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The Sustainability of "Postmodern" University Research

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1. Introduction

A succinct definition of the mission of a university has been given by Spier (1998) as to inspire curiosity, instil criticality and inculcate capability (in the students). On the other hand, the industry's mission is to survive, which it typically achieves through the generation of profit and the loyalty of its employees. The different missions imply different characteristics: the University is open, whereas industry is secret and closed;[1] the University is individualistic, whereas industry is based on teamwork and hierarchy; and the University is nonmonetary, whereas industry is monetary (Spier, 1998). Yet the two are intimately related since many of the University's alumni will work in industry or commerce after graduation.[2]

The relative importance of students to a university can vary widely. Some universities fill lecture theatres with large numbers of undergraduates, who might have very little contact with the professors during their years of study. Others are focused on research and the numbers of students, who are all graduates and themselves engaged, to a greater or lesser degree, in research, are comparable to the numbers of staff (including research assistants and junior academic grades as well as the professors).

Spier's definition of the mission of a university does not include the generation of knowledge. The greater the ratio of

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research staff to undergraduates, the more important knowledge generation is in the mission of a given university. There are two broad models for the relationship between knowledge and wealth (Pethica et al., 2008). The "Baconian" (after Francis Bacon, who was led to the idea by reflecting on the way the Spaniards had apparently achieved technical superiority over the English around the time of the Spanish Armada in 1588) model argues that research (knowledge generation, including gathering facts but also the equally important work of creating new laws, usually as a generalization of specific facts) leads to technology, which in turn leads to wealth, both through spawning profitable industries and through ensuring military superiority. In Bacon's vision, the two purposes of science are "for the relief of man's estate" and for intellectual enlightenment. Insofar as mankind has both material and spiritual needs, both are important. Nowadays, Bacon's model is often used by governments to justify public expenditure on science – they expect that it will increase gross domestic product. In the "alternative" model (Ramsden, 2018), wealth comes first and leads to leisure, a fraction of which is devoted to science. Since scientific discoveries usually end up being exploited in one way or another, hence leading to wealth generation, the process becomes cyclic and the difference between the two models vanishes, although the "alternative" model cannot be used to justify public expenditure on science – sapient private entrepreneurs will spot opportunities for developing scientific discoveries.

The more fundamental the research, the more far-reaching the ultimate consequences. As Bernal (1939) has pointed out, however, the more "upstream" the research, the more general the benefit, the corollary of which is, the more difficult it is to get anyone to pay for doing it. People have always been able to make a personal decision to set aside some of their leisure for scientific investigation. In some fields, such as astronomy, the role of the amateur is still important. Otherwise, there are two choices. The

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research can be paid for by students receiving tuition, either from individual researchers using some of their time to coach students – even Socrates might have followed this model, although as far as we know he had what are nowadays called independent means and students did not need to pay to attend his *conversazioni* – or within the framework of an institutional arrangement whereby tuition is available and research laboratories exist. Alternatively, people of great wealth can endow "seats of learning" as a good thing (i.e., an enhancer of civilisation). Many colleges of the ancient universities of Oxford and Cambridge received vast endowments of land from various kings, queens and others to support their fellows. Naturally enough, fellows working at the forefront of knowledge attracted students around them, who would essentially assist in the research (e.g., by acting as amanuenses); arrangements might be made to instruct them more formally in areas where their knowledge was deficient.

Land, however, is finite and the population ever-increasing. Although this might increase the value of a given piece of land, it limits the possibilities for endowing more recent foundations.[3] As a result, universities have had to become dependent on other means of finance, and student fees are nowadays very important, whether they are paid directly by the students or on their behalf by governments convinced that encouraging the higher education of their citizens is a good thing.[4] Subsidies may also be paid as a block grant, independent of the number of students. This seems to be favoured by governments because it allows them to exercise control over the universities.[5] For research-intensive universities, with small numbers of students, this route is inadequate–bearing in mind that there is a practical upper limit to the fees that can be charged. The idea has therefore arisen that universities could generate income directly from their research by selling it.

The idea of "selling research" is not, of course, new. To some extent, it depends on the meaning of the research (Ramsden, 2011). If the emphasis is on the "re", facts are simply gathered

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and compiled into reports. Much business research (e.g., market research) is of this kind. There would usually be no attempt to create new knowledge through an inductive process. At best, certain generalisations might be deduced from the gathered facts. This kind of research can usually be fairly accurately planned and, hence, it is easy to draw up a contract to supply such results.

One characteristic of this kind of research is that the results, since they lack generality, are only of interest to a limited group of people or organisations. The most valuable market research is commissioned by a company and specifically investigates that company's products, either existing or projected. Research involving testing a specific product, or optimising a product, is of a similar nature. In the past, much work of this kind, essential for any industry wishing to remain ahead of its competitors, was conducted in-house in laboratories specially constructed for that purpose. Larger companies had their own research and engineering centres. Smaller companies, unable to afford such expensive facilities, subscribed to research organisations such as the Paper Industries Research Association (PIRA). Some of these organisations even became international, such as the Tin Research and Development Council.[6]

During the past few decades, however, it has been a notable trend for these in-house facilities to be run down. The most striking example is the rather well-known fate of Bell Laboratories in the USA. Nowadays, it is hard to imagine that half a century ago, United Steel employed about 70 people (under the direction of Stafford Beer) researching into cybernetics. Perhaps only the pharmaceutical industry (in the UK) maintains large in-house research facilities nowadays – and even those seem to be under threat, as evinced by the closure of the splendid Sandwich laboratories of Pfizer (which is, however, not headquartered in the UK).[7] The government has encouraged companies to outsource their research to universities (Lambert, 2003). The traditional university is not, however, well-suited to carry out industrial

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research. Most importantly, industrial research necessarily lacks universality. Its results are relevant to a very specific client, hence a university wishing to undertake such research must become closed and secretive, contrary to the essential ethos of the University. This development is not new. Commenting on the situation in Germany around the beginning of the First World War, Frederick Scott Oliver (1915) perceptively noted that "the close alliance between learning and the bureaucracy does not seem to be altogether satisfactory. For thought loses its fine edge when it is set to cut millstones of state. It loses its fine temper in the red heat of political controversy. By turning utilitarian, it ceases to be universal; and what is perhaps even worse, it ceases to be free. It tends more and more become the mere inventor of things which will sell at a profit; less and less the discoverer of high principles which the gods have hidden out of sight."

