

## *Science-Policy Interfaces in an Era of Global Commodification*<sup>12</sup>

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### *Research and policy*

In 1959, in his Rede lecture C. P. Snow famously identified two scholarly cultures and argued that the gulf between science and the humanities and the social priority and status granted to the humanities were obstacles to progress. Not long afterwards, Thomas Balogh, one of a new generation of expert policy advisers (like the Open University, this being one of Harold Wilson's enduring innovations) berated the 'humanities-based education and pre-industrial social attitudes' of his bureaucratic peers, denouncing them as 'the apotheosis of the dilettante'.<sup>3</sup> Ever since, the chasm between research and policy, between the specialist and the generalist, has invited bridges to be built. But it was not until the 1990s that the 'two cultures' were effectively challenged in Anglo Saxon societies by John Brockman<sup>4</sup> who announced and celebrated a 'third culture' in

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<sup>2</sup> **Dedicated to the memory of David Dickson (1947-2013) science and technology journalist and scholar.**

<sup>3</sup> Cited in C Leys, 2005, *The Cynical State*, pp1-27 in (eds) L Panitch and C Leys *Telling the Truth* Merlin Press

<sup>4</sup> J. Brockman, 1995, *The Third Culture: Beyond the Scientific Revolution*, Simon and Shuster

the ‘public communication’ and popularisation of both fundamental and applied natural sciences. In fact, this ‘bridging’ culture had been long in the making<sup>5</sup> and has proved indefatigable in its own defence against a barrage of post-modern culturalist criticism of the hegemonic power of the ‘discourses of science’.

But of all the criticisms that have been levelled at this concept the most penetrating and significant is that while the third culture has flourished it has tended to naturalise markets - as the ultimate test of institutional fitness and as the ultimate self-regulating system - to be the basis of the information society and knowledge economy<sup>6</sup> just as it ‘culturalises’ and ‘marketises’ nature.<sup>7</sup>

In fact, the central issue for science and policy today is no longer the gap between the cultures of science on the one hand and the humanities and generalist policy makers on the other, or even whether it has been bridged by a third culture. Instead it is the role of markets in the emergence of a unifying culture – a ‘fourth culture’, if you like: that of *de-politicisation*.

This de-politicised culture appears to serve the role of a lingua franca, seeming to overcome the technicality of the specialised languages proliferating in all research fields,<sup>8</sup> which makes them intelligible only to their practitioners. But the achievement of a lingua franca is at the expense of abandoning the crucial critical and self-critical process through which science, and ultimately society, make progress. It masks the deployment of markets to reorganise the processes and products of science in forms that can be privately exchanged. The contemporary economy is widely accepted to rest on knowledge; the ‘knowledge economy’ is one in which knowledge is being reconfigured so that it can be bought and sold. The requirements of

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<sup>5</sup> In the work for example of Haldane, Hogben, Medawar, Bronowski, and Michie. See (ed) A Srinivasan 2009 *Donald Michie on Machine Intelligence, Biology and More*, Oxford Clarendon Press for a beautiful example.

<sup>6</sup> MM Waldrup 1992 *Complexity: the merging science at the edge of order and chaos* Penguin Books

<sup>7</sup> Social memes, in the language of this third culture, use biological genes as an analogy; while biological and hydrological processes become ‘ecological services’ to society. See G Hodgson 2001 *Why economics forgot history* Routledge for this argument ; see S Zizek 2002 Welcome to the Desert of the Real! *South Atlantic Quarterly* Spring 2002 101(2):385-389; for criticism of it.

<sup>8</sup> The philosopher of mind, John Searle, has concluded that language is the fundamental social institution, one ignored by most other theorists of institutions. John R. Searle, *Making the Social World: The Structure of Human Civilization*, Oxford University Press, 2010

the contemporary economy - in particular the ‘marketising’ and commodification both of knowledge and of policy<sup>9</sup> - not only airbrush politics away but also rearticulate science with de-politicised and un-theorised social models - with implications as serious for policy in the public interest as they are for science and for society

My intervention here explores this conceptual and practical paving over the epistemological chasm and its effects on both littorals. I explore the proposition that the opposition Balogh saw between the expert knowledge of the academy and the practical knowledge of the policymaker is being realigned, in part by being de-politicised but in part by being commodified.

My method is drawn from political economy and is historical and comparative. I will use British evidence and debates<sup>10</sup> to generate questions which may already have been widely rehearsed in India but which may still pose challenges that the Indian intelligentsia can negotiate more effectively than the intelligentsia of the former Imperial power. Two preliminary questions need to be answered<sup>11</sup>:

1. What models of society do physical and biological scientists and engineers operate with?

2. What models of science and of society do expert policy-makers use? Are these ‘fit for purpose’?

These take the first part of this essay to address. The results will then turn us toward a third question:

3. How is expert knowledge and policy knowledge being commodified, and with what discursive and real effects?

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<sup>9</sup> C Leys 2007 *Total Capitalism* New Delhi, Three Essays Press

<sup>10</sup> These are drawn mainly from health, agriculture/sustainability, technology development and education. In February 2013 these fields were used by the President of the Royal Society to exemplify core scientific research for the public good. Prof Sir Paul Nurse 2013 ‘Making Science Work’, The Haldane Lecture, Wolfson College, Oxford

<sup>11</sup> There are more. In particular the large literature on the public engagement of science is out of the current scope of this essay (see A Irwin 1995 *Citizen Science: A Study of People, Expertise and Sustainable Development* Routledge; S Funtowicz and J Ravetz 1993 Science for the post-normal age *Futures* Volume 25, Issue 7, September 1993, Pages 739–755 and the literature from Sussex University’s Science Policy Research Unit and the journal *Public Understanding of Science*. For a good example see J Burgess et al , 2007, Deliberative mapping: a novel analytic-deliberative methodology to support contested science-policy decisions *Public Understand. Sci.* 16 (2007) 299–322

In exploring this question, the second part relates the process of de-politicisation to that of commodification.

