

## **“Research funding and the consequences for university research”**

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### **SUMMARY NOTES**

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#### **DR DAVID WOODS**

The traditional role of a university - its traditional core business - is teaching and research (T&R). Over the last 20 or 30 years community involvement has become an important subsidiary component. Community involvement depends on teaching and research. Universities are not charities and community involvement should feed out from teaching and research and feed back in teaching and research.

#### **The importance of research**

Why is it important for universities to undertake research?

- Some say you can have teaching universities and research universities, but I believe a person at the cutting edge of research is a much better teacher. Gene regulation was my speciality. We chose to study bacteria that are vital to South African industry and developed some novel gene regulation pathways. Having done this research work, I was a far better teacher. People who win research awards often win teaching awards too.
- Masters and PhD graduates are the intellectual capital of this country; it is this that enables us to compete in an internationally competitive knowledge age.
- Some people say we should just buy in technology, but no country will sell you their current technology. Even if they were, it would be expensive. Research enables complex technology transfer. Much technology is so complex that, unless it goes into a research environment, it will fail.
- Research in the humanities ensures vibrant evolving national cultures, it contributes to citizenship, identity, communication, language, peace and social development.
- Research facilitates community involvement – community involvement feeds out from T&R, and feeds back into T&R.
- Research is a university's national and international passport. Other institutions will collaborate with you provided you have something to offer.

#### **Funding requirements for success in research**

Universities are the custodians of fundamental research. But according to a 2001 Department of Science and Technology survey of research expenditure, only 27% of money went into basic research (strategic basic research 14.9% and pure basic research 12.1%) while the balance went into applied research (40%) and experimental development (33%). Far too little money is spent on basic research.

Adequate funding for research is a critical requirement for success. What environment do we need for research? We need to get the idea of research being active within our universities.

- *Adequate salaries for academic staff.* Because salaries are simply not keeping pace with the going rates, academics are spending time doing paying consulting work and neglecting their research. This is a major problem. Government does not see how serious the situation is. Poor salaries are one of the reasons we are unable to attract young black researchers. In the 1970s professors' salaries were linked to those of judges. Then academia broke from the civil service structure in exchange for autonomy, but their salaries have steadily lagged behind. A judge in the High Court or Labour Court in 2002 earned a basic annual salary of R529 965, excluding such perks as housing, car allowance and medical aid. An analysis by PE Corporate Services of 660 professorial salaries at institutions in Johannesburg, Pretoria, KwaZulu-Natal, the Western Cape and the Eastern Cape showed that the median professorial salary was R241 270 with a median annual cost to employer of R273 681. With university salaries as low as they are, it is not possible to attract enough good people. If the median salary of a professor were increased to R400 000 (much lower than that of a judge), it would go a long way towards solving the problem. Increasing a lecturer's basic salary from R131 489 to R260 000 would make such a position competitive in the market place.
- *Time to undertake research.* Another critical requirement for research is time. The staff:student ratio is a critical factor here. There has been unsustainable growth in the numbers of university students over the last 3–4 years. The Department of Education thinks the ratio measured as teaching input units/FTE teaching staff should be 30:1. In 2000, the ratio was 33.3:1, but in 2003 this stood at 41.5:1 with the figure in technical universities being over 50:1. Another factor impacting negatively on the time available for research is the high number of students who are under-prepared as a result of poor schooling.
- *Access to information* – information technology and libraries.
- *Capital infrastructure.* The National Research Foundation used to have a system of capital funding for infrastructure, but over the last 2–3 years, the amount has declined to nothing. There has been no realistic funding for capital equipment from the NRF for the last 5-6 years.
- *Administrative and technical support.*
- *Funding for Masters, PhD and post-doctoral students.*
- *Travel and running expenses.*

### **Creating a research culture**

Research requires a research culture and passion for research. You cannot buy this. It comes from sensible trade-offs between salary and providing the basic environment in which research can thrive. If the time and effort put in is not matched by the development of a research culture, the commitment of researchers will diminish.