2. Some terminology

There has been a good deal of debate and discussion about the changing role of universities in recent years. Different authors have invented different terminologies. Gibbons et al. (1994) refer to "Mode 1" (traditional academic) and "Mode 2" (sponsored) research; Ziman (e.g., 2003) refers to non-instrumental (or pre-instrumental) and instrumental research. The concept of the "triple helix" has been elaborated to denote the intertwining of government, universities and industry (Etzkowitz and Leydesdorff, 2000).[8] Although the term is new, the idea is not – this is exactly what Oliver was referring to in the quotation at the end of Section 1. Then there is also the notion of the postmodern University. This is somewhat difficult to define, as hinted at by Readings (1996) – mainly through "excellence in excellence" (Webster, 2013). The more strident the assertions of excellence, the less likely they are to correspond to reality. At many universities, every PhD vacancy seems to be labelled "a fantastic

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opportunity". Doing a PhD is a wonderful privilege, but the candidate who does not already have the ineradicable desire to embark upon it but is merely seduced by the "fantastic opportunity" is unlikely to enter into the spirit of the apprenticeship for research, which is essentially what the PhD is. Rather, this sort of appellation seems to correspond to what far too many PhD studentships have become – providing merely technical services as part of a closely prescribed programme of contract research. I am inclined to think the postmodern University is synonymous with the university engaged in Mode 2 or instrumental research for, as I shall show below, this type of activity implies the loss of traditional university values.

3. The dangers of contract research

A university accepting a contract to carry out a certain piece of research is potentially exposing itself to dangers. The first question to answer is why clients want the research to be undertaken. The straightforward answer is that they want to find out something that they know they don't know.[9] For example, they may wish to know how a particular steel can be made tougher. A series of empirical experiments, guided by general metallurgical knowledge as well as existing facts, may well suffice to provide the answer. The prevalence of such work in industrial research laboratories presumably accounted for Bernal's (1939) observation of "the peculiarly unimaginative nature of industrial research". In contrast, the traditional university was more interested in true exploration – the unknown unknowns. Since, however, the industrial research laboratories have mostly been closed down, it is left to the universities to take on such work. It is rather tragic that the PhD, conceived as an apprenticeship in navigating the terrain of the unknown unknowns, all too often has become a well-mapped journey through the known unknowns. Nevertheless, if the university is

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strapped for cash, it may have no other option than to accept such work.

Far more pernicious is a situation when the client already has a firm view of the result from the research. This typically arises when an industrial company has invented a new chemical that has excellent properties as a pesticide or a medicinal drug, for example. Legislation in many countries demands that a chemical be demonstrated to be safe before it is allowed to be sold. There is a certain attraction in contracting a university to investigate such a thing because universities are supposedly independent and objective. Thus, its result should carry more weight than if the same study had been undertaken by the manufacturer. Unfortunately, venality is likely to intervene to distort the outcome of the university research. As Upton Sinclair remarked in 1936, "It is difficult to get a man to understand something when his salary depends upon his not understanding it." This is the trap into which the professional world is always likely to fall. As Denman (1993) has put it, "Truth, as one saw it [in academic life], was outspoken and expectant of contradiction, confrontation, rebuttal, denunciation and criticism. Words were not trimmed nor ideas double-thought. The straight flung speech was never considered impolite. The professional world, on the contrary, appeared to confuse politeness with deference. The shopkeepers' code, the customer is always right, was the aphorism to work by. Should the client wish to think that black is white, don't disillusion him – you might lose a fee! What the French call *prévenence* held precedence over a hammered-out truth."

The distortion might even take the form of suppressing that part of clinical trial data that showed unacceptable side effects of a drug (Healy, 2003). Other egregious practices are mentioned by Brown (2002) and Goldacre (2012). A more pernicious example is given by the recently published "Aircraft cabin air sampling study" (Crump et al., 2011).

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3.1 A case study – aircraft cabin air

Modern jet aircraft flying at high altitudes need to pressurise their cabins. Up to the early 1960s, this was done using a dedicated compressor. Since then, the air has been bled off from the forward parts of the jet engines. Although this is an elegant and economic engineering solution, it creates the danger of introducing neurotoxic organophosphates, practically unavoidably present in the jet engine oil, into the cabin.[10] Since governmental regulatory agencies have the responsibility for ensuring safe flying conditions, it was natural for the UK Department for Transport to commission research to actually measure the composition of aircraft cabin air. It might seem surprising that the department does not itself have the scientific expertise to undertake such a study, but apparently, it does not. Cranfield University was commissioned to carry it out and the final report was published on the World Wide Web (Crump et al., 2011). The last paragraph of the final section ("Conclusion") of the report is "With respect to the conditions of flight that were experienced during this study, there was no evidence for target pollutants occurring in the cabin air at levels exceeding available health and safety standards and guidelines."

At the very least, this statement can be construed as being misleading. There are, actually, no relevant "health and safety standards and guidelines" available at present. Furthermore, the results themselves are none too sound – even generic knowledge of statistics reveals that. Nevertheless, on the day the report was published (10 May 2011) by the Department for Transport, the Minister of State (Mrs T. Villiers) gave a written statement that "The main conclusion of Cranfield's research was that there was no evidence of pollutants occurring in cabin air at levels exceeding available health and safety standards". Notice the subtle distortions in the statement. Crump et al. did not actually state that this was the main conclusion (although its position at the

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very end of the main body of their report might well imply this), and they referred to "guidelines", whereas Mrs Villiers referred only to "standards", which are even less palpable for the key pollutants than the guidelines.