*Q1: How do natural scientists see society when they engage with policy?*

To see how this depoliticised culture has come into existence and what it does to science and society we first need to identify the models of society used by natural scientists when they communicate with policy-makers, and their significant failure to use the models developed by social scientists – who after all do make society their subject matter. Here examples have to be used. They are drawn from three linked and self-evidently important fields of policy – the loss of biodiversity, climate change, and how the results of scientific and technological progress can best be turned to national economic advantage. These are fields that the president of the Royal Society has identified as science for the public good in which ‘scientific advice must be of the highest quality’.<sup>12</sup>

*Biodiversity Loss*– Of late a number of expert ‘assessments’ have been published. An assessment is a term of art denoting a collective ‘scoping’ of a scientific field for an educated audience. The reports of the Intergovernmental Panel on Climate Change are paradigmatic expert ‘assessments’. In the 2012 assessment of ‘Biodiversity Loss’ in *Nature*,<sup>13</sup>, after an elegant analysis of the extreme complexity of the way ecosystems function – which forms the bulk of the assessment and which scrupulously indicates where there are still areas of ignorance, scepticism, uncertainty and controversy - there follows a description of the science needed to ‘serve management and policy’. This calls inter alia for the development of ‘decision support tools’, of ‘models at

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<sup>12</sup> Nurse, 2013. It remains to disprove their representativity.

<sup>13</sup> Bradley J. Cardinale, J. Emmett Duffy, Andrew Gonzalez, David U. Hooper, Charles Perrings, Patrick Venail, Anita Narwani, Georgina M. Mace, David Tilman, David A. Wardle, Ann P. Kinzig Gretchen, C. Daily, Michel Loreau, James B. Grace, Anne Larigauderie, Diane S. Srivastava and Shahid Naeem 2012, Biodiversity loss and its impact on humanity *Nature* <http://www.nature.com/nature/journal/v486/n7401/full/nature11148.html>

appropriate scales for policy’ such as ‘ecosystem service production functions’, ‘to explore trade-offs between services at multiple temporal and spatial scales’ for ‘stakeholders’ who are seen as expecting ‘positive returns’. Policy-making and implementation is described as having the scope of a ‘natural laboratory’.

In this rational and economic model, science is visualised as entering into the policy process in a role of service. But just as economists treat nature as an externality, so does this model of society treat power and politics as an externality too.

*ii) Population and Climate change.* In the ‘Royal Society’, Britain’s apex learned society for science, policy work is organised around four themes: diplomacy, governance, innovation and sustainability. Research topics are then subsumed under these organising axes. So under diplomacy we find examples of the changing nature of global science; under governance: the implications for society for developments in rapidly developing areas of science and technology; under innovation: science funding; and under sustainability: the role of science in debates about sustainability and climate change. How are society and policy seen in this way of proceeding?

In *People and the Planet* (2012)<sup>14</sup> a Royal Society expert group argues with a great deal of evidence that climate change is a product of population growth, migration, urbanisation and consumption and will in turn have impacts on all these aspects of society. The recursive relationship between people and the planet needs, therefore, ‘urgent reframing’. Among other policy activities that are implied by this call is the need to change existing patterns of consumption: states (i.e. governments) are assumed able to increase the consumption of the poor and to scale back that of the rich. These experts also see it as possible for energy to be decoupled from fossil fuel and economic activity to be decoupled from material throughputs and from negative environmental externalities – i.e. to be de-carbonifiable and

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<sup>14</sup> The Royal Society: Sir John Sulston and a multidisciplinary team, 2012 *People and the Planet*, London, Royal Society

ever lighter in its footprint. In their view political leadership can change the current socio-economic model and institutions (p7-8).

This is a consensus model, obviously, but from the standpoint of a social scientist it is wildly unrealistic: reductive, a-theoretical, exclusivist in its ignoring of production and the ‘social manufacture’ of consumption, in its disregard of the dynamic and institutions of capitalism (a veritable taboo concept). And its implication that if the current socio-economic model cannot be changed it is not the fault of science but of political leadership is a classic intellectual escape hatch.<sup>15</sup>

*iii) Converting scientific progress into economic progress*

The application of science involves an ‘interactive ecosystem’ of institutions.<sup>16</sup> The apex learned society for engineering has labelled the gulf that has to be bridged to convert the products of research and invention into useful commodities as the ‘*Valley of Death*’.<sup>17</sup> For the Royal Academy of Engineering, ‘bridge-heads’ help this valley to be spanned. Policy making capacity and active state power are assumed to be capable of making ‘strategic decisions not based on cost-benefit analysis’ in order to build ‘sovereign capabilities’ (i.e. state capacity) that will permit ‘open innovation between private and public sector’,<sup>18</sup> reduce risk, improve infrastructure, develop banks and the logistics of

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<sup>15</sup> That leading scientists may concede that public policy is based on science ‘and a wide range of other factors’ is also an escape hatch for science (Nurse, 2013). On escape hatches, see Schaffer 1984 ‘Towards Responsibility’ in (eds) B Schaffer and E Clay *Room for Manoeuvre* Heinemann. Escape hatches were long ago lampooned by the Harvard mathematician and songwriter Tom Lehrer. “‘Once the rockets are up, who cares where they come down? It’s not my department’ said Wernher von Braun.” Lehrer T 1965, *That Was The Year That Was* (record album).

<sup>16</sup> Nurse, 2013 ‘Making science work’ Haldane lecture, Wolfson College, Oxford

<sup>17</sup> Royal Academy of Engineering 2012 *Bridging the valley of death*; Sir Paul Nurse 2013 Making science work Haldane lecture, Oxford

<sup>18</sup> An example of how this may work is the reform to the world’s public agricultural research system in which the products, referred to as international public goods in the guidelines on intellectual property, may be ‘restricted’ (read privatised) on any one of four grounds i) if commercialization significantly enhances the scale or scope of impact on target beneficiaries (small and poor farmers) in developing countries; ii) if it is invaluable for the further improvement or effective utilization of such intellectual assets’; iii) to improve food security and alleviate poverty and iv) when there are no alternatives under no or less restrictive conditions. This gives very little intellectual basis for resisting the privatization of public assets in the name of partnership. It is a subsidy to the private commercialization of seed and other agricultural technology.

supply and even state procurement, and create a skilled workforce including skilled regulators themselves.<sup>19</sup>

The engineers' policy focus is on UK competitive advantage. On this evidence engineers see the role of engineering science as being to help policy-makers improve competition policy, which they think policy makers are capable of implementing by interventions across a vast range of social and economic life.

