011. (b) A comparison of the total value of the running expenses component of grants awarded from CoEs (1 grant 2006–2011) and SARChIs (7 grants 2007–2011) to FAP-KFD running expenses (from 171 grants in 2006 to 200 grants in 2011). The average value of a CoE grant in 2011 was R5.2 million, a SARChI grant (running expenses only) was R1.2 million, and a FAP-KFD grant was R0.1 million.

Skills scholarships, through the injection of additional funds on an *ad-hoc* basis from the DST, these are not directly linked to research grants, and do not come with associated research running expenses. The increase in funds available for graduate students, arising from the introduction of SARChI funding in 2007, has not translated into an increase in the number of graduate students 3 years later in the faculty: 158 MSc and PhD students graduated in 2006, and this number increased only marginally to 161 and 162 in 2009 and 2010, respectively, while master’s registrations have actually dropped between 2006 and 2010<sup>2</sup> (Figure 3). Nationally, the number of PhD students supported by the NRF in all programmes declined from a peak of 2221 in 2006 to 983 in 2009<sup>3</sup>; the NRF’s new strategy is thus resulting in the support of fewer rather than more students at the doctoral level. This result is particularly regrettable as the NRF is the major source of support for full-time doctoral students nationally, and it is largely full-time students who stand a chance of completing their doctorates in 3–4 years.<sup>4</sup> The replacement of the FAP with the Incentive Funding Programme, which de-links research funding from



FAP (Focus Area Programme); CSUR, Competitive Support for Unrated Researchers; RNA (Research Niche Areas); KFD (Knowledge Fields Development).

**FIGURE 5:** Funding income of departments within the Faculty of Science, University of Cape Town which have received an increase in research funds for running expenses under the National Research FAP-KFD stable of grants, for the period 2006–2011: (a) Astronomy, (b) Botany and (c) Statistical Sciences.

grant-holder bursaries, appears to have been an unsuccessful strategy.

In UCT's science faculty, the total value for the funding of the running expenses component of research grants in the FPA-KFD sector has increased by 6% from R21 million in 2006 to R22.1 million in 2011 (Figure 4a), with a drop in the average value of a research grant from R122 000 in 2006 to R111 000 in 2011 (without any adjustments for inflation). The total value of research funding for running expenses increases dramatically, by 47%, if the running expenses associated with the seven SARChI chairs and one CoE in the Faculty of Science are added to this data set (Figure 4b). What is striking is that while funds for the running expenses component of grants in the FPA-KFD stable hardly grew, the

funds awarded for international liaison and short-term travel grew by 72% for the same period, from R9.9 million in 2006 to R17.1 million in 2011 (Figure 1). Researchers have been left in the unusual position where similar amounts of funds are available for research running expenses as for international liaison and travel.

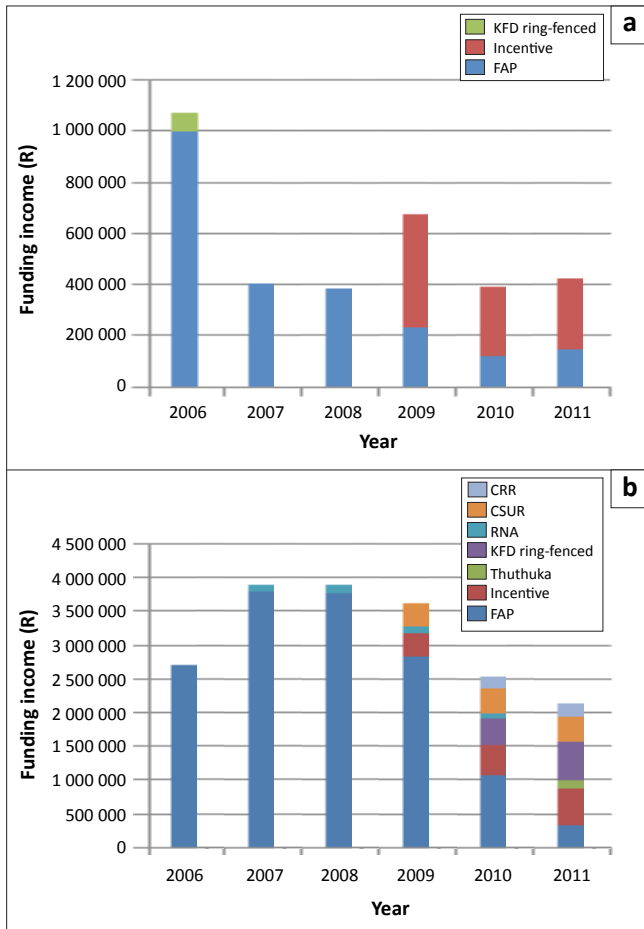
I interrogated the data set further to investigate whether the shift in funding policy within, (1) the FAP-KFD stable and (2) additional SARChI and CoE funding is affecting all departments in the faculty similarly, or whether particular disciplines are favoured. Whereas several departments have seen a significant increase in the funds available to cover research running expenses (for example Astronomy and Statistical Sciences), others have seen a dramatic drop in funding from the FAP-KFD stable of grants and are receiving less funding in 2011 than they did in 2006 (Table 2). What is cause for alarm is that research in all these departments is dependent on direct experimentation with associated high running costs. For some departments (Chemistry and Zoology), the drop in funding via the FAP-KFD stable is mitigated by an injection of funding by SARChI and CoE awards, whereas research in the Geological Sciences and Molecular and Cell Biology is now chronically underfunded compared with the situation in 2006.