## **Funding mechanisms**

There must be a balance between stability, evaluation and continuation or withdrawal of support. There must also be a balance between groundbreaking and incremental research:

<b>Groundbreaking</b>	<b>Incremental</b>
<ul style="list-style-type: none"><li>• Risky</li><li>• Few major impacts</li><li>• High impact</li></ul>	<ul style="list-style-type: none"><li>• Regular outputs</li><li>• Many minor impacts</li><li>• Low impact</li></ul>

## **The advent of the knowledge economy**

Recently the world has experienced the emergence of the knowledge age and the knowledge economy. There has been a fundamental change from research aimed at pushing back the frontiers of knowledge and seeking the truth to advance the public good to economies based on research and knowledge, and from graduates who are informed and capable democratic citizens to entrepreneurial graduates who can contribute to the knowledge economy. Universities have changed from being disinterested agencies fostering disinterested inquiry and free expression of opinion to efficiently-managed institutions generating wealth from their intellectual capital and research infrastructure.

At the Unesco conference on higher education in 1998, Dr Mike Gibbons, former head of the Association of Commonwealth Universities, spoke about how universities had been custodians of research but industry is competing with them because they have larger laboratories and more resources.

## **Linkages between universities and industry/the private sector**

In 1980 the US Patent and Trademarks Act was amended to allow universities to own intellectual property rights on invention, especially research done with Federal Funds. In this way the advent of the knowledge economy resulted in government investing in research.

There are now linkages between universities on the one hand and industry and the private sector on the other based on the promise of financial gain to all parties. There are multimillion dollar contracts with industries which either control or share in the intellectual property rights, licences and so on. This has created a class of entrepreneurial academics who have started spin-off companies and who do consulting. Universities are now managing and benefiting from technology transfer and intellectual property. Many have started specialised technology transfer offices (TTOs).

TTOs are seen as essential to facilitate links with industry and obtain research grants, to contribute to the local and national economies in the form of science parks and spin-off companies, and to recruit academic staff. Academics are reluctant to join universities without TTOs to assist them to get grants. TTOs are a long-term investment, not a get-rich-quick scheme.

I was funded by the Mellon Foundation to visit a number of North American universities in 2002 – Princeton, Tufts, Brown, Indiana University-Purdue University Indianapolis, Duke, The University of North Carolina at Chapel Hill, Virginia

(Charlottesville), Dalhousie, McGill and Concordia. All of these had TTOs, and all of these offices cost more than the revenue they were able to bring in. Around 5–7 universities have hit the jackpot; mainly in the field of biomedical research. In 2004 Tony Heher wrote a paper on this subject entitled *Profiting from research: Opportunities and pitfalls*.

### **Problems and dangers**

Some of the problems and dangers of this approach to research are:

- Academics sell their time and expertise to companies which exert control and demand positive results and secrecy. There are horror stories of academics not getting promotion or being dismissed if their research findings go against the interests of companies.
- The research records of Masters, PhD and post-doctoral students suffer. Their theses may be delayed. There is no publication of research results because of the secrecy provisions. And the examination system is flawed – there are cases where examiners are aligned to company interests.
- Undergraduate teaching and postgraduate supervision is neglected because academics are working for companies, doing consulting, or doing outside research.
- There has been a move from unfettered inquiry to commercially-driven research.
- There is less emphasis on fundamental research with no obvious industrial or economic spin-off.
- Research output declines due to contract research and consulting.
- There is a loss of collegiality, collaboration and unrestricted access to research results, all of which inhibit the advancement of knowledge.