The contrast between the models of society which all these scientists appear to have when they seek to influence policy, and the models which social scientists use, is dramatic and in more than one way painful. Social scientists see the natural scientists' models, which the latter acknowledge (in discussion with the author) to be 'seat of the pants', un-theorised models, as exactly that. Social science practises a double hermeneutic. The objects of social science are social institutions and practices which reflect about, and interact with, the categories, measurements and interpretations of the social scientist. As Giddens puts it, "(t)he 'findings' of the social sciences very often enter constitutively into the world they describe" (Giddens 1987: 20). What follows is an unavoidable plurality of theoretical approaches to the understanding of society.<sup>20</sup> Not only does this mean that different social science disciplines have different models of society, but the paradigms and sub-fields within them also use different models. Progress is made through the open, critical scrutiny of assumptions, logic and predictions against empirical/historical tests.<sup>21</sup> Grand narratives have received much criticism but they survive because they are indispensable, as they allow a thousand mini-narrative flowers to bloom in their interstices. We live in an era of specialist sub-fields, giving rise to a complexity that makes it difficult not just to transmit the achieved knowledge of the social sciences from each generation the next, but also, and particularly, to collaborate with natural

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<sup>19</sup> By means of vivid military metaphors, and by reverse-engineering the list of desirables given here, the *absent* policy components turning the development process into a valley of death may be reconstructed and modelled.

<sup>20</sup> John Bellamy Foster and colleagues would add that 'because the social cannot easily be separated from ethical questions of right and wrong, this investigation inevitably implicates what is regarded as acceptable or unacceptable, and therefore "tends to be filtered through the dominant institutions and structures of the prevailing hierarchical social order" (J Bellamy Foster et al, 2010, *The Ecological Rift – Capitalism's War on the Earth* (Monthly Review Press, p. 20)).

<sup>21</sup> This is at the heart of the thematic discipline of development studies which is my profession.

scientists whose own subfields are proliferating too - and with policy makers. As a result, almost all the grand narratives and specialist subfields of social science are ignored at today's science-policy interface. However they enter policy, the findings of social science do not seem to 'enter constitutively' into science. And when it comes to policy making the sophistication and characteristic reflexivity of social science seems to go by the board, as the following example from the British Academy shows.

iv) *Social scientists and policy-making*. In a policy document entitled '*Punching our Weight*' which considers the problems of integrating social research into policy, the British Academy, the UK's apex learned society for social sciences and the humanities,<sup>22</sup> focuses on the weaknesses of the state's own research processes.

The Academy sees public policy-makers as 'fire-fighters', who would fight fire better if they made use of social science research. Hence the BA suggests that there should be incentives for social scientists to hold dialogues with policy makers, for the activation of science-policy partnerships with social science, for policy makers to conduct long-term research, for government research to be peer reviewed, for social science researchers to be skilled in what it takes to reach out to policy-makers, and for multi- and inter-departmental co-ordination in government to be organised for dealing with complex topics. Policy engagement should be a promotion criterion for academics and grounds for eligibility for high status forms of academic recognition.

The BA writes in an idiom of 'co-production'. While it recognises that there is a difference of quality (and perhaps status) between fire-fighting research and rapid policy making on the one hand, and the open ended or long term research of the academy on the other, it sees no difference of *interest* between research and policy. Policy making is improved by high quality research. And like the natural scientists the BA assumes that the state is rational and has wide-ranging capacity to act on the basis of whatever contribution social scientists can make.

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<sup>22</sup> British Academy 2008 *Punching our Weight*, London, British Academy



While fire-fighting (‘contingent expertise’) is a necessary policy skill, Ravi Rajan’s critical research on the management of industrial risk in India<sup>23</sup> shows that it is by no means sufficient. This is because advocacy documents like that of the BA ignore the role of social science in creating two other kinds of expertise needed by policy makers for the complex problems of what Ulrich Beck has termed the ‘risk societies’ of today.<sup>24</sup> One is conceptual expertise, which is required in order to respond creatively to drawn-out implementation processes that are replete with unintended consequences. The other is contextual expertise – knowledge of ground realities, and especially the multiplicity of informal institutions and practices that parallel those of the state in regulating any society - peculiarly relevant to India but present in all societies to a greater or lesser degree’.<sup>25</sup> So while there may or may not be scope in the BA’s text for blue skies research, it is - or should be - inherent in social science research to criticise the main lines of policy as well as their details, from top to bottom. And while ‘policy makers’ are depicted by the BA as an undifferentiated bureaucratic category there is no scope for (social) science to contribute to decisions and courses of action determining outcomes (i.e. to policy-making activities) which are sited elsewhere in the state - e.g. in the courts- or in (civil) society e.g. the media, business, churches - or organised crime.

## *Q2: The incorporation of science by policymakers*

*“Governments and international agencies look to universities to undertake policy research. This does not mean the study of policies, how they are made, how they are implemented, and what assumptions they rest on. To ask these questions subverts the enterprise. Ruling institutions expect researchers to tell them what they want to know and not to be told that they are asking the wrong questions.”*

Gavin Williams: Keynote Address to International Conference on Higher Education and Globalization, University of Ilorin, 10 February, 2010.

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<sup>23</sup> S Ravi Rajan 2002 Disaster, Development and Governance: Reflections on the ‘Lessons’ of Bhopal *Environmental Values*11: 369–94

<sup>24</sup> U Beck 1992 *The Risk Society :Towards a new modernity* Sage

<sup>25</sup> R Rajan, forthcoming Environment and Development in India, ch 10, in (eds) D Davin and B Harriss-White ‘China-India : Pathways of economic and social development’, London, OUP for the British Academy

How in turn do policymakers, see and use science? The incorporation of scientific advice into policy-making turns out to be itself natural-science-driven, moulding policy into the paradigm of a science in various ways. The oldest of these from neoclassical economics, closer to a hard science than a social science in many respects, is an approach to policy evaluation which privileges cost benefit analysis for answering the politicians' questions about value for money and policy efficiency.<sup>26</sup> More recently it has involved applying evidence-based procedures from hard science to policy, and especially the transfer of Randomised Control Trials and Evidence-Based procedures drawn from medicine to policy, together with a step-change upwards in the placing of scientists into government as scientific advisers.