It is quite clear from the history of this topic (and parallel developments in Germany) that the government has strongly resolved to deny that there might be a health (long-term effects of chronic exposure) and even a safety (pilot incapacitation) problem. While it is possible to demonstrate the enormous costs (direct medical costs and loss of gross domestic product) arising from the deleterious effects on the health of, especially, frequent flyers, presumably the costs associated with admitting the problem are many orders of magnitude greater. They would probably be mainly incurred through liability actions taken by aircrew and passengers against airlines and aircraft manufacturers. Given the very high current level of taxation of passenger flights, governments would also face an enormous loss of revenue if the industry collapsed. While creative solutions to avoid this scenario can doubtless be found, governments have resolved to adopt the strategy of the tortoise to deflect any criticism of the present arrangements. It is a *curiosum* that the official regulatory body of the air traffic industry, the Civil Aviation Authority (CAA), is actually owned by the industry; hence, the "double helix" of industry and government is especially tightly intertwined in this case, and it is highly regrettable that a university was recruited to complete the triple helix – a perfect illustration of Etzkowitz and Leydesdorff's thesis.

Given this background, it is possible to infer that the government wished to produce "independent" evidence of no danger. Since universities have a traditional reputation for independence and the ability to deliver objective research results, a university was commissioned accordingly. There seem to be two ways of interpreting the final report. One is that the authors, perhaps through sheer incompetence, simply botched the job. One

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is naturally reluctant to accept such an interpretation; the authors are established academic scientists. The other is that they were, in some subtle and doubtless practically untraceable fashion, instructed – perhaps by their head of department in a quiet conversation – to produce a result predesired by the client. It is, of course, a far worse offence to have gone along with this perversion than to have acted incompetently.

This case is perhaps unusual because of the determination of some of the individuals, especially pilots, whose health has been affected, to get to the bottom of the matter. It would appear that there are other examples (e.g., connected with genetic modification of comestible crops and the use of pesticides in agriculture) where, in a similar fashion, a university was commissioned to carry out a study to produce a predetermined result,[11] but the constituency suffering detriment in consequence is not as determined and articulate as the pilots and flight attendants.

The aircraft cabin air study is particularly egregious because the erroneous conclusion was actually given in the report produced by the University. If the authors had merely presented the data and left it for the Minister to make the (indefensible) statement that "the levels of pollutants found did not exceed available health and safety standards," the university's record would have remained unblemished.[12] The ramifications of universities accepting such research contracts with dubious motives go well beyond the work associated with the specific contract. Although such work is generally conducted fairly discreetly, it is usually not formally confidential and secret, and colleagues (working in related or other areas) of the researchers actually involved may well come to hear about it. If so, it is their duty to call attention to the dereliction of academic standards and encourage a proper debate on the matter. On the other hand, the administrators of the University, eager to receive the income associated with any research contract, feel, doubtless equally

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strongly, that it is their duty to suppress such debate, for by displeasing the client who commissioned the specific contract it may well lead to no future work from that client, nor perhaps from its industrial allies, being commissioned. Indeed, once a university acquires a reputation for unflinching honesty in undertaking and reporting research work, some industries may baulk at commissioning research from that university since, after all, the outcome of real research is unknown and unpredictable.

3.2 The research councils

By "research council" I include all those governmental agencies that disburse public monies to scientists for undertaking research. In some countries, they are known as national science foundations. The oldest, that in the USA, was created in 1950, hence the concept is a relatively recent invention. Switzerland followed suit in 1952; the UK Science Research Council was formed in 1965, and the French Agence Nationale de la Recherche was founded as recently as 2007. The European Union has a comparable programme of research and technical development.

The *modus operandi* of these organisations is to accept more or less specific "proposals" for carrying out research, which are then assessed by a committee, possibly assisted by external referees, who would typically be active scientists working in the same field as that of the proposed research, in order to reach a decision on whether to disburse the requested funds. Formerly (that is, when the system first started), there was a distinction between a "grant" and a "contract". The former was, as the name implied, a grant of money to a scientist to work in a certain area, which might be as vaguely defined as "theoretical physics" for example. The latter was money given to undertake a closely defined piece of work with specified outcomes. Since the research councils, again at least initially, only dealt with "basic" research without immediate applications, the specified outcomes might be

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genuinely undetermined, but at least the questions being addressed were closely defined.

Over time, the distinction between the two has become blurred. Already in the 1980s in Switzerland, for example, a scientist with a long and distinguished track record in a certain special field, feeling that he had exhausted his interest and creativity after a decade spent researching it, might then seek to change to a new field, albeit within the same discipline. His application for a new grant would typically be refused on the grounds that "he has no track record [in the new field]". Since then, most so-called "grants" are actually research contracts: the research proposed must be carefully specified in advance. The European Union has developed this prespecification to a high degree: proposals must include formal "milestones" and "deliverables" and every year the performance of the grant recipients will be checked against the previously declared milestones and deliverables. Presumably, failure to reach them and deliver could result in the cancellation of the remaining term of a grant, although this seems to happen infrequently despite the generally poor performance of researchers working on EU contracts.

