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Corporations and career choice in science and technology

By Dr Stuart Parkinson

A *Scientists for Global Responsibility* Briefing

Summary

Corporations have become one of the most powerful influences within science and technology in recent years. This has thrown up many ethical concerns, not least the issue of whether their involvement has a distorting influence on the direction of research and development. This briefing outlines the key ethical issues in this area, and discusses how these affect career choice for scientists and engineers. It gives tips on spotting ethical corporations and looks at alternative career options in the public and non-profit sectors.

Introduction to the main ethical issues

Commercial corporations play an integral part in science, engineering and technology in the modern world. They are the largest funders of research and development (R&D) and the largest employers of scientists and engineers. Increasingly, governments see the involvement of corporations in scientific endeavour as a keystone of an advanced, industrial economy.

It's true that the commercialisation process can be very important in developing and distributing useful technologies within society. Yet corporate involvement in science and technology also brings with it significant ethical concerns. Most obvious is the way that a corporation is legally obliged to put its own interests first – so that it prioritises the pursuit of profitable technologies and practices even though, in some cases, they may have detrimental effects on human health, social justice or the environment.

This profit imperative leads to other concerns, for example the possibility that corporate involvement in research may bias the results of that research or that commercial confidentiality might require the research to be conducted in a less open way. As a result, these effects might then introduce significant bias into decision-making processes on scientific and technological issues.

In this briefing, I attempt to unravel these ethical concerns in the context of a career in science and technology. I will highlight the activities giving rise to most concern, and those career paths most likely to have a positive effect. I'll begin, however, with some background on corporate issues.

About the author

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Ethical careers in science, design and technology

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The development of the corporation

A 'corporation' is a legal entity set up by a group of people to carry out a specific function, most commonly some form of business. The law recognises it as separate from those who set it up and endows it with a set of rights, which in many contexts put it on an equal legal footing with a person. Two important implications result from this. The first is that the people who run the corporation are legally obliged to protect the interests of the corporation. The second is that the corporation takes on liability for any debts or damage that its activities may cause, rather than the people who run it. J. Bakan discusses these issues in more detail [1].

Corporations have a long history dating back to at least the sixteenth century in England [2]. Initially they were created to give non-profit organisations a formal legal status; making a profit was specifically excluded. But gradually, the number and type of institutions that were allowed to have corporate status were increased, leading to the first commercial corporations around 1700.

Today many corporations are both very rich and very powerful. Indeed, in a list of the world's largest economic entities in 2000, the biggest corporations – Exxon-Mobil and General Motors – each ranked higher than over 150 nation states [3]. Many people question whether organisations whose central aim is to make private profits for themselves or their shareholders should have greater power than governments and other bodies serving the public interest. Specific criticism has been made of the extent to which corporations can wield major influence over legislation on, for example, workers' rights and environmental standards. Numerous examples of corporate malpractice have been documented in recent years [4].

Science, technology and the corporations

The Industrial Revolution in the mid-nineteenth century saw corporations starting to harness technology on a large scale. The larger corporations began to undertake their own research and development (R&D), albeit quite narrow in scope, while scientific research in academia retained a broader focus. Commercial involvement in academia was limited.

In the UK this situation only changed quite slowly until, in the 1970s, concerted efforts were made to rapidly increase links between corporations and universities. This arose from the observation that UK scientific research had led to a number of breakthroughs that had been later commercialised in other countries. Britain, it was argued, was losing out economically and hence academia needed to work much more closely with industry.

Since then, many collaborative ventures between corporations and academia have arisen. 'Science parks' (or 'research parks') – facilities set up on university campuses to carry out jointly targeted research with corporations – provide one such example. Meanwhile, university departments have greatly increased the number of corporately funded projects, research groups and professorships. George Monbiot has highlighted some of the most controversial examples [5]. They include partnerships with military, tobacco, fossil fuel and biotechnology corporations.

UK government policy has continued to encourage expansion of this collaboration. In 1994, it created the 'Foresight' panels to promote greater practical application of research, especially by industry. The following year, the government's Office of Science and Technology was made part of the Department of Trade and Industry. The latest milestone was the launch in 2004 of the ten-year *Science and innovation investment framework* [6], which includes a raft of measures both to expand R&D carried out by the private sector and to increase corporate-university collaboration. Most significant within these measures are a series of funds [7] – with combined budgets of hundreds of millions of pounds – to support collaborative projects and reward the setting up of university-run 'spin-out' companies.

The ten-year investment strategy does include a commitment to significantly expand publicly funded R&D – but much of this is justified in terms of providing a foundation for economic advancement, rather than being targeted at social and environmental priorities.

