

BOOK REVIEW

Sex, science & profits

By Terence Kealey

William Heinemann (Random House), London, 2008

Review by Pierre Desrochers

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Clinical biochemist, (privately-funded) university administrator and EJSD editorial board member Terence Kealey¹ first gained some measure of public attention in 1996 with the publication of his book *The Economic Laws of Scientific Research* (henceforth, *The Economic Laws*) in which he argued that governments need not fund science. Kealey's original impetus for venturing outside the confines of his laboratory was the campaign orchestrated in 1984 by Oxford academics to deny an honorary degree to British Prime Minister Margaret Thatcher on the grounds that her budgetary cuts were then destroying British science. Having himself been asked to leave this institution a few years earlier because of a shortage of laboratory space and having later been able to observe abundant resources wherever he took his research, Kealey set out to document how British science was actually thriving under Conservative policy due to increased private funding. What perhaps began as a somewhat modest project eventually turned into an ambitious survey of historical and contemporary economic, science and technology controversies. The biochemist's main conclusion was that public funding always and everywhere crowds out far more important and effective private support of science.

Despite his comment in the preface of *The Economic Laws* that he "hope[d] never to write another book," Kealey found the time and energy to expand significantly on his first foray into science and technology policy. The result is *Sex, Science & Profits* (henceforth, *SSP*), a courageous and witty book that not only restates in a more accessible style the main arguments of his earlier work, but also contains a more ambitious discussion of the intellectual and sociological nature of the scientific enterprise which is rooted in evolutionary psychology thinking.

As in his previous book, Kealey first introduces Sir

Francis Bacon's (1561–1626) 'linear' model of technological advance and economic growth, which he summarizes as follows:

Government money → science → technology → wealth

Despite the longstanding academic and political support behind Bacon's notion of science as a public good which can only thrive through government support, Kealey argues that it is not supported by the available evidence. His main objectives in *SSP*, however, are more ambitious than simply documenting this fact, for he not only contends that science is not and cannot be a Baconian public good, but also presents readers with an alternative model of science, technology and economic growth interactions.

As in *The Economic Laws*, the author first supports his argument through a broad and lengthy (almost 260 pages) revisionist historical survey stretching from the Stone Age to recent British government science policy. Kealey's interpretation of the available evidence is rooted in the framework put forward more than two centuries ago by the economist Adam Smith, which he sums up as follows:

Academic science ← new technology → wealth

↑

industrial money + old technology

In short, Smith not only believed that most industrial advances emerge from the creative thinking of people directly involved in production activities rather than from academics ensconced in university laboratories, but also that academic science more often than not feeds off new problems or discoveries made in the technological realm.

Unlike many other broad surveys on the topic written by respected academics,² Kealey pulls no punches for characters he dislikes and often reminds his readers of his good fortune in having been born an Englishman. The result is, to my knowledge, one of the most entertaining serious discussions ever written on the subject. Indeed, I have already recommended it as beach reading to some (obviously academic) acquaintances of mine...

Kealey provides wide ranging evidence in support of the hypothesis that the scientific method is intuitive, citing among others the work of psychologist Jean Piaget, archaeologist Steven Mithen and various dolphin and chimpanzee specialists. He also adds a personal anecdote, observing that upon arriving in his lab, his own PhD students – educated in the British school and University system and lacking in-depth knowledge of any topic other than football – already understood the scientific method.

His observations concerning the inherently