Emmanuel College

THE UNIVERSITY OF QUEENSLAND

Whither Universities?

By

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Emmanuel College
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Emmanuel College is Australia's ninth, and with St John’s College, The University of Queensland's first residential college to gain affiliation. It was founded by the Presbyterian Church of Queensland in 1911 with the first students taking up residence in Wickham Terrace in 1912. As the Presbyterian Church moved towards partnership with other religious denominations during the 1970s, Emmanuel College also came under the auspices of the Uniting Church. Upon its inauguration, Emmanuel College was an all male residence but this changed in 1975 when women were admitted as collegians. Now, the College numbers around 340 students with half our population being female.

Further change was experienced by the College when it moved in 1955 from its original site in Wickham Terrace to its present location on the main university campus in St Lucia.

Since 1911, Emmanuel has stood for excellence in all round education and has had seven Rhodes Scholars during its history. Its graduates have gone on to make a major contribution to Australia in many areas, including as doctors, scientists, teachers, engineers, lawyers and judges, politicians, ambassadors and diplomats, and church leaders.

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Whither Universities?

Emergence of the present system

One of the major contributions which universities make to a community is scientific research, teaching and development. Yet today's university is a far cry from that of Isaac Newton whose discoveries contributed greatly to the rise of modern science. When he arrived at Cambridge in June 1661 he found it dominated by Aristotelianism as it had been for four centuries. Of the books demanded by the curriculum, Newton never finished any of them and almost all that he learned at Cambridge was the result of solitary reading and personal research. When Halley asked him 'what he thought the Curve would be that would be described by the planets supposing the force of attraction towards the Sun to be reciprocal to the square of the distance from it' he replied – 'an ellipse'. With the time and freedom to think for a couple of months he committed it to paper. This led to the concept of universal gravitation, an awesome synthesis born of academic freedom [1].

Natural philosophy, as it was called in the seventeenth century, was often driven by the religious quest for a deeper understanding of God particularly as depicted in the early chapters of Genesis. It became a search for the origins of the universe, for Nature's practical utilities, and for the exercise of human dominion over the planet with all the ambiguities that entailed. Later, Wilhelm von Humboldt (1767-1835) expressed the ideals of universities as the freedom and unity of teaching, learning and research which provided students with an all-round humanist education. These ideals were the founding spirit of many universities and in particular the University of Berlin. Later, as Darwin's theory of evolution by natural selection emerged, it appeared to substantiate David Hume's earlier claim that Nature was a moral vacuum with no theological conclusions of any consequence, and the move towards the secularisation of science was truly underway [2].

Until recently, the Humboldtian tradition has been uppermost in many centres of learning. For example, students in Norway have enjoyed until recently the freedom of how and in what way they chose to study and an absence of serious institutional pressure to complete studies within an allotted amount of time. The primary goal of such centres of learning was to produce interested and independent students who matured into scholars. This utopian vision still retains its power today as a counterpart to the realities of mass education [3]. However, both commercialisation and the Bologna Process are seen by some as a death knoll to the Humboldt tradition and damaging to the old values [4].

This concern about commercialisation in universities was expressed in a recent editorial in *Science* concerning Australia where the former government is claimed to have dismantled research centres in order to leave programmes totally orientated towards commercial outcomes [5]. Also in China, one of the goals of their current five-year plan is to bring pressure to bear on its universities to improve and apply their research. It is claimed that this has led to an apparent epidemic of fraud in universities run by administrators whose primary qualification is Party loyalty [6]. So has the process of moving away from the traditional view of universities as ivory towers of learning and creation of new knowledge gone too far?

Modern forms of knowledge creation

The historical vision that portrayed science as autonomous, apolitical and ethically neutral has been transformed. No longer is the vision concerned solely with the pursuit of truth [7, 8]. Instead, knowledge has become commodified and the boundaries have become increasingly blurred through the mechanisms of funding and the demands of the funding bodies. Timescales from discovery to application may be greatly foreshortened so that in biotechnology, for instance, industry-sponsored basic research into gene regulation can result in the incorporation of genetic engineering into medicine and agriculture within a single decade rather than three [9].

Stephen Jackson, Professor of Biology at Cambridge, a curiosity-driven biological scientist, discovered new ways to expose tumours to compounds that prevented the cells from repairing themselves and improved the efficacy of cancer treatments. He set up a spin-out company and within 10 years sold it to Astra Zeneca for £121m giving an average internal rate of return for investors of 29% pa, or 2.8 times [10]. Such examples have become more common and it is unsurprising that UK universities have become market-orientated.