This system results in grave distortion of the scientific method and, although it was foolishly introduced by accountants wishing to avoid wasting public money by ensuring that it was spent on exactly what it was given for, the actual result is a waste of nearly all the money spent because the scientists have given up their freedom in return for bread. The research funded by the research councils is nowadays overwhelmingly of a pedestrian and trivial nature. The layman, however, reading the glossy brochures produced by these councils, would not think so. John Armitt, sometime chairman of the UK Engineering and Physical Sciences Research Council (EPSRC), was asked "What have been the most successful research projects under your leadership?", to which he deceitfully responded: "The award of the Nobel Prize

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for physics to the EPSRC researcher Professor Andre Geim and fellow Russian-born scientist Konstantin Novoselov for their groundbreaking work on graphene was very exciting".[13] The EPSRC would never have funded the work that led to graphene because, had there been such a proposal, it would have lacked milestones and deliverables (sometimes called "objectives"). And why is Geim labelled an "EPSRC researcher"? Perhaps because he has received an EPSRC grant for some trivial piece of work.[14]

It frequently happens that, after having carefully written a proposal in the currently acceptable form with its minutely detailed description of the "research" to be carried out, once the money has been granted, the researchers will sit down to discuss what actually ought to be done. Perhaps in the meantime (and, typically, many months will pass after having submitted the proposal before notification whether the money will be granted is received) the investigators have become cognizant of new work carried out elsewhere and just published, or have had further reflexions of their own, and they have conceived an even better way of tackling the problem than that described (with its full panoply of milestones and deliverables) in the proposal. But such an advance puts them in a quandary, for if they now carry out the research as it should be carried out, to the best of their scientific judgment, they will no longer fulfil the stated milestones and deliverables, and might even be asked to repay the grant! Many university researchers, under extreme pressure from the administrators to ensure that the money comes in, will simply carry out the work according to the original plan – essentially wasting money from any grander viewpoint, but well fulfilling their contract from the viewpoint of the research council and university administrators.

Great waste also arises through the fact that only a small proportion – 10% is nowadays a typical figure – of proposals end up being funded. Despite strenuous efforts, it does not seem to be possible to establish a set of criteria for what makes a good

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proposal, which could be used for internal review purposes within the institution before sending it out to the research councils. As David Stephenson, erstwhile Professor of Materials Processing at Cranfield University, has forthrightly asserted, "A good research proposal is one that gets funded." Therefore, 90% of this proposal-writing effort (which typically takes up at least a quarter of the productive working time of most scientists nowadays) ends up being wasted.[15] Apart from the waste of time, there is also the deleterious effect on morale. This seems to be a particular problem among the sometimes large international consortia of researchers that must be constituted to bid for EU research funds. A particularly bad feature of the EU "Framework" programmes is that there are formal assessment criteria for evaluating proposals, and all those exceeding a certain threshold are supposed to be funded, but because of perhaps unavoidable human weaknesses in the system (such as overgenerous assessment by some of the subpanels charged with assessment) sometimes only a minority of the proposals exceeding the threshold can be funded, which is particularly disheartening for the members of the consortia.

All of the research councils use some kind of committee system for evaluating proposals submitted to them. As is well known to students of comitology, a committee will tend to reach consensus on the most unexceptionable of a collection of items, which means, in the case of research proposals, that all those displaying some spark of originality will be vetoed by at least one member of the committee. This situation can also be formally examined using the concept of the "mainstream". By definition, in any given field, most scientists are working in the mainstream. Therefore, mainstream scientists will always form a majority on any committee.[16] Hence, any proposal departing from the mainstream will always be outvoted (Gillies, 2010). In countries implementing research assessment systems, such as the UK's Research Excellence Framework (REF), the prospects for pursuing innovative, original work have become even fainter.

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REF amounts to a quadruple peer-review process. First, there is the rigorous selection for an established academic post at the University (candidacy for which presupposes having successfully passed numerous examinations to obtain the requisite degrees). Only such established academics are allowed to submit proposals to the research councils, the main source of funding nowadays for all but work requiring only pencil, paper and thinking. These proposals are themselves rigorously peer-reviewed. The work will hopefully result in papers submitted to journals – again, these are rigorously peer-reviewed. Finally, under REF, these papers are again peer-scrutinised. Some peer review is doubtless necessary to weed out absurdity, but clearly, we now have a surfeit. Perhaps we should keep the rigorous selection process for academic appointments and for published journal papers (especially since nowadays anyone is free to post outrageous ideas on their own website), but eliminate it for proposals (as was advocated several decades ago by O.G. Selfridge),[17] and abolish research assessment systems altogether.

The present long-winded and expensive – in terms of both time and money – process is likely to finally and definitively ensure that any new ideas are prevented from reaching fruition.

Given the ever-increasing financial stringency in one form or another affecting the resources available for scientific research,[18] it is of heightened importance to ensure that what is spent is well and wisely spent. While concentrating funding into specific pieces of proposed research, as has become the norm in the UK through their system of research councils, as well as elsewhere, might seem like an effective way to prevent waste by eliminating work that does not yield predefined "deliverables", there is a pernicious secondary effect of this policy which, because it is slow to become apparent, has already built up to an alarming degree. Namely, because the universities hosting the research projects retain a percentage of the grant for their "overheads" (upon which they rely to remain solvent), the ruling

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criterion for a "good" proposal is the size of the grant. As far as the university administration is concerned, the intrinsic scientific quality of a proposal plays no role, provided the grant is won. This leads inevitably to a drift towards mediocrity, and even if some individual scientists still strive to combine winning largesse with quality, there seems to be no corrective mechanism to prevent the general drift or reverse its direction, and ultimately, the funded science will become so trivial as to marginalise itself in society. Project-funded research is, therefore, unsustainable.

4. The ascendancy of administrators in universities

As pointed out in the Introduction, the age of seats of learning endowed with vast tracts of land, removing from their bursars the need to indulge in astute financial manoeuvres of the kind associated with contemporary fund management, belongs to the past. No doubt, according to contemporary benchmarks, this rather passive traditional approach would be labelled as grossly inefficient – and indeed it might be, in the short term. At the beginning of the Thatcher era, in the UK universities, in general, had acquired the reputation of not being particularly efficiently managed. The work of the Steering Committee for Efficiency Studies in Universities, under the chairmanship of Sir Alex Jarratt, set out to change all that. The Jarratt Report (1985) resulted in very far-reaching changes to the way universities were organised. Essentially it led to the replacement of the old collegial style of governance, in which those responsible for administration (e.g., the heads (chairmen or deans) of departments, the Vice-Chancellor) were elected by their peers to serve for one or two years, and accepted it as a necessary, albeit undesirable, obligation balancing the privileges of academia, by a new professional style of governance, in which administrative posts were of indefinite duration and were not elected but appointed. Appointees could now – and often did – come from outside the

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university. Internal appointments were usually professors who were no longer productive in research and did not relish marking time until retirement; external appointments were typically professionals armed with qualifications in accounting, management, etc.