Currently, about £22.5 billion is spent annually on R&D in the UK, about two-thirds by business and one-third by the public sector (including government departments, universities etc). This represents 1.9% of national wealth (as defined by gross domestic product or GDP). The ten-year strategy aims to expand this to 2.5% by 2014 [8].

As shown in the Figure opposite, the majority of R&D staff work for corporations, with universities being the other main employer. In addition, virtually all engineers working in the manufacturing sector now work in the private sector – most government-run industry having of course been privatised in the 1980s and 1990s.

The ethical concerns of corporate science and technology

As the ties between scientific and technological work and economic and corporate goals have grown, so have concerns about the negative effects of this trend on society. Here I highlight four major ethical concerns related to corporate involvement:

a) that the results of scientific research can be biased or even suppressed;
b) that R&D relating to new technologies does not give enough attention to their possible environmental and social effects;
c) that current technological development can exacerbate social injustice;
d) that current technological development feeds unsustainable consumption contributing to global environmental problems.

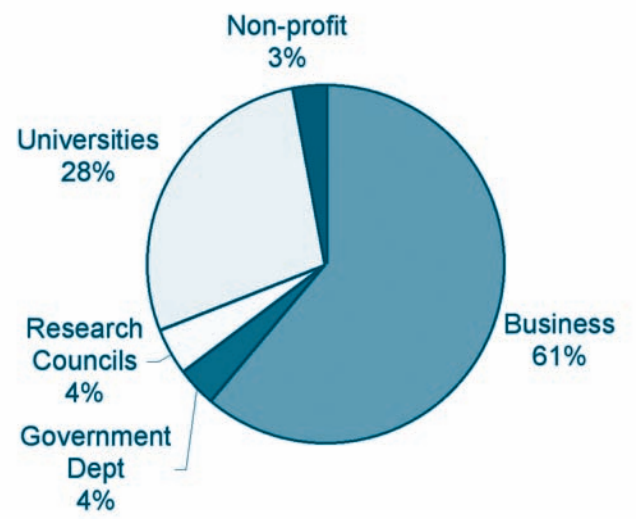

Figure – UK personnel in R&D, 2003
From Office of Science and Technology (2005) [9]

The first ethical concern relates to the way that corporate interests can bias scientific research, both consciously and unconsciously. For example, several large investigations have recently been carried out into the extent of the bias in research on pharmaceuticals. A 1998 study which examined 70 research papers on a particular drug treatment for cardiovascular disease was typical. It found that of those authors supportive of the drugs' positive benefits, 96% had financial relationships with the drugs' manufacturers; while only 37% of those who were critical had such relationships [10]. Almost all of the other investigations found similar results: when a single vested interest, for example a corporation, funds a research study on an area of relevance to them, that study is much more likely to yield results which favour the vested interest. Indeed, as Jennifer Washburn points out [11], the distortion can actually be deliberately imposed through the use of 'gagging clauses' and other measures which actively prevent the publication of unfavourable results.

The extent to which such problems occur in other areas of research outside the field of pharmaceuticals is hard to determine as it has not been as comprehensively investigated. However, most academic journals do not enforce a policy requiring researchers to reveal any financial connections with corporations that may benefit from their research and public concern is justifiably high, especially in areas of controversy like genetically-modified crops. Similar concerns extend to scientists sitting on governmental advisory panels.

The second ethical concern arises from the preference that industry has for high technology. One reason for this preference is that such technological development can yield more opportunities for patents and hence increase profits [12]. However, high technology has a price. The very fact that it is at the cutting edge of science means that its effects when released into society or the environment are often hard to predict. There are many historical examples of products that were considered safe for widespread use when first developed, but were later found to be damaging. They include asbestos, an insulation material which caused major health problems amongst construction workers, and CFCs, used as coolants in refrigerators, which caused the hole in the protective ozone layer [13]. The US government, for example, is currently spending more than $1 billion a year on the development of nanotechnologies – from which it anticipates large economic and corporate benefits – but less than 1% of this budget is spent on researching the environmental or health dimensions [14]. A more precautionary approach to technological development is certainly needed [15].

The third ethical concern is the way that corporate influence can lead to science and technology which exacerbates social injustice. For example, there is a clear imbalance in the global health sector, in which about half the R&D finance is spent by corporations. Here, approximately 90% of the funds (both corporate and government) is spent on tackling diseases which affect only 10% of the world's population – mainly those in the rich, industrialised countries [16]. While corporate influence is not the only factor leading to this imbalance, it is a very significant one.