Boden et al [9] describe ‘curiosity-driven’ (academic) science as a discrete and independent activity which should not be interfered with by management and funding controls. Ideally, it should be funded by organisations dedicated to the production of knowledge for its own sake and for public good. It is the seedbed of new ideas and paradigm-shifts so that the idea of a European Research Centre that distributes EU funding to fundamental research is welcomed provided it safeguards and increases the quality and visibility of fundamental European research globally.

‘Useful science’ is that which contributes to wealth creation and quality of life, supported by funds competitively acquired with outputs that are transferred to users. This model implies linearity which is both misleading and an oversimplification; an interactive model more accurately describes what happens in reality between scientists, industry and end-users.

‘Commodified science’ goes further because it refers to scientific knowledge produced in the context of its application rather than with the potential for transfer to end-users. Hence, in today’s increasingly technologically-driven world, the trend has accelerated in favour of work that will lead to increased competitiveness with a focus on what you do best, or at least better than your neighbours or more distant countries. The outcome is that UK universities are now classified according to whether they are ‘research-intensive’ or ‘business-facing’ and although these terms do not depict exclusivity they reflect how innovation has become a strong driving force that enables and benefits industrial and business exploitation.

What emerges from this brief review of different types of knowledge creation in universities is the impact on the public good - take-up of research findings and the exploitation of intellectual property, development of human capital through the acquisition of skills and knowledge, and improvements in the quality of life including the environment, social welfare and health. Some impacts may have been unintended and some were not necessarily part of the original rationale for the specific investment, and in this respect the full range of impacts may be easily under-represented [11].

How valuable is the university-market relationship?

Returns The economic case for investment in science and research has been frequently advanced based on evidence that a strong public science base supports improvements in human welfare. One study found that 1% growth in public R&D led to a 0.17% increase in the total factor productivity in the long run; 1% increase in business R&D raised it by 0.13. Moreover, this effect was greater with the share of public science conducted in universities [12], and there was a positive though non-linear relationship between citation intensity and GDP per head for 31 countries [13]. However, the gross expenditure on R&D in OECD countries falls short of the Barcelona target of 3% of GDP except for Finland, Sweden and Japan indicating that greater public and private investment is needed in many countries [14, 15].

The returns of commercialisation to one of the world’s most progressive and successful centres, Massachusetts Institute of Technology (MIT), are substantial though they may not reach the size of golden eggs that solve all the financial problems of a modern university. The revenue from MIT’s intellectual property amounted to about 5% of its research budget (MIT sponsored research budget financial year 2007 was $1306m, number of inventions disclosed 487, royalties $61m, expenditure on patents $13m, number of staff in office 30) [16, 17]. So while intellectual property may have great potential value, universities and governments should not overestimate the returns since they will hardly protect against impending shortfalls.

Cambridge University, its Colleges, Press and Assessment employ 11,700 people, support 77,000 jobs and have a direct expenditure of nearly £1bn. Outward transfer and exploitation of research (‘technology-push’) has occurred in the Greater Cambridge Technopole (Silicon Fen) which consists of 900 innovation-based companies, 250 of which have been started on knowledge transfer from the University and survive today. The substantial venture capital scene has facilitated a steady growth in the flow of knowledge into industry not only locally but also nationally and internationally (152 invention disclosures, 58 patents filed, 61 licences granted, 28 new start-up companies, 82 consultancy contracts, and four spin-out companies created annually). If the University did not exist the realistic economic impact of the loss on the UK over the next ten years has been estimated at a Net Present Value (NPV) of £53.1bn in GDP and 143,00 jobs [11, 18].

Evidence from the UK suggests that high-technology clusters of R&D-based and venture-backed companies grow out of the research excellence of the local university and around large research universities regardless of the size of the city in which the university exists. A cluster also grows out of universities with a high score in the research assessment exercise; they have a disproportionately larger effect on cluster formation than those with a lower score [13].

A different example emerges from the city of Enschede in the region of Twente, Netherlands where ‘technology-pull’ has been the dominant factor [19]. With a serious decline in its longstanding history of textile manufacturing during the second half of the last century, its science-based Technical University created in 1964 has grown to over 8,000 students and academics. University starter schemes encouraged the formation of spin-out companies and the emphasis has been on a mix of engineering projects that include environmental, chemical and medical engineering. This activity has created a new entrepreneurial climate replacing classical academic attitudes, with a significant impact of R&D companies on the local economy boosted by government incentives for the establishment of start-up companies.

Opportunities The concept of excellence is not only about surpassing others in terms of originality and creativity, it is fundamental to the type of innovation that translates discovery and invention into application. Pavitt [20] has argued that high quality academic papers arising from publicly funded work in prestigious universities and institutions have been the major source of USA patents in recent years. Businesses also gave great attention not only to immediately useful knowledge but to the benefits of trained researchers familiar with the latest research techniques and results, background expertise and membership of leading-edge international networks. For these and many other reasons Pavitt [21] has argued that there are strong reasons for supporting policies at the heart of governance in Europe to ensure high-quality academic research that is mainly publicly funded and frequently interdisciplinary.