According to the book *Universities in the marketplace* by Dr Derek Bok, former president of Harvard University:

*Bit by bit commercialization threatens to change the character of the university in ways that limit its freedom, sap its effectiveness and lower its standing in the society ... The problems come so gradually and silently that their link to commercialization may not even be perceived. Like individuals who experiment with drugs, therefore, campus officials may believe that they can proceed without serious risk.*

And Pope John Paul II in a letter to the Apostolic Nuncio in Poland on 25 March 2002 said:

*the pre-eminence of the profit motive in conducting scientific research ultimately means that science is deprived of its epistemological character, according to which its primary goal is discovery of the truth. The risk is that when research takes a utilitarian turn, its speculative dimension, which is the inner dynamic of man's intellectual journey, will be diminished or stifled.*

### **The middle road**

The middle road win-win solution for academics, universities, industry and knowledge generation is all about “contract, contract, contract”. Industry knows about contracts

and will spend time on getting them right. Academics are the worst in getting themselves decent contracts, so industry takes them to the cleaners. TTOs have a real role to play in ensuring that fair contracts are put in place. Contracts can be structured in a way to ensure that research goes the patent route, which is to say it is publishable rather than secret. This would enhance collegiality.

### **Agency funding**

Research funding agencies should:

- ensure that research excellence is the criterion – not the ‘sprinkler system’ which gives everybody a little bit
- nurture and build capacity among Masters, PhD, post-doctoral students and young researchers
- support excellent researchers
- promote collaboration
- promote fundamental research
- engage in stringent evaluation and monitoring
- reduce bureaucracy.

The National Research Foundation (NRF) is not in good shape and its lack of capacity is worrying. It promotes funding of development-oriented research rather than basic research. It is losing the confidence of researchers because the hassle of applying for funding is not worth the amount of money it may yield. Many are turning to other sources of funding. The NRF is failing to push excellence and some of its priority areas are out of date. Applying to be graded through its ratings system is a major undertaking. It is excellent system, and if you come out with an A rating, you will qualify for funds. But even if you are A-rated, you still have to put an impressive annual proposal. Prof Jack de Wet says the last five years of a researcher’s work is the best indicator of the quality of the next five years of research output. It would be better to evaluate the quality of a researcher’s work in five-year periods rather than doing it annually.

### **Combining excellence with capacity-building**

Can you combine excellence and capacity building? I believe you can through a dynamic cyclic development research model. The successful development of research capacity requires someone who is capable of supervising and producing a group of PhD graduates capable of doing independent research. Once these graduates become established researchers in their own groups, they will be able to supervise and produce more PhD graduates who in turn will generate their own groups again. This model requires top PhD students, not just people who are essentially a pair of hands, technicians who are only able to do what the supervisor has directed them to do.

### **The new research funding formula**

There has been a major change in government research funding from 12% ‘blind’ funding, R20 000 for a published paper in a peer-reviewed journal which together resulted in approximately 15% of a university’s subsidy component. The new system is based on earned outputs, for example, published papers (R73 000 for a paper in a peer-reviewed journal). This system rewards quantity rather than quality and over the course of its three-year phase-in period it will generate a two-tier system of

universities in South Africa. The new system promotes the pursuit of incremental research rather than groundbreaking research. We need systems to recognise quality. I propose a five-year cycle of review as a way of evaluating the quality of a researcher's work.

## COMMENTS AND QUESTIONS

### NRF review

- The NRF has just undergone a five-year institutional review. It was a 14-day process involving six people, three of them from inside South Africa. Over 400 individuals were interviewed. In addition other researchers sent in comments via e-mail and other channels.

### Money as the bottom line

- US President Harry Truman coined the term 'military-industrial complex'. Now we are seeing the academic-industrial complex. Money is the bottom line but we seem to have lost sight of academic progress and a value system. There has been phenomenal growth in the economy and yet the divide between rich and poor is increasing. There must be a fundamental change in ideas of what the good life is.
- The Massachusetts Institute of Technology started with industry links. Industry supported it because its work is good for industry. Now 50% of university professors have shares in biotechnology companies. Universities have been like this since the 1880s.

### Managerialism in universities

- Senior academics are drawn into managerial posts even if they are not good managers. This represents a loss of capacity because they move out of doing what they are good at.
- Academics have lost control of their own destiny. There is a privatisation of public universities and micro-management of academics. We are now being told by administrators what to do and what to teach.

**David Woods:** I still believe the head of a university should be a strong academic, not a strong business person. We always follow countries like the UK when it comes to such things as the managerial trend in universities. But now British universities have had enough of this approach. The loss of academic control comes from managerialism and is forced by evaluations. We must justify that we are great. I welcome a periodic evaluation every five years. There inevitably must be some evaluation, bureaucracy and administration.