The one curious thing about the situation is that it seems that the academic staff who became administrators almost invariably aligned their attitudes with those of their new peers, the professional accountants etc. True scientists generally find these attitudes inimical to their work, because everything seems to be subordinated to money. This tension is by no means confined to universities. Private companies have also greatly suffered from the domination of accountants. A very good example is the once-proud engineering company Guest, Keen and Nettlefolds, which (perhaps surprisingly) still exists but is nowadays known as GKN. They used to publish an excellent house journal, *Far and Wide*, containing articles of an extremely high standard. This was axed by accountants who saw it as a pointless extravagance. To those who were lucky enough to be sent copies of *Far and Wide*, it epitomised uncompromising quality and excellence and one presumed – rightly, I dare say – that this was an ethos deeply rooted in the company and that one could, therefore, expect the same kind of excellence from any of their products and services. That seems to be a more elevated standard than any achievable by carefully controlling costs. The accountants' mentality will never go the extra mile (for there is usually no immediate return of such an investment of effort). In their almost nonexistent imagination, prospective customers will coldly compare rival products and their costs and decide according to the best ratio. This strikes the scientist as being incredibly naïve. One might be able to do it with some very simple product, but even something as apparently simple as a sheet of paper has certain attributes that cannot be captured in a specification – one has to feel it in one's hands, and the reputation of the paper mill also counts for quite a lot.

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Ironically enough, in a kind of deconstructionist procedure, the accountants have now invented "product-service systems" (PSS) in which it is acknowledged that what the client desires is not simply a piece of manufactured material or machinery but something greater in scope and less tangible that provides ongoing functionality. The accountant will nevertheless still assert that this enhanced offering can be compared with rivals and a judgment made.

The great defect of the accountant is that he (or she) lacks morals, at least from the viewpoint of the scientist. They do have a kind of ethical code – one that demands that any outstanding account is settled to the last penny. An invoice for an expensive piece of machinery may amount to, say, £1,350,246.10. They will cavil at receiving £1,350,246, let alone at £1,350,245. On the other hand, they might accept £1,350,247 – suggesting that venality preponderates over logic. Since morality is ultimately arbitrary, this lack might not be a real defect, were it not associated with the neglect of lofty ideals. *Far and Wide* represented a lofty ideal, but if the idea of selling, as a profitable sideline, a pornographic broadsheet had occurred to the contemporary management of GKN, there would doubtless have been no argument against it.

As Christ remarked in his Sermon on the Mount,[19] "Ye cannot serve God and mammon". Although not all scientists would agree, clearly, science is a divine calling since its results are measured against the absolute, which is a synonym for God. The accountant must somehow manage not to serve mammon, despite being frequently confronted by him.

The ethical code of the scientist has been very eloquently set out by Richard Feynman in his 1974 Caltech commencement address.[20] He remarked, "...the idea that we all hope you have learnt in studying science in school – we never explicitly say what this *is*, but just hope that you catch on by all the examples of scientific investigation... It's a kind of scientific integrity, a

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principle of scientific thought that corresponds to a kind of utter honesty... In summary, the idea is to try to give *all* of the information to help others to judge the value of your contribution; not just the information that leads to judgment in one particular direction or another."

This kind of thinking is completely alien to the mind of the administrator. But if the administration has become so powerful that it preponderates in the running of the university, then the chances are that science in that university will be destroyed. If the scientist who has won a research contract from a public funding agency becomes convinced that doing the research is worthless and a waste of his time, but does it nevertheless because he has a contract to do it and if he doesn't, then the university will not get paid and will not get its overheads, then the scientist is being dishonest, but the administrators will be happy.

5. The ascendancy of lawyers

The administrators are perhaps not so much immoral (i.e., actively opposed to the morality of science) as amoral – in other words, blandly unconcerned with the issues. Although the institution and recognition of the degree of "master of business administration" (MBA) have conferred some coherence on the corps of administrators, this is a comparatively recent development, and even today, they have a fairly heterogeneous background. As mentioned above, in universities, they are typically either former scientists or professional accountants.[21] There is another, much older profession, namely that of the law, with a much more clearly delineated ethos. Lawyers are perhaps not particularly strongly represented among administrators, but they represent the largest professional group in the present UK parliament (and have been so for many decades) and are well represented on the boards of companies and in committees of inquiry. Some of these committees – most notably, perhaps, the parliamentary ones – are

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quite active in investigating "scientific" topics, by which I mean topics in which some knowledge of science is needed in order to reach conclusions of any value. Since we have already mentioned (Section 3.1) the aircraft cabin air issue, we can use it again as an example: the House of Lords Select Committee on Science and Technology's Fifth Report (published in 2000) has a chapter (no 4) entitled "Elements of healthy cabin air". This report typifies the judicial approach, in which a given issue has an advocate and an opponent, each of whom carefully selects the evidence to boost his or her side of the argument. Indeed, this "judicious selection" forms the main intellectual challenge and interest of law as a discipline. The judicial approach thus stands in sharp contrast to the scientific approach (for which we can take Feynman's lapidary exposition) and, hence, the scientist is justified in calling the lawyer immoral.