There are large literatures about the 'scientisation' of policy from which key texts and arguments about effects will be summarised here. When economic considerations are given priority over those derived from scientific and other scholarly fields such as ethics or law that cannot be measured in economic terms, or when non-economic arguments are converted into imputed \$, controversy about purely economic factors can and does de-stabilise policy. Familiar examples of the criticisms to which this form of scientism gives rise concern missing, 'distorted' or 'guesstimated' prices; putting a monetary value on un-monetary aspects of human and natural life; the assumption that there can be generalised trade-offs between one kind of valued outcome and another, or that they are substitutable for each other; the adoption of requirements of certainty for outcomes that are not certain; the choice of discount rates which are meant to represent the value of the future to the present but which involve questionable assumptions; the neglect of differing values held by different groups within a differentiated society; the limiting of technology or policy choices that are selected to undergo cost benefit analysis; the general extrapolation of results constructed for specific places, societies and

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<sup>26</sup> See "Taking Forward the UK Climate Change Bill: The Government Response to Pre-Legislative Scrutiny and Public Consultation," October 2007, <http://www.official-documents.gov.uk/document/cm72/7225/7225.pdf> for the economic reasoning behind the UK's climate change policy. (In the light of subsequent economic controversy this has been revised by its author and it would seem that economics is not proof against policy instability.)

times to others very different from these and so on. All legitimate points of criticism.<sup>27</sup>

More recently, over the last decade, a wide range of policy questions have been handled through the use of randomised control trials (RCTs), a methodology first developed in medicine.<sup>28</sup> The method has been transferred so as to compare the effects of interventions with what happens without an intervention (often paraphrased as a ‘counterfactual’), to systematise impact evaluations, and to refine policy design.<sup>29</sup> The RCT method has been found to be valuable for empirical policy questions about poverty, health and education, but it is rarely sufficiently acknowledged that this tool-driven approach excludes transformative questions un-answerable through the conventions of RCTs and controls. It presupposes that the questions to be answered are the important ones, implying that the overall assumptions of policy from which they stem are sound – which in fact may be and often is highly questionable. James Copestake argues that RCTs are ‘good for agronomy but only for a limited range of the constantly changing problems that small-scale farmers confront within diverse, complex, risky and shifting agro-ecological systems’.<sup>30</sup> And for Sanjay Reddy ‘it is not possible to discuss individual fates without taking note of the macro economy, history, culture, and politics’. The RCT paradigm signifies that ‘a focus on such interventions, as opposed to those which reshape that context, is

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<sup>27</sup> See F Stewart 1975 A note on Social Cost-benefit Analysis and Class Conflict in LDCs *World Development* vol 3 , no 1, pp31-40, and the discussions of the Stern Review on the Economics of Climate Change [http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/sternreview\\_index.htm](http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/sternreview_index.htm) ; and for a taste of the kind of criticism not confined to the points made in the text here, see R O Mendelsohn 2006 A Critique of the Stern Report *Regulation* pp 42-6 <http://www.cato.org/sites/cato.org/files/serials/files/regulation/2006/12/v29n4-5.pdf>. Space constrains discussing alternatives but large literatures exist on alternatives ranging from public engagement, and deliberative democracy to multicriteria analysis.,

<sup>28</sup> RCTs are designed to answer two simple questions – whether the medicine / molecule / vaccine actually works and whether there are any harmful side effects.

<sup>29</sup> A Banerjee and E Duflo 2011 *Poor economics*; D. Karlan,, N. Goldberg, and J. Copestake, 2009 Randomized control trials are the best way to measure impact of microfinance programs and improve microfinance product *Enterprise Development and Microfinance*, Volume 20, Number 3, September 2009 , pp. 167-176(10)[http:// karlan.yale.edu/p/Crossfire%2020-3\(4\)%20revised.pdf](http://karlan.yale.edu/p/Crossfire%2020-3(4)%20revised.pdf)

<sup>30</sup> S Reddy 2012 ‘Randomise This! On Poor Economics’ *Review of Agrarian Studies* 2,2, [http://www.ras.org.in/randomise\\_this\\_on\\_poor\\_economics](http://www.ras.org.in/randomise_this_on_poor_economics); and A Bhargava "Randomized controlled experiments in health and social sciences: Some conceptual issues". *Economics and Human Biology*, 2008, 6, 293-298

sufficient to address poverty’ (a position that Reddy criticises). By their nature, RCTs tend to de-legitimate other ways of knowing: practical experiential knowledge, triangulation, observational, longitudinal<sup>31</sup> and historical approaches.<sup>32</sup>

Another kind of science-derived methodology increasingly favoured by policy-makers is the systematic review, also drawn from Evidence Based Medicine. Systematic reviews (SR) combine and aggregate evidence which satisfies the demanding quality conditions of positivist science. Thus for example the early results of a meta-review of a multimillion-pound systematic review of systematic reviews at the UK’s DFID reveals a substantial class of research and policy topics, framed as empirical questions, that show no cause-effect relations deemed useful for policy interventions – not because there are no cause effect relationships but because the body of data in a given policy field is deemed not of a quality to test that proposition either way.

The epistemological framework for both RCTs and SRs is technocratic – in the words of Sanjay Reddy, ‘modular, reductive and mechanical’. ‘It is at odds with a non-mechanistic understanding of society, in which all actions are defined as well as outcomes shaped by complex and often unpredictable processes of mutual interaction’ (Reddy, 2012). To apply SR to parts of a system under review while neglecting the whole is to neglect the interaction within a system. Moreover, since the intervener using the RCT paradigm for development usually stands outside the society s/he aims to intervene in, the way it is practised is also often at odds with concept of social development as democratic deliberation.<sup>33</sup>

In the UK, all science-using departments of government, including the Treasury, now have a chief scientific adviser (CSA), drawn part-time

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<sup>31</sup> As in comparative statics.

<sup>32</sup> The RCT approach is not confined to quantitative evidence however, but may incorporate qualitative evidence in statistically rigorous ways. The approach has been accused of selection and publication biases, it is claimed vulnerable to the misattribution of causes and to scaling. To prove lack of replicability is very costly but unless that is done its claims to general policy relevance may be compromised (a problem not at all confined to RCTs).

<sup>33</sup> A Sen 1999 *Development as Freedom*, Oxford, Clarendon press

from, and reinforcing, an epistemic community involving universities, industry and the scientific civil service; so that, as claimed by the UK government's own CSA, policy 'decisions in their departments are based on solid science and engineering'.<sup>34</sup> Not only do CSAs help to supply the evidence base for policy but also, networked throughout government, and supported through the British government's Office for Science (embedded in the Department for Business and Skills), they 'encourage and support departments' use and management of science, as well as challenging them to match best practice across Government and (where appropriate) outside'.<sup>35</sup> While very widely welcomed, and with direct access to Ministers, the institution of CSA has received criticism for its lack of, or uneven, influence. In 2011, a House of Lords Science and Technology Committee, chaired by an eminent scientist, examined their power over public spending and their impact on policy.<sup>36</sup> It found that along with the adoption and co-optation of science, CSAs' evidence was sometimes neutralised: blocked, dismissed or sought too late to influence decisions.<sup>37</sup> Advice was also sometimes compromised by conflicts of interest as for example in the case where the independent science advisory committee of the Home Office had been chaired by a career civil servant drawn from the very constituency the committee was meant to use science to challenge.<sup>38</sup>

So the 'scientising' of policy proceeds apace, but with mixed and sometimes contradictory effects. The economisation of policy imposes a rigorous template for cost effectiveness onto policy which may have the effect of destabilising it, since the economic parameters are contestable. RCTs are also widely recognised as a way of narrowing the field of questions considered amenable for policy and

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<sup>34</sup> Sir John Beddington, 2011, <http://www.newscientist.com/blogs/thesword/2011/06/the-government-network-of-chie.html> The sciences include natural sciences, social sciences, engineering and medicine.