Corporate involvement can also contribute to social injustice as a result of its bias towards high technology. High technology tends to be expensive and/or requires a sizeable technical infrastructure to support it. As such it can exacerbate the gap between rich and poor, as only those on higher incomes (both individuals and societies) can afford the high technology and the benefits it may bring. This is of particular concern in efforts to tackle poverty

in developing countries. Indeed, some international development organisations focus on developing and deploying 'intermediate' technology (e.g. Practical Action [17]) for helping to reduce poverty, which they find is more successful.

The final concern is that much technological development simply feeds the current unsustainable demand for consumer goods in our society. Many new technological products which are sold in huge quantities (such as electronic goods) have a comparatively large environmental impact for their size, further depleting our limited supplies of material and energy resources and causing huge emissions of pollutants. Together these factors cause major environmental problems such as global climate change and massive losses wildlife losses (see SGR ethical careers briefings on cleaner technologies and climate change [18]). While some corporations are developing technologies which aim to reduce environmental damage, in general the effort is not nearly enough [19]. Sadly the reasons for this inertia are often less to do with scientific and technological knowledge and more to do with economic, corporate and political resistance [20].

Career choices

Having considered all this, it might be tempting to believe that the only ethical path is to avoid all commercial work. However, this would be too narrow an interpretation. The commercialisation process can help beneficial technologies (e.g. renewable energy technologies, health products) to be distributed quickly and widely within society. An ethical career choice can often be swung as much by the aims and ethics of the individual organisation as by its commercial credentials.

In this section, I outline some of the employment areas that show most promise in avoiding ethical problems such as those outlined above, and touch on the thorny issue of whether to work for a multinational corporation.

Universities
As universities are the second largest employers of R&D workers, they are an obvious choice for ethically-concerned scientists and engineers. But, given the increasing degree of business-university collaboration described above, it is wise to tread carefully.

Many areas of university research are of little direct interest to corporations because they are not easy to commodify. For instance, much research is 'blue skies', driven more by a desire to understand the world around us than by a specific application. Some of this research (e.g. astronomy) will have little effect on public policy either way, but other areas of basic research will have important implications. For example, the environmental sciences can help improve our understanding of the climate system or vulnerable ecosystems, which can in turn inform policy decisions in these areas. Most such areas are funded by grants without corporate links, either from public sources (e.g. the UK Research Councils [21] or the European Commission's Directorate-General for Research [22]) or charitable trusts.

However, 'blue skies' research can lead to commercial applications at a future time, and research with relevance to public policy (such as on the environment) may impact on commercial decisions. It is worth investigating who may be using results in your field and for what purpose.

For research that is applied to directly solve problems or develop new technologies, corporate involvement in academic projects becomes more marked. It can take many forms, including:
- complete funding from one or more corporations;
- joint funding from one or more corporations and a public body (e.g. a Research Council [23] or a government ministry) or charity;
- complete funding from public funds or charity, but with the aim of commercialising any products/patents at the end of the project.

In all these circumstances, it is important when deciding whether to work on such a project to consider both the ethical credentials of the corporation(s) involved and the nature of the work. For the former, there are a number of online databases revealing the ethical record of a particular corporation (e.g. Corporate Critic [24]). The nature of the work can be harder to judge. If the project's aim is to improve a mature/ uncontroversial technology to help achieve a clear social/environmental goal, then (assuming the corporation has a good ethical record) there may be few ethical concerns. Examples include adapting a widely-used technology for disabled users, or improving the efficiency of an existing renewable energy technology.

However, there could be ethical problems if:
a) the project involves developing a new technology;
b) the university plans to commercialise the products of the project through a spin-out company.

In (a), the presence of corporate funding could lead to significant bias in the assessment of the health or environmental benefits/damage of the technology, so it is important to look out for safeguards to try to prevent this (e.g. a project advisory committee independent from the funders). The case of (b) throws up various concerns, the most worrying being that the university and/or researcher have a financial interest in the end product. This blurs the distinction between the independent, not-for-profit nature of academic work and the commercial arena, and can cause conflicts of interest. Jennifer Washburn has examined this issue in detail and concludes that such endeavours are ill-advised and alternative strategies should be followed if commercialisation of a technology is considered justified [25].

Other areas of corporate involvement in academia are likely to be narrowly focused on the commercially relevant work, and so ethical concerns will tend to be accorded an even lower priority.

Note the exception of health and medical research, in which a large amount of university research funding comes from charitable trusts with a clear health agenda. Currently this amounts to over £300 million a year [26]. Projects with such funding will avoid many of the ethical problems outlined above.