The relevance of this to our present thesis is that the administrator, even if he or she is a former scientist, is much more comfortable with the judicial approach than the scientific one.[22] Hence, to a degree corresponding to the degree of preponderance of the administration over the academic research scientists in the University, the judicial approach will tend to permeate the ethos of the entire University. What this means in practice is that if an external client (e.g., a government department or a private company) commissions a piece of research, they will more often than not nowadays have a clear idea of the kind of result they want, which will be reflected in the research outcome (usually embodied in the final report).[23] In fact, this approach is not even properly judicial, only quasi-judicial, because only one side of the argument is presented. In a court of law, there is every opportunity to present the other side. There is no guarantee of such balance within the university.[24] The knowledge – if it can indeed be called knowledge – embodied in the final outcome is no longer reliable.

If universities are no longer purveyors of reliable

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knowledge, there is no sense in commissioning them to undertake research. Since this degradation of reliability is already (tragically) ubiquitous, it must be presumed that universities still receive commissions based on past reputation – which is, actually, the reputation of universities in general as bastions of objective scientific inquiry, established over roughly a millennium (and assumed to be shared even by the most recent foundation). This is, unfortunately, an inevitable corollary of the "new", "postmodern", "mode 2", "instrumental" university, call it what you will, but one that does not seem to have been perceived by any of the past writers on the subject. And if this direction of development of universities is indeed favoured by governments, which even in the UK, where universities are mostly private foundations, exercise immense control over them, we must conclude that universities have become indistinguishable from private contract research organisations, which can, of course, do whatever they please and whose only connexion to the traditional ethos of objective, independent inquiry is through those of their employees who happen to be alumni of those universities that still inculcate traditional values in their undergraduates.

This kind of degradation is not confined to universities. In Great Britain, knighthoods are nowadays conferred on a great variety of people, including successful businessmen and administrators, to whom the traditional values of chivalry are unknown (Ramsden et al., 2007).

It would be natural to expect that the degradation of the ethos of independent scientific inquiry will diminish the attraction of university education, other than in the very narrow sense of obtaining a specific qualification that will assist one in getting a job, which presumably explains the great proliferation of small, private "universities" after the economic reforms in the countries of the former Soviet Union, albeit that the best of these do indeed follow the old tradition of offering a truly liberal education.

Sir George Thomson (1957) rightly pointed out that "the

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one really dangerous menace is the loss of freedom. Science depends above all things on freedom to think." Clearly, the kind of interference in research that we have been discussing, which takes place in order to produce a predetermined output and, hence, secures payment by the client, is fatal to the reliability of the output. Indeed, it is doubtful whether it can be called "research" at all. In his lecture, Thomson had in mind what happened to biology in the Lysenko era in the Soviet Union, but exactly the same precepts apply nowadays to our so-called "free" Western economies.

6. Conclusions

The postmodern University may be financially sustainable in the short term as a contract research organisation, but as they lose their reputations as purveyors of reliable knowledge, they will become uncompetitive compared with private research organisations, unencumbered by the voluminous baggage of a teaching institution. In the recent past, universities could also compete on price, mainly because expensive laboratory facilities were subsidised by the government, and many research projects could be assigned to very poorly paid graduate students. In the current régime of dwindling government subsidies, some universities are finding that their teaching activities are actually loss-making, cross-subsidised by research income. Hence, their rates will have to increase, making them even less competitive.

In other words, the "triple helix" or "Lambert" model of business – university collaboration is unsustainable. Will at least some universities, perhaps those with the most ancient traditions that have most to lose if universities disappear in the traditional form, repudiate these new models and revert to objective, independent inquiry? Provided it can be made financially viable, there seems to be no reason why not. In other words, I am not advocating any government-led reforms – which would anyway

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constitute a paradox, because governments have been at least partly responsible for the present situation – but believe that the problem can be solved by vigorous and resolute individual initiatives within universities, which will, eventually, percolate to form a new, stable régime.

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1. As an example, one can readily find full contact details of all professors at a university from the internet; indeed, some universities (e.g., Oxford) list (or used to list) the direct telephone numbers of college fellows in the public telephone directory. In contrast, it is sometimes difficult to find out even the names of members of the senior management team (e.g., the chief executive officer) of a commercial company, let alone contact details.
2. From the data given in Ball et al. (2020), one finds that about 77% of UK graduates went into employment (including self-employment) after leaving the University, and about 17% opted to continue their education in one way or another (including travelling), leaving about 6% unemployed. The greatest proportion went into healthcare (including social work but excluding medical doctors assigned to the "liberal professions" category) (about 40% of the sample of about 50,000 graduates) followed by commerce (19%), education (15%), liberal professions (law and medicine) (13%) and government (local and central) 7%. Of course, nearly all healthcare and education is organised by the State, hence state employment actually amounts to more than 60%. Furthermore, many lawyers and medical doctors are employed by corporations or the State rather than exercising their professions in a truly liberal fashion. The now very small size of the manufacturing sector in the UK accounts for the absence of manufacturing professionals as a separate category in the statistics.
3. A corollary is that the endowments of the ancient universities increase in value, but that has not stopped them from becoming cash-strapped, a phenomenon that can be explained by the revenue theory of costs (Bowen, 1980).
4. Nowadays, a "good thing" is often interpreted as a good monetary return on the initial investment (Holt, 2012).
5. Governments have started to go to inordinate lengths to devise means of assessing the quality of the work done at universities, with a view to matching subsidies to the quality. Gillies (2010) has shown that these research assessment systems actually diminish research quality.
6. The complete picture is very much more complex, and also includes the guilds, manufacturers' associations, which might also sponsor research, and so forth. See, for example, Heath and Hetherington (1946) for a survey of

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conditions in the United Kingdom.