### Excellence vs commercialisation

- There is a tension between excellent research outputs and commercialisation. There are examples of academics who produce few academic papers and journal articles but they are able to make a lot of money.

**David Woods:** Biotechnology exists today because in the 50s some ivory tower academics were doing basic research, 'playing' with bacteria. Choosing excellence would require saying "don't take that contract, rather do this research". Research agency money should go that route. It should not do what industry will do anyway; it should rather allow people to do pioneering research. There has been a trend to looking at 'papers vs patents', but it is possible to get both – two for the price of one. There is a long way between taking out a global patent and having a product to sell.

Many patents are not worth very much. Universities should be producing papers *and* patents.

### **Pure basic research vs strategic basic research**

- In the continuum from pure basic research to strategic basic research, optimists say you can protect the enterprise, but others say strategic research will swamp basic research.
- In Germany there are research institutes like the Max Plank Institute, funded mainly by the government, which are neither industry nor academia.
- We gather research funding from international agencies. What role do you see for government agencies doing basic and applied research, especially in the medical field? And what about the Bill Gates Foundation setting the agenda?

**David Woods:** The German model of research institutes is the Rolls Royce model. The line between pure basic and strategic basic research is blurred – there is no necessity to distinguish between the two. There is a drift towards applied research because it generates money. This is fine as long as it is good research; it does generate papers. We have our state-funded research councils like the Council for Scientific and Industrial Research (CSIR) and the Medical Research Council, but there is nothing like the Max Plank Institute here. The CSIR competes with us - they were meant to do fundamental research, but the pendulum has swung the other way to make them earn their own keep. Industry no longer goes to the CSIR because they have lost so many researchers. At the same time, the universities have gained researchers. We are a bit slow at accessing international grants. The better-funded universities can employ people to help them do it. There are opportunities – many programmes say you must have southern hemisphere or African partners. International agencies have a major role to play in providing access to equipment and in promoting collegial contact.

### **Who speaks for academics?**

- Ordinary academics have almost completely lost their political bias. What is the institution that speaks for academics? We have a very do-good state that wants to control the universities. The only collective voice is the Committee of University Principals, there is no national body of academics that speaks for academics and their interests.

### **Academic vs technical universities**

- In Australia no one looks down at an engineer from an academic university. Those from the technology universities are better at practical application.

**David Woods:** Parliamentarians think the universities are useless - institutions with high failure rates which produce unemployable graduates because we pass everyone. The Department of Education and the Department of Labour are fighting. Labour wants SETAs [sector education and training authorities] to provide technical education. SETAs have pots of money. Technikons had an important position before they were turned into universities of technology. This has meant that the training of technicians has declined because these new institutions concentrate on BTech degrees rather than the vitally important 1 or 2-year technical diplomas. Now the Minister of Education wants to elevate the further education and training (FET) colleges to take the place of the technikons.

### **Transformation**

- Currently two thirds of science research is done by white males over 50 years old.

**David Woods:** Johan Mouton's work shows output productivity has shifted to 50 to 60 year olds at a time when the energy should be in the youngsters. We must support excellent people to train people. This is a long-term strategy of growing our own timber. There has been a change. The rush of young black students going into commerce is slowing. We must cultivate excellent people who are enthused and passionate. Changing the staff profile of the universities is not going to happen quickly. Universities cannot just keep growing their student numbers. There must be a major political decision on admissions – we must learn to say no to people who do not have the potential to succeed.

### **Peer-reviewed publications**

**David Woods:** The old system was a mess in that the list of peer-reviewed journals included journals that not many people publish in, but now things are better. The good journals are recognised; there are fewer gaps. South African journals must now have international peer review, and they must come out regularly. Some rubbishy journals have not survived. Where there is a mess is the lack of recognition of books and chapters in books. There is a way of recognising quality. There is a known impact factor for journals – you can scientifically measure the impact of scientific journals.