<sup>35</sup> <http://www.bis.gov.uk/go-science/about/how-we-work>

<sup>36</sup> <http://www.parliament.uk/business/committees/committees-a-z/lords-select/science-and-technology-committee/inquiries/parliament-2010/chief-scientific-advisers/>

<sup>37</sup> For another instance, in the 14 months to October 2013, ever since the Environment Secretary, Owen Paterson, took up his position, he had not requested a briefing from Sir Ian Boyd, the Chief Scientific Adviser at Mr Paterson's Department for the Environment, Food and Rural Affairs (Defra).

<http://www.independent.co.uk/news/uk/politics/environment-secretary-owen-paterson-has-yet-to-be-briefed-on-climate-change-by-chief-scientist-sir-ian-boyd-8912738.html>

<sup>38</sup> A considerable number of examples of lack of influence are given in <http://www.guardian.co.uk/science/2012/feb/29/scientific-advisers-ignored-lords-report>

of narrowing them further through their data requirements. And despite the highly politicised nature of the selection of issues for systematic review, or the application to them of RCTs – an agenda of questions catering for, or anticipating, politicians asking ‘what works?’ - all these modes of relating science to policy-making are de-politicising. The political process through which the agenda of questions is generated is excluded from consideration, as is the political context in which the policies chosen will be implemented. Yet we see from the evaluation of CSAs above that when science and policy decision making are not aligned, policy has more power than science, and such positive impact as science might or even should have is lost.

So far we see that the scientisation of policy and the ‘new science’ models of society are varied, rational, empiricist, metaphorical, not consensual but also - in contrast to practice in the science mainstream - not contested, either in or out of science.<sup>39</sup> These models are not drawn from social science itself. Although certain social science subfields are themselves developing de-politicised ways of modelling society and the policy process, with the exception of mainstream economics, the social sciences are benignly neglected or actively rejected by natural science, for reasons unclear. Perhaps because of their baffling plurality. But perhaps because they cannot avoid engaging with politics.

For one trait all the new models of society used by natural scientists have in common is the distinction made between science and politics. Politics, both as a social science and as the practice of power, is clearly rejected. Politics as ‘ideology’ is regarded as contaminating science.<sup>40</sup> Both science and policy are de-politicised, cleansed of

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<sup>39</sup> Physical and biological sciences and engineering all ‘tend to regard the universe and the world as law abiding, non capricious and above all, understandable. This view is then transferred to society. Economics is perceived through commonsense nostrums, failing to understand that current economics is a descendant of political economy and that the discipline itself has been shaped by politics. They also fail to understand that common sense views are themselves historically manufactured through the manufacture of consent.... Thus they fall prey to depoliticized functionalist ‘versions’ of society aimed at designing social engineering policies or projects. In their view, society is “messy” and requires such interventions to uphold law and orderliness.’ (Sanjeev Ghotge, Pers Comm, March 2013). See also D. J. Haraway 1991, *Simians Cyborgs and Women: the Reinvention of Nature*, Routledge. on the cultural constructs of science. Space here constrains development of these themes.

<sup>40</sup> Nurse, 2013. ‘Science needs to be kept clear of political ideology and religious contamination.’

politics. But de-politicisation, the externalising of politics, is itself a form of politics. How is this politics to be understood? Who gains from this extraordinary mental closure?

*The 'de-politicised' politics of the science-policy interface*<sup>41</sup>

'(P)olitical conflicts and ambiguities underlie almost all technological decisions' writes David Dickson, a mathematically-trained scholar of technology and science (1988, p303). In a carefully researched and documented historical study of science, technology and policy in the US, Dickson describes a politically-driven process in which, despite Friedmanite criticism of any public funding for science, federal government expenditure has protected basic science while the individual US states have targeted funding increasingly towards fields with military and industrial applications (computing, biotechnology, materials etc) which offer employment and tax benefits for local populations.<sup>42</sup>

Dickson explains how in the US the 'government' is no mere receiver of scientific policy expertise but is instead the prime arbiter of the political economy of science and technology. This intensely politicised process involves simultaneous feedback relations between 'science' (universities and public laboratories), the 'state', and 'industry'. Demands from labour unions and environmental movements for science and technology to be socially relevant are defined, in the politics Dickson analyses, as no more than 'a cacophony, making decision making difficult'. They have been subdued by deliberate exclusion from decision processes, and by increasing secrecy.<sup>43</sup>

The first set of feedback relations between science and the state are as a result mediated by industry and party politics. Dickson strives but fails to refute the hypothesis that this subordinates scientific evidence

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<sup>41</sup> This section is drawn from B Harriss-White et al, 2011 Revisiting technology and Under development: Climate change, politics and the 'D' of solar energy technology in contemporary India pp92-127 in (eds) V Fitzgerald, J Heyer and R Thorp *Overcoming the persistence of inequality and poverty* Palgrave

<sup>42</sup> Dickson D 1984/8 *The New Politics of Science* Chicago, Univ of Chicago Press p 2,39, 44, pp72-7.

<sup>43</sup> Op cit pp 53 and 54

to commercial interests. Policy based evidence parades as evidence based policy. Dickson shows that university establishments which may be supposed to embody at best independence, but which in practice have divided political loyalties, have moved / been moved towards a position hostile to 'state interference' and are easily captured by private funders.<sup>44</sup>

The second set of feedback relations are those between science and industry/business. Increasingly university science, science in state-funded labs and business all become politically unified and opposed to control by the state. 'Corporate science' then funds university research, supplementing public funds and privately appropriating the development phase of public research, the D of R and D, where ownership is key to political control and regulation. It is then a short step for industry to expand control from the development phase upstream to publicly-funded research itself.<sup>45</sup>

The last set of feedbacks relates industry to the state. Privately appropriated technology becomes an instrument of foreign policy. Skilled labour is invited into the country, while technology is allowed to be exported if it reduces production costs and can be closely controlled - for despite patent and process protection, fees and royalties, exported technology has the potential to be used to compete with and erode the carefully constructed metropolitan 'competitive' advantage. Policy-making also comes under the aegis of economics, which develops policy as an exemplary field for cost-benefit analysis for resource allocation in the interest of national competitiveness.<sup>46</sup>

Yet on these science-policy relationships Dickson comments: 'the value of science as a policy instrument is both limited and dangerous' (Dickson, 1884/8, p299) since there is no neat division between facts and values and the facts of science are commonly open to more than a

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<sup>44</sup> Op cit pp22-25, p 106, ch 6).