7. Different countries have somewhat different approaches. France, Germany, Italy and the USSR (and now, Russia) all have systems of State research laboratories and the universities play a relatively lesser role, whereas in the UK the most important research, at least during the past century, has always been carried out at the universities, except for certain very expensive, or dangerous, or strategically important fields such as atomic weapons and rocket propulsion.
8. See also the critique of Shinn (2002) comparing the triple helix with Gibbons et al.'s "new production of knowledge".
9. This classification of known knowns, known unknowns and unknown unknowns (and unknown knowns, which can usually be found by deskwork) appears in an unpublished paper by D.A. Maluf, Yu.O. Gawdiak and D.G. Bell, On space exploration and human error. It may have been inspired by an earlier paper by R.B. Furlong, Clausewitz and modern war-gaming (Air University Review, July-August 1984).
10. For a comprehensive account of the history and present-day situation, see Michaelis (2010).
11. Evans and Packham (2003) have also discussed this issue.
12. The technical validity of the results could still be questioned, of course, but this would be an academic matter among professionals and might lead, for example, to the development of improved methodologies.
13. Reported in *Materials World*, pp. 27-28 (August 2011).
14. Armitt also remarked that "events such as the Olympics provide a unique opportunity to inspire and excite the next generation of scientists and engineers by demonstrating the far-reaching implications for scientific research." One could scarcely imagine a more fatuous statement. Armitt, now Sir John, and originally a civil engineer, has made a very full career out of being a safe pair of hands, having been chief executive of the ill-fated Railtrack plc and then seamlessly of its successor Network Rail before becoming chairman of the Olympic Delivery Authority charged with organising the 2012 Olympic Games in London, and is presently chairman of the UK's National Infrastructure Commission.
15. Sometimes a proposal can be resubmitted, particularly when it received no substantive criticism from the peer review panels organised by the research councils. But the research councils themselves discourage such resubmission, because the 90% failure rate also burdens them with a huge amount of work, considering that all proposals need to be processed and go through some kind of assessment procedure.
16. The rules of probability tell us that it is, of course, theoretically possible to have a committee with mainstream scientists in the minority, just like it is perfectly possible to toss a coin 20 times and get 20 heads. Therefore, strictly speaking, we should say "mainstream scientists will *almost* always form a majority".
17. In: Good, I.J. *The Scientist Speculates: An Anthology of Half-Baked Ideas*.

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London: Heinemann (1962).
18. The problem is not the great returns that can be anticipated from investment in scientific research, but competition from the even greater returns from venality and corruption, especially in connection with land and construction (Ramsden, 2021).
19. Matthew 6:24.
20. Much more pertinently, it might be added, than by what is to be found in lengthy publications such as the OECD document "Best Practices for Ensuring Scientific Integrity and Preventing Misconduct" or the European Science Foundation (ESF) report "Fostering Research Integrity in Europe".
21. It will be recalled that until comparatively recently, it was a kind of tradition for Oxford and Cambridge college bursars to be retired military officers, often of high rank.
22. We might hypothesise that the "scientists" who become administrators perhaps never accepted or understood the scientific methodology, in which case they would have been both relatively unsuccessful and frustrated, motivating them to change career direction.
23. The process whereby this happens is not very clear. It is doubtful whether it is embodied in the research contract – the public would still be outraged were it to be discovered. This probably needs further investigation.
24. A good example is the way in which the aircraft cabin air study (Section 3.1) was handled within Cranfield University: the authors of the report (Crump et al.) were notably absent from the workshop convened to discuss it (see www.itcoba.net), even though they had been invited.
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ჯერემი ჯ. რამსდენი
ნანოტექნოლოგიების საპატიო პროფესორი,
ბაკინგემის უნივერსიტეტი

„პოსტმოდერნული“ საუნივერსიტეტო კვლევების მდგრადი განვითარება

(ანოტაცია)

საკვანძო სიტყვები: საუნივერსიტეტო მისია, ინდუსტრიული მისია, საკონტრაქტო კვლევები, სამეცნიერო-კვლევითი საბჭო

კვლევების ის ტიპი, რომელსაც დღეს ეძებს და ახორციელებს თანამედროვე უნივერსიტეტების უმეტესობა, ფაქტობრივად, არის ინფორმაციის გადაცემის პროცესი აკადემიური სფეროდან ინდუსტრიულ და კომერციულ სფეროში. გაერთიანებული სამეფოს უნივერსიტეტების ადმინისტრაციები, როგორც წესი, ამგვარ საქმიანობას თვლიან ერთადერთ მეთოდად, რომელსაც შეუძლია უმაღლესი სასწავლებლების ფინანსური სტაბილურობის უზრუნველყოფა. რადგან დღევანდელი ბაზარი და თვითგადარჩენის ინსტინქტი ამას კარნახობს, ისინიც საერთო ფეხის ხმას არიან აყოლილები და უნივერსიტეტის დანიშნულება დავიწყებას მისცემია.

რაც უფრო ნაკლებადაა სწავლის საფასურის გადამხდელი სტუდენტების მიერ დარიცხულ თანხებზე დამოკიდებული საუნივერსიტეტო შემოსავალი, მით უფრო იზრდება სამრეწველო კვლევით კონტრაქტებსა და აქედან მიღებულ მოგებაზე უმაღლესი სასწავლებლის დამოკიდე-

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ბულების ხარისხი. ბუნებრივად ჩნდება კითხვები: არის თუ არა კვლევების ასეთი რეჟიმი აკადემიურად გამართლებული და რა პირობებშია იგი მდგრადი.

რ. ე. სპირის ლაკონიური განმარტების თანახმად, საუნივერსიტეტო მისია გულისხმობს ცნობისმოყვარეობის აღძვრას, კრიტიკული აზროვნების დანერგვასა და კვლევა-ძიების უნარის გამომუშავებას სტუდენტებში. ამის პარალელურად, ინდუსტრიული მისიაა თვითგადარჩენა, რასაც წარმოება, ჩვეულებრივ, ახერხებს მოგების მიღებითა და მისი თანამშრომლების ერთგულებით. უნივერსიტეტებისა და საწარმოების განსხვავებული მისიები განსხვავებულ თვისებებს გულისხმობს: უნივერსიტეტი ღიაა, ინდუსტრია – ფარული და დახურული; უნივერსიტეტი ინდივიდუალისტურია, ხოლო ინდუსტრია გუნდურ მუშაობასა და იერარქიას ემყარება; უნივერსიტეტი არაა მონეტარული ინდუსტრიისგან განსხვავებით ის დაწესებულება, რომლის ამოსავალი წერტილიც ფულადი ინტერესია. ამ განსხვავებების მიუხედავად, ორივე მჭიდროდაა დაკავშირებული, რადგან უნივერსიტეტის კურსდამთავრებულთა უმეტესობა სწორედ წარმოებასა თუ კომერციულ საქმიანობაში ერთვება.