To conclude, readers should note that only about 10% of funding for UK universities comes from corporations [27], so many research projects will have little direct commercial involvement. However, in some applied areas (e.g. biotechnology, information and communication technologies, energy technologies) corporate funding is a major fraction of that available, and much of the public funding is there to enhance the commercial agenda, so special care is needed in such areas.

Other public bodies

Apart from universities, there are a number of other options for scientists and technologists wanting to work in the public sector. These are:

- public sector research establishments
- government ministries
- schools

Public sector research establishments (PSREs) include research institutes run directly by the seven UK Research Councils. Much of the R&D they undertake is aimed at assisting government bodies carry out their activities, e.g. the National Health Service, the Environmental Agency. Schools obviously do not carry out any R&D but there is currently a shortage of science teachers, so this is another positive option.

While these employers do not have the narrowly focused financial agenda of the corporation, they are not entirely free from ethical concerns. For a start, the government's belief in the central role of commercialisation within science and technology will affect how your work is directed and used. In particular, PSREs are in a similar situation to universities in that the government is putting pressure on them to build closer links with industry. Finally, there is the added complication of whether government policy in your area of work meets your ethical standards.

Charities and campaigning organisations

Between the public and the corporate sectors lie the 'private non-profit organisations'. These include charities and campaigning/political organisations, which are much freer to pursue an agenda that prioritises ethical concerns such as human health, social justice, peace, environmental sustainability or animal welfare. They employ comparatively few scientists and technologists in R&D (only 3% of the national total), but a large fraction of their R&D funds goes to supporting researchers within universities, and many also employ scientists in public education work.

Of the charities that carry out R&D themselves, the largest employers are the health charities. Some (e.g. Cancer Research UK) are large enough to run their own postgraduate training schemes. Smaller organisations can offer a focus on specific ethical concerns which have not attracted large funds from elsewhere. For example, the Dr Hadwen Trust [28] funds only medical research that does not involve animal experiments.

Campaigning and political organisations – which include many environmental pressure groups and health advocacy groups – employ a few scientists, generally either in education/campaign work or in commissioning and co-ordinating research from academia.

It is important to be aware that some charities and campaigning organisations have close links with particular corporations from which they derive a large fraction of their income. This will obviously affect their priorities. Indeed, some of these organisations have been specifically set up by corporations to lobby in support of their own interests. This problem is especially widespread in the USA, but increasingly it is happening in other countries.

Look up and double-check the ethical claims of any prospective corporate employer

For example, in the UK, an organisation called the Scientific Alliance was set up using industry finance to provide counter arguments to those put forward by environmental campaigners [29].

Ethically-orientated corporations

There are a growing number of corporations that were set up specifically to contribute to an explicit ethical aim or aims. Such companies tend to be fairly small, to have clearly defined social and/or environmental objectives, and to see commercial activity as a way of helping them achieve their main aims. Examples of such employers can be found on the SGR web-site [30]. They are most commonly found in the renewable energy, green building, and environmental consultancy sectors.

Multinational corporations

In the last few years, a corporation's ethical record has become increasingly important, affecting how much financial investment it can raise or how many of its job vacancies it can fill with high quality candidates. In response to this, a concept called *Corporate Social Responsibility* (CSR) was developed in the 1990s to help corporations to become more ethical. It has been embraced by many major multinational corporations. While some argue that CSR has had a major positive impact on corporate behaviour [31], others argue its contribution will only be significant if regulation is much stronger [32]. But one thing is clear: multinational corporations are now much better at presenting their activities as 'responsible' than they used to be. Hence, it is especially important to check their ethical record [33].

This is especially relevant to scientists and technologists for two reasons:

- a high percentage of the available jobs is with these companies;
- they offer attractive training packages in a wide range of fields.

Some may choose to reject such employment options because these companies have a large number of ethical shortcomings, widely discussed elsewhere. However, another possibility – if you find your options limited – is to work for such a corporation for a short period, gain experience, and then, when the opportunity arises, move to a more ethical employer.

Concluding comments

As this briefing has shown, corporate involvement with science and technology raises complex ethical issues for scientists and technologists. However, there is a range of career options that can either allow positive contributions or avoid problematic ones. The most promising routes are:

- R&D at a university which is either publicly or charity funded;
- R&D for an ethically orientated corporation;
- research, education or communication work at a non-profit organisation.

However, as with many ethical issues, there are always grey areas, so it is important to try to understand the background of your work – how and why it is carried out – in order to make as informed a career choice as possible.