An analysis of the shift in the FAP-KFD funding streams shows that departments which have showed an increase in funding did so largely because, (1) the funding they received under Incentive Funding in 2011 was greater than that received under FAP funding in 2006 (e.g. Astronomy and Statistical Sciences) or (2) they were able to successfully find a home for funding under the ring-fenced KFD funding instrument (e.g. Botany) (Figure 5). The Department of Geological Sciences has been the worst affected, as researchers have been unsuccessful in finding a new home in the ring-fenced KFD to supply an alternative source of funding since the demise of the FAP (Figure 6).

## Conclusion

In a recent presentation at UCT, Albert van Jaarsveld, the CEO of the NRF, spelt out the foundation's vision for the next 8 years, which continues to place an emphasis on the further investment in another 198 SARChI chairs and 22 CoEs, with an acknowledgement that additional support is needed for emerging and established researchers. Whilst the NRF readily admits that Incentive Funding is top-up funding which is insufficient to support experimentally based research with high associated running costs, no immediate relief is being prioritised by the DST or NRF in the short term.

While the funding situation in 2011 was tough, 2012 is going to be even worse with the complete termination of the FAP, and an inadequate increase in funds available under the CRR and CSUR programmes. The CRR programme received 446 applications for funding in 2012. Although 252 of these grants were deemed fundable after an extensive



FAP (Focus Area Programme); CRR (Competitive Programme for Rated Researchers); CSUR, Competitive Support for Unrated Researchers; RNA (Research Niche Areas); KFD (Knowledge Fields Development).

**FIGURE 6:** Funding income of departments within the Faculty of Science, University of Cape Town which have received a decrease in research funds for running expenses under the National Research Foundation's FAP-KFD stable of grants, for the period 2006–2011: (a) Geological Sciences and (b) Molecular and Cell Biology.

peer-review process, only 53 were lucky enough to be funded, representing a success rate of 12%. Emerging researchers trying to build up a research team of graduate students and their scientific reputations so that they can in turn become eligible for rating and subsequent incentive funding face even tougher prospects as they have been informed that no further calls will be made under the CSUR umbrella until 2014 (for funding in 2015). In this harsh climate, the NRF recently announced the further creation of another 60 SARCHI chairs at a total cost of R150 million, which will be on top of the R235 million already allocated to SARCHI by 2011 (both figures exclude salaries of the incumbents). The SARCHI is modelled on the Canadian Research Chair Programme, which comprises 13% of the total annual research funds available for grants (Lynn T, Social Sciences and Humanities

Research Council of Canada, 2012, personal communication, March 01). Whilst the figures for the annual South African relative research investment are not readily available at a national level, SARCHI represented 36% of the total research income in UCT's science faculty in 2011. Whilst it may be argued that UCT has the most SARCHIs in the country, it also has the highest number of rated researchers.

This funding crisis has serious implications for the experimental sciences – not only for research output in the form of publications, but also for the training of graduate students in the country. It is of particular concern, given this background, that the NRF in its 8-year vision is considering putting funds aside to send PhD students to be trained abroad, whilst neglecting the adequate resourcing of several thousand active, well-qualified South African researchers at academic institutions within the country,<sup>5,6</sup> who are keen to train graduate students but have been left without sufficient funding for experimentally based research projects and graduate student support.

An immediate, major injection of funds into the CRR and CSUR, where the sole criteria for successful grants should be the excellence of research and the desire to train graduate students, should be the DST's and NRF's first priority. Furthermore, an independent review is needed to quantify the effects of the change in DST and NRF funding strategies on all disciplines, across all universities, to evaluate the extent of the trends described here nationally.

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