უნივერსიტეტებში გატარებული „პოსტმოდერნული“ რეფორმების შედეგად, მნიშვნელოვნად შეიცვალა სამეცნიერო-კვლევითი პროცესიცა და მისდამი დამოკიდებულებაც. ბევრი უმაღლესი სასწავლებელი მხოლოდ ფინანსური შემოსავლის გაზრდის მიზნით იწვევს სტუდენტებს სადოქტორო პროგრამაში და ამას „ფანტასტიკურ შესაძლებლობად“ ასაღებს. თანამედროვე დოქტორანტების უმეტესობას კონკრეტული საკვლევი თემატიკა და ინტერესები არც კი გააჩნია, ისე აბარებს მისაღებ გამოცდებს „ფანტასტიკურად“ პრესტიჟული დოქტორის ხარისხის მო-

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პოვების ბრმა სურვილს აყოლილი. სინამდვილეში, სადოქტორო პროგრამაზე სწავლა ისეთი ახალგაზრდა მკვლევრების პრეროგატივაა, ვისაც სამეცნიერო-კვლევითი საქმიანობის განხორციელების გამოცდილებაც აქვს და მისთვის თავდადების მუდმივი სურვილიც. სადოქტორო სკოლები მხოლოდ სამეცნიერო კვლევების სულისკვეთებით ანთებული შეგირდებით უნდა დაკომპლექტდეს, როგორც ადრე ხდებოდა. დოქტორის ხარისხის მოპოვების სარეკლამო ასპექტებმა თავად სადოქტორო ნაშრომების ხარისხი დააქვეითა, რადგან დოქტორანტების უმეტესობა დღეს მხოლოდ ტექნიკურ სამუშაოს ასრულებს, რაც საკონტრაქტო კვლევების მკაცრად განსაზღვრული ნაწილია.

მოცემულ სტატიაში ფაქტების შეჯერებითი ანალიზის საფუძველზე, დასაბუთებულია, რომ ასეთი სამეცნიერო კვლევები აკადემიურად არამდგრადია და, გრძელვადიან პერსპექტივაში, არც ფინანსურად იქნება სიცოცხლისუნარიანი. ამის მიზეზია ის, რომ კვლევების ეს რეჟიმი უნივერსიტეტების მიერ შეთავაზებული ინფორმაციისადმი ნდობას ფარულად ამცირებს და, საბოლოოდ, მასზე მოთხოვნა გაქრება. უნივერსიტეტებმა უნდა გაატარონ რეფორმა, რათა დაიბრუნონ თავიანთი ტრადიციული, სამეცნიერო-კვლევითი ფუნქცია, როგორც დამოუკიდებელმა, მიუკერძოებელმა კვლევითმა ცენტრებმა, ან არსებობის შეწყვეტა მოუწევთ.

პოსტმოდერნული უნივერსიტეტი, როგორც საკონტრაქტო კვლევითი ორგანიზაცია, ფინანსურად სტაბილური დროის მხოლოდ მცირე მონაკვეთში იქნება. გრძელვადიან პერსპექტივაში, უნივერსიტეტის რეპუტაცია ისე დაეცემა, რომ სრულიად დაკარგავს ნდობას, როგორც უმაღლესი სასწავლებელი, რადგან ვერ გაუწევს კონკუ-

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რენციას კერძო კვლევით ორგანიზაციებს, რომლებსაც სწავლების ვალდებულება არ ამძიმებთ.

ადრე თუ უნივერსიტეტები კონკურენციას სამთავრობო სუბსიდიების წყალობით უძლებდნენ, რითიც ძვირადღირებული ლაბორატორიული ობიექტები უხვად ფინანსდებოდა, ხოლო კვლევითი პროექტების უდიდესი ნაწილის შესრულება მეცნიერების მსახურების ჟინით სავსე დოქტორანტების ზურგზე გადადიოდა, მიზერულ ანაზღაურებას რომ სჯერდებოდნენ დარგის განვითარების შესაძლებლობით ამაყნი და ბედნიერნი. დღეს ვითარება რადიკალურადაა შეცვლილი.

წმინდა სამეცნიერო პროექტების სამთავრობო დაფინანსება ამჟამად კატასტროფულადაა შემცირებული. ზოგიერთი უნივერსიტეტი კარგა ხანია მიხვდა, რომ მათი სასწავლო საქმიანობა რეალურად წამგებიანია და სამეცნიერო კვლევებიდან მიღებული შემოსავლების წყალობით, კომბინირებული სუბსიდირების ხარჯზე გააქვს თავი. ეს ნიშნავს, რომ სწავლის გადასახადი მუდმივად უნდა გაიზარდოს, რაც აშკარად წამგებიან პოზიციაში აყენებს უნივერსიტეტებს.

მთავრობის მიერ განხორციელებული რაიმე სახის საუნივერსიტეტო რეფორმის მომხრე ნამდვილად არა ვარ. ეს პარადოქსი იქნებოდა, რადგან სწორედ მთავრობათა სინდისზეა დღევანდელ სავალალო ვითარებაზე პასუხისმგებლობა. მჯერა, რომ არსებული პრობლემის მოგვარება შესაძლებელია შიდასაუნივერსიტეტო, ინდივიდუალური, ჯანსაღი და ქმედითი ინიციატივების შედეგად, რაც მოგვცემს ახალ, სტაბილურ სისტემას საუნივერსიტეტო სწავლებისა და სამეცნიერო-კვლევითი საქმიანობის წარმართვისათვის.

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