References and further reading

[1] Bakan J. (2004). The Corporation: The Pathological Pursuit of Profit and Power. Constable, London.
[2] Bennett D., Paul H. (1999). The creation & development of English commercial corporations and the abolition of democratic control over their behaviour. Program on Corporations Law & Democracy, Corporate Watch, Oxford.
http://archive.corporatewatch.org/pages/dan_corp.html (accessed June 2005)
[3] UNCTAD (2002). Are transnationals bigger than countries? United Nations Conference on Trade and Development, Geneva.
http://www.unctad.org/Templates/webflyer.asp?docid=2426&intItemID=1634&lang=1 (accessed 22/09/05)
[4] For example, see Monbiot G. (2000) Captive State: the corporate takeover of Britain. Macmillan, London. See also [1].
[5] p281-301 of [4]
[6] HM Treasury, DTI, DfES (2004). Science and innovation investment framework 2004-2014. The Stationery Office, London.
http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/
spending_sr04_science.cfm
[7] One example is the Higher Education Innovation Fund.
[8] p6-7 of [6]
[9] Office of Science and Technology (2005). Science, engineering and technology statistics. (Tables 5.14 and 8.3)
http://www.ost.gov.uk/setstats/
[10] Stelfox H. T., Chua G., O'Rourke K., Detsky A. S. (1998). Conflict of interest in the debate over calcium-channel antagonists. New England Journal of Medicine, no 338 p101-6.
[11] Washburn J. (2005) University Inc. – the corporate corruption of higher education. Basic Books, New York.
[12] A patent is a licence given to the developer of a new technological product which allows it to have exclusive commercial rights over that product for a period of time (commonly 17 years).
[13] Often some evidence of health or environmental problems was available early in the development of such products but controls were inadequate. Detailed case studies can be found in: European Environment Agency (2001). Late Lessons from Early Warnings: The precautionary principle 1896-2000. Environmental issue report No 22. Copenhagen. http://www.eea.eu.int/
[14] Balbus J., Denison R., Florini K., Walsh S. (2005). Getting nanotechnology right the first time. Issues in science and technology, summer, p65-71. National Academy of Sciences.
[15] See reference in [13] for more details of the steps that need to be taken.
[16] Global Forum for Health Research (2004). The 10/90 Report on Health Research 2003-2004. http://www.globalforumhealth.org/
[17] Practical Action; http://www.itdg.org/
[18] SGR ethical careers web-pages; http://www.sgr.org.uk/ethics.html
[19] Worldwatch Institute (2004) State of the World 2004: Progress towards a sustainable society. Earthscan, London.
[20] See, for example, Von Weizsacker E. (1998). Factor Four: Doubling Wealth, Halving Resource Use - A Report to the Club of Rome. Earthscan, London.
[21] Research Councils UK; http://www.rcuk.ac.uk
[22] Directorate-General for Research, European Commission; http://europa.eu.int/comm/research/index_en.cfm
[23] The largest industry-Research Council programme is called LINK.
[24] Corporate Critic; http://www.corporatecritic.org/
[25] p137-170 of [11]
[26] p42 of [6]
[27] Chapter 5 of reference in [9]
[28] Dr Hadwen Trust; http://www.drhadwentrust.org.uk/
[29] Rowell A. (2001). Hard rockers. The Guardian. 11th July. http://www.guardian.co.uk/
[30] as [18]
[31] For example, see Arena C. (2004). Cause for Success: 10 Companies That Put Profit Second and Came in First. New World Library, California.
[32] For example, the CORE coalition; http://www.corporate-responsibility.org/
[33] In addition to [24], there are several other websites which are useful for checking corporate claims of ethical behaviour: Corporate Watch - http://www.corporatewatch.org/; SEE companies - http://www.SEEcompanies.com; Lobbywatch - http://www.lobbywatch.org/; Spinwatch - http://www.spinwatch.org/

Ethical careers in science, design and technology

About the series

This briefing is one in a series, produced as part of the *Ethical careers in science, design and technology* programme. The programme is intended to give information and advice to students and professionals in science, design and technology about the wider ethical dimensions of careers in these fields. Each briefing focuses on a field in which these professions can play a major role, either good or bad, and examines the social and environmental controversies in that area. It then gives guidance on how to make an informed, 'ethical' career choice. For further details about the programme - including a full list of the current briefings and a list of 'ethical employers' - see www.sgr.org.uk/ethics.html or contact us (details below). The series of briefings is edited by Dr Stuart Parkinson and Vanessa Spedding, Scientists for Global Responsibility (SGR).

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