The UK is a country with 1% of the world's population, produces 8.5% of the world's papers, receives 11% of the world's citations of scientific papers, and has steadily claimed about 10% of all internationally recognised scientific prizes awards throughout the century. It occupies a leading position if the data were scaled for population size. Yet, it has rarely admitted science to the centre of its policies. During a brief period in the 1960s Harold Wilson's Labour government experimented with the white heat of technology as a charter for modernising Britain. In recent times, however, Tony Blair when Prime Minister stated [22] that 'science is vital to our country's continued future prosperity' and Lord Sainsbury, then Science Minister and now Chair of the Review on UK Innovation, averred that 'science and scientific research should be at the heart of government policy-making' [12]. More recently Sainsbury stated [13] 'the challenge is not to hide behind trade barriers or engage in a 'race to the bottom' but to invest in the future in areas such as knowledge generation, innovation, education, re-training, and technological infrastructure'.

Here, if we needed it, is further evidence that the relationship between higher education, scientific research and social change is an important one given the considerable sums of public (government) money spent on research. Moreover, competition for the creation of new knowledge has increased globally [23] as revealed by recent figures showing that China has overtaken Japan and the UK to become the world's second largest producer of scientific research papers in 2006, second only to the USA [24].

Weaknesses In the UK, all centres of excellence have been in the vanguard of profound changes in respect of institutional cohesion, employment structures, resources and their management, research priorities and their evaluation, the evolution of global networks, and the emphasis on university-industry collaboration [25]. Tenure has virtually disappeared, career paths and career choices have diversified, while small research groups have learned to flourish through networking. Activities have shifted towards research projects so that many of today's research workers can boast a portfolio of short-term projects that provide a mix of basic science, and others that are funded directly by users and stakeholders who demand quick returns to specific questions of an applied nature [9].

However, during this period of turmoil the credibility of scientists has been put at risk. The association between academia and industry has been heavily criticised in the case of genetically-modified crops where the validity of publicised claims has been questioned. Over the past 12 months more than 3,000 news stories were critically analysed and posted on the website of GM Watch, indicative of the intensity of scrutiny by one of several activist groups. Furthermore, analysis of the responses from 1100 people questioned in the UK by MORI opinion pollsters about who they trusted showed that doctors registered 92% of votes, professors 80, clergymen and priests 75, scientists 72, police 61, ordinary people 56, business leaders 31, politicians 20 and journalists 19.

Threats There is an interesting codicil. Not only do you need demonstrably good scientists to create new knowledge, you need demonstrably impartial scientists. Historically, these came from academia and independent people such as those with private incomes who owed no allegiance to anyone. The supply of overtly independent bench scientists is threatened by policies energetically pursued in many countries to drive academia and industry together.

This is not a minor matter. Academic biologists and corporate researchers have often become indistinguishable with special awards being given by governments for collaborations between the two sectors for behaviour that used to be cited as a conflict of interest. Efforts are now made either to avoid or to document potential conflicts of interest so that the nature of the advice is transparent and not called into question [26].

Conclusions

Universities have undergone a remarkable evolution particularly since the onset of the modern scientific revolution. They are now seen not only as creators of knowledge and sources of learning and education but also as drivers of innovation. They are international by nature and the scale of their activities, aspirations and investments are increasing rather than declining in terms of public good as exemplified by work on the human genome, climate change, infectious diseases, particle colliders, large data sets and many other fields. National networks and facilities have been crucial to this process and the development of the international reach has been unprecedented [23]. This trend seems set to continue in relation to things that we value such as wealth, health, food, environment and security [13].

'Curiosity-driven' needs to be protected because it is the life-blood of new initiatives and business opportunities, and it fosters a rich source of the skills required to translate new knowledge into practice. It provides an enhanced ability to solve complex technological problems, and it can be used as an 'entry ticket' into the world's stock of knowledge because it provides the ability to participate effectively in networks and to absorb and exploit the resulting knowledge and skills [20, 26]. Basic research also improves our ability to reach informed decisions and to formulate policies [27] and should not be compromised by the temptations of commercialisation. It should be rigorously evaluated because this will show where investments for the future should be focussed. Outputs are not easily measured, as the UK's Research Assessment has demonstrated, but the aim should be to enhance 'curiosity-driven' research as a public good [13].

The greatest challenge is how to balance the pursuit of creative science and the ever-growing demands of economic benefit [13, 28, 29] because without it lies opportunism and exploitation of knowledge rather than the discovery of its conceptual utility and trustworthiness for the greatest good as distinct from its instrumental use. As Pope John

Paul II has argued – ‘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’ [30].

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