<sup>45</sup> Op cit, pp 66-95. For the first time in history, cutting-edge military technology develops independently of direct, formal state control (see S Willetts, 2002, *Weapons at the Turn of the Millennium*, in (ed) B Harris-White *Globalisation and Insecurity* Macmillan )

<sup>46</sup> Dickson, 1884/8 p286 and chapter 4.



single interpretation. The paradox Dickson describes for the USA is that with the rule of experts and science instated in public policy, scientific autonomy and the state are undermined and private interests prevail.

Dickson's account, admittedly of the USA rather than the UK, tracks hostility to state control and to politics at the interface between science and public policy. In the present era an episteme that denies politics has been built between science and policy-making and is seized on by both parties. What it is about politics to which science and the professional field of policy might be averse? While not being an easy question to answer, we saw at the outset that the 'third culture' has naturalised markets as the ultimate social and political regulators. To start building an answer to this question, we therefore turn in the last two sections of this essay to explore the relationship between the processes of commodification of both knowledge / science and policy making on the one hand and the 'fourth culture' of de-politicisation on the other.

### *Q3: Research and policy in an era of the commodification of knowledge*

The 'knowledge society' at the heart of this book refers to one in which knowledge is no longer confined to those who acquire and develop it but instead is made freely available, for a price, through markets. Knowledge in this situation becomes a vast collection of commodities, along with so many other things which were previously organised or understood along non-market principles.<sup>47</sup> While private industrial funding for medical research in universities has a pedigree dating from the 19<sup>th</sup> century,<sup>48</sup> the process of commodification has already gone very far and is accelerating in reach and pace. By now most of the world's agriculture and food production has been commodified. So, as we all now appreciate after the Wall Street crisis, has risk. So too have many domestic activities, at least in middle-class households— keeping food fresh has been replaced by fridges,

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<sup>47</sup> U Salam, forthcoming, 'Commodification, capitalism and crisis' in (eds) J Heyer and B Harriss-White *Indian Capitalism in Development* Routledge

<sup>48</sup> Amelia Bonea, Pers. Comm., July 2013

washing clothes by washing machines, cooking by buying pre-cooked food and restaurant meals. Not only have farmland and fresh water supplies been commodified, but also parts of the oceans at an unprecedented pace (through the creation and sale of exclusive fishing and drilling rights), and even air itself (carbon trading is - in theory - a market for fresher air).<sup>49</sup>

Now it is the turn of knowledge. Commodification has only two levers to brake it. One consists of politically determined limits - resulting from processes ranging from public deliberation to force. The second comprises non-commodifiable realms such as the family, the state or nature itself which are not produced under market conditions and yet which supply essential preconditions for capital - whether it be public infrastructure or the commons of scientific knowledge. The question then is whether scientific knowledge is like the family, and needs to be protected from commodification if it is to remain true to its nature: whether society can do without the kind of knowledge which only a non-commodified form of knowledge production can provide.<sup>50</sup>

In the scholarly subfield of the knowledge economy, it is not only knowledge itself that is to be commodified through patents and private intellectual property rights, a larger argument is being made for the worth of commodifying an entire set of institutions through which knowledge is created, acquired and multiplied. The role of the university/higher education is then to create human capital through ever more commercialisable means.<sup>51</sup> Current supply and demand or

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<sup>49</sup> <http://www.opendemocracy.net/ourkingdom/colin-leys-barbara-harriss-white/commodification-essence-of-our-time>

<sup>50</sup> Some also argue that social institutions such as gender and ethnicity put a brake on the penetration of markets. Whether they are archaic outliers from pre-capitalist society or reworked as modern elements of contemporary capitalism is as debated an issue as whether they constrain market economy and protect market society or whether they disappear under advanced forms of capitalism. Ho's ethnography of the roles of race, gender, class and university of origin in the hierarchical internal structuring of Wall Street investment banking seems to settle these debates. (K Ho, 2009) *Liquidated: an ethnography of Wall Street*, Duke University Press

<sup>51</sup> 'The government has removed grants for subjects where private providers are able to compete, allowed students at private colleges access to the official student loan scheme and maintenance grants, and introduced a HMRC-led consultation to exempt commercial degree providers from having to add VAT to their tuition fees.' In the UK there are only six private universities (out of about 100 universities and 159 institutions with degree awarding powers, one is for profit and another one from ten recently allowed university status is being purchased for profit by a for profit corporation. At the same time, hundreds of 'colleges' have been established since 2011 selling degrees accredited by universities all over the world - a regulatory nightmare.

‘quasi’ markets will order the ownership and management of the university, its accreditation, its disciplinary structure, the curriculum, the results of examinations and certification, the nature and value of research, the way research is communicated to wider audiences, the returns to patents, and the remuneration of teachers / ‘instructors’ so as to minimise costs and maximise profit.<sup>52</sup> Progress of all sorts is evaluated by money metrics. British universities are in the throes of moving from being independent institutions where knowledge is thought to be an entitlement, through a process where they house a private investment in human capital, onwards to a full consumer-driven system, in which the business model is openly competitive, and the state intervenes to incentive marketization. In teaching, the trebling of student fees has reduced the number of applications- by 7% in 2012 and a further estimated 6% in 2013. In research, funding for whole areas of enquiry has been blocked off, open-ended research is discouraged, transactions costs are deemed excessive for small claims on society’s research resources to be administered. Research resources become skewed towards corporate interests, patenting and spin-off companies are actively encouraged, privatising the results of public grants. The collective, collegial and critical ethos of research is being actively compromised and private and public boundaries blurred.<sup>53</sup>

Karl Polanyi argued that a ‘market society’ is a contradiction in terms: markets were so destructive of conditions of social existence that a society in which market principles ruled supreme – a ‘market society’ – couldn’t exist.<sup>54</sup> Without political control, markets cannot safeguard the conditions of reproduction of a society. Something very similar may be said of the outcome of a generalised knowledge economy - a knowledge *society* is a contradiction in terms. In the restricted form of the subject of this essay, research knowledge depends on public goods

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See A McGettigan, 2012, ‘New universities: will the public good yield to private profit?’ 29.11.12 *The Guardian* and S Collini, 2013 ‘Sold Out’ *London Review of Books* Vol. 35 No. 20 · 24 October 2013 pages 3-12 |

<sup>52</sup> See for instance the Leader: ‘US web education’ *Financial Times*; 15.3.13

<sup>53</sup> See Nurse, 2013. Asked to fill activity time-sheets in a detail of minutes per day prior to the retrospective release of research funds, the current writer is imagined by funding agencies to be well and truly Taylorised

<sup>54</sup> K Polanyi 1957 *The Great Transformation* Boston, Beacon Press

and collective activity. In the same way as for material goods, commodified (enclosed) knowledge, is selected for profitable development from the product of a non-commodified knowledge commons,<sup>55</sup> and then extracts rents from its use.

Capital – in the shape of individual firms – has no interest in paying for the ‘curiosity-driven’ knowledge in whose production everyone has a collective interest. But it shoots itself in the foot if it actively attacks the collective production of knowledge on which commodifiable knowledge depends. Capital however is not geared to measuring and worrying about the extent to which the conditions of existence of basic, collectively generated knowledge are being undermined. That role is played by political critique. But in the commodified and depoliticised forms of knowledge that are now common in today’s science-policy exchange, there is no place for political critique.

As we have seen in the examples introduced here, official political ‘discourse has become increasingly colonised by an economic idiom, which is derived not strictly from economic theory proper, but rather from the language of management schools, business consultants and financial journalism’.<sup>56</sup> (Collini, 2011). I have argued here that it is not just a language that is imported from economics but also a set of practices. ‘The language of the market saturates much of public discourse, including the practice of a large part of the social sciences, and even the functionings of the state could be said to resemble a marketplace, in which political decision-making is itself a product’.<sup>57</sup>

*Research and policy under the commodification of the core functions of the state.*

‘(I)f other parts of the public sector were to be market-tested, policy, too, should be open to contestability’ observed the British Cabinet Secretary in 2012.<sup>58</sup> When commodification directly engages the

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<sup>55</sup> U Salam, forthcoming,

<sup>56</sup> S Collini 2011 From Robbins to McKinsey London Review of Books [Vol. 33 No. 16 · 25 August 2011](#) pages 9-14 and 2012 *What are Universities for?* Penguin Books

<sup>57</sup> Salam, forthcoming

<sup>58</sup> Quoted in J. Dudman *Guardian Professional*, Tuesday 6 March 2012

state, a set of political changes are triggered. They include the social re-valuing of the provision of public goods and services, the incentivisation of private sector involvement through state-underwritten capital investment and the subsidy of risk, the reconfiguring of the workforce as one from which profit can be made and the transformation in physical terms, as well as in the public consciousness, of public services into private commodities.<sup>59</sup> The process is not being confined to the privatisation of textbook public goods and services (defined as non-excludable and non-rivalrous (e.g. the army)) but expands towards the privatisation of goods and services about which there is a social (democratically established) consensus that they should be in public ownership (India's Essential Commodities Act seems to have passed both this test and the test of time). Blind to consequences, commodification even includes the processes of policy making and 'political decision making' themselves. Each component of policy making is commodified: policy advice is subcontracted out to management consultancies, policy formulation may go to commercial legal drafting companies. Universities are drawn in. They compete with more or less 'interested' think-tanks and private lobbies to capture the agenda and to store information essential to the decision process. The consequences are that conflicts of interest are deliberately embedded in the state, that the state has a short-term rather than long-term institutional memory, and that data origins and quality are increasingly hard to evaluate for evidence based policy decisions. Data are less secure too.

In this process the credit rating agencies (themselves commercialised) which 'regulate' global financial markets then set severe limits on the scope of the whole field of contestable public-interest policy. Policy makers need qualities of 'entrepreneurialism' rather than a capacity for the dispassionate sifting of debated evidence. Balogh's 'dilettante', or, more realistically, the higher civil service 'mandarinate', originally conceived as the state's defence against the corruption of special interests, is becoming obsolete. In the New Labour era, from 2004-8 half the top civil service positions in the UK

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<sup>59</sup> C Leys 2001 *Market Driven Politics* Verso

were drawn from outside, mainly from business. Under the current (2013) coalition government, about half the senior civil service now have their salaries paid to their own private companies, significantly reducing their tax obligations.<sup>60</sup> High level policy entrepreneurs develop the capacity to encourage a ‘direction of travel’ towards internal markets, and/or external privatisation, to exclude incompatible futures, to manage the transactions costs of commissioning and subcontracting core policy activities. So the normalised social networking and ‘revolving door’ which gives bureaucrats direct experience of business pre- and post-retirement and vice versa also embeds conflicts of interest and further erodes the boundaries between the public and private spheres and their interests. The public is surrendering to the private.

This is the context in which many scientists and policy makers now find themselves operating. The ‘fourth culture’ is the result. As it consolidates, the mutual de-politicised discourse between science and policy develops into something that is both un-scientific (restricting disinterested enquiry) and often bad policy, if we accept the need for, and value of, the public sphere.

Public policy and the public interest must then be redefined as the sum total of private interest. But to define the public interest as the sum of private interests is manifest nonsense since the latter conflict – the theme of every political philosopher since Hobbes - if not before.

This is a political project indifferent to certain kinds of evidence – e.g. the British Treasury’s ignored case, published in 2003, against the privatisation of healthcare.<sup>61</sup> It is a project in which flawed evidence may be mobilised - e.g. the subsequently much criticised case of the costs and performance of a US healthcare corporation used against the British National Health Service.<sup>62</sup> It is one in which policy based evidence (working backwards from an already decided policy,

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<sup>60</sup> The evidence can be found in C Leys 2012 *The Dissolution of the Mandarins*, *Open Democracy* <http://www.opendemocracy.net/ourkingdom/colin-leys/dissolution-of-mandarins-sell-off-of-british-state>

<sup>61</sup> Price signals don’t work in relation to health care; the consumer lacks the necessary knowledge, creating a risk of overtreatment; there is a potential abuse of monopoly power; it is hard to write and enforce contracts for medical treatment; and ‘it is difficult to let failing hospitals go bust – individuals are entitled to expect continuous, high-quality health care wherever they are’ (HM Treasury, 2003, 12-14) (9). <http://renewal.org.uk/articles/the-plot-against-the-nhs/>

<sup>62</sup> A. Talbot-Smith et al 2004 Questioning the Claims from Kaiser *British Journal of General Practice*, 54, 415-21

selectively ‘cherry picking’ to generate supporting evidence) rather than evidence based policy is invited.<sup>63</sup> In the case of the health reforms being rammed through the UK, the budget for marketised health has new wedges to cover i) repayments for public-private partnered infrastructure, ii) transactions and co-ordination costs for outsourced private services, iii) for fraud and litigation not to mention iv) for profit. The opportunity cost of all of these private cost components is public health care. It is far too early in the process of privatisation for outcome or impact statistics,<sup>64</sup> but one effort to mimic a private company in the form of a single Foundation Hospital Trust has led to the preventable deaths of between 400 and 1200 patients over four years.<sup>65</sup>

In the commodification of policy making, curiosity driven research, justifiable in utilitarian as well as civilizational terms,<sup>66</sup> is increasingly less valued by official research funding councils. To illustrate with another example, in one of the 15 international agricultural research centres co-ordinated in a global network and reformed through the Consultative Group on International Agricultural Research, funding for blue skies research declined from 30% to zero over the six years from 2006. Research themes were increasingly prescribed by donors,<sup>67</sup> influenced by business rather than frontier science, shattered into hundreds of normal research projects, with new research and employment contracts becoming time-bound and ‘performance-related’. To be eligible for funding inside these constraints, inspired discovery science has to develop a deliberate strategic vagueness. Or curiosity-driven research must be cross-subsidised inside that subset of institutions that values and can resource it. And the result may be

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<sup>63</sup>House of Commons Science and Technology Committee, 2006, *Scientific Advice, Risk and Evidence Based Policy Making* paras 89,95-6;and see Nurse, 2013 ; and S Player and C Leys 2011 *The Plot against the NHS* Merlin, for systematic PBE in the drawn-out privatisation of British healthcare

<sup>64</sup> The question is frequently asked without introducing the element of time. It is another point that the privileging of a utilitarian conception of impact crowds out many other useful factors about research (e.g. learning) (Nurse, 2013)

<sup>65</sup> The case of Mid Staffs Hospital, the object of the 31 month enquiry resulting in the recent Francis Report; <http://www.guardian.co.uk/society/2013/feb/06/mid-staffordshire-report-sweeping-changes>

<sup>66</sup> The utilitarian argument being that most of the significant inventions of the 20<sup>th</sup> century have been found to have emerged from blue skies research (see <http://www.ucl.ac.uk/EarthSci/research/blueskies/background.html> not just for the facts but also for the suggestion that private ‘venture’ funds can underlie future discovery science). For the civilizational case see Nurse 2013.

<sup>67</sup> Minimising transactions costs of research approval s may be a superficial reason for top-down control but this practice is consistent with enabling the research agenda to be restricted.

illustrated in a London University institution, which acts as the guardian of many rare academic disciplines and fields, where a new academic cultural abyss is opening up *within* social science and humanities, alienated from the ‘fourth culture’, between rare disciplines with few students, able to retain an independent critical research culture, and popular, heavily subscribed disciplines, dominated by the requirements of market-mediated mass-teaching, the latter cross-subsidising the former and having far less time for research.

For science to be useful for policy it has to manage a contradiction. Not only does it have to be able to be plugged into the politics of commodification –hence the proliferation of new and profitable industries of translation, standardisation and de-politicisation – but it also has to preserve the capacity to criticise social processes in order – at the very minimum – to preserve the non-commodified base essential to society and economy, the very base that commodification works to undermine.

### *In sum*

We have argued that when communicating with policymakers, most physical and biological scientists and engineers (with a public interest conception of natural sciences) operate with un-theorised and ad hoc models of society not drawn from social science; that they neglect or reject politics entirely; that expert policy-makers are transferring certain modes of reasoning from science that fulfil a narrowly defined set of policy questions - ‘fit for very limited purposes’ – and also reject the rigorous study of power in their own policy processes, prominent among which are expressions of powers hostile to the public interest; finally that both expert knowledge and policy knowledge is being commodified. This is the ‘fourth culture’: an expert culture in which science, social science and policy making are tightly linked, and re-politicised through their joint de-politicisation.

We saw the processes at work in the ‘knowledge society’ which must depend in practice upon a knowledge commons that is not part of the knowledge economy. One of the conditions for progress in both



science and policy is the freedom of un-commodified and critical research. But this freedom is confronted by the de-politicised science-policy interface. We have argued that the process of de-politicisation is so systematic that it cannot be a random accident and must therefore be open to interpretation as a political intervention which serves social purposes. So the final question concerns the interests that are served.

We have seen that depoliticised models of society/policy form a lingua franca in the face of baffling terminological complexities in both science and social science. The lingua franca is a translational device. Even the concept of policy, distinct from politics, is a feature of the English language. Few other languages permit it. This depoliticised discourse strives to wrench clarity from uncertainty when clarity is thought to be needed for policy makers. But the lingua franca makes political critique impossible. And in so doing it does injustice to science. Since the idea of science serving policy depends on the excellence of science (as argued by the President of the Royal Society, quoted earlier), it therefore does injustice to policy. So the final significance of this de-politicisation is that it is quite *unable to halt the process of commodification and the supplanting of the public interest by private interests.*

Not acting as a brake, or indeed even nurturing commodification, may even be the socially engineered purpose of the fourth culture, but that proposition would go further than our argument and evidence here. It is certainly its unintended consequence. Whatever its intentionality, the 'fourth culture' attacks its own nutrient base, its necessary preconditions.

Three urgent actions follow from the argument of this essay. First scientists and social scientists need to define what is needed to ensure the survival of a non-commodified knowledge base, given where higher education is headed. Second non-commodified science and social science need to be well-articulated with policy making in ways that are not mutually damaging and inform the public interest.<sup>68</sup> Third,

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<sup>68</sup> 'An instrumentalist perspective, for better or worse, is a necessary condition of policy making ...I want to be able to use the outputs of social science research instrumentally and that requires dialogue and discussion

in this interpretive role, policy decisions must be viewed from at least three standpoints – that of the proponent (the (in)vested interest), that of the state, and of the larger public interest.<sup>69</sup>

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with social scientists... Policy makers arguably instantiate the Marxist notion of ‘praxis’ ( A UK policy maker, Pers. Comm. May, 2013).

<sup>69</sup> This is the adventurous call made in the 2013 report ‘Benefits and limitations of nuclear fission for a low-carbon economy’ (Brussels, European Commission), pp 6,9-10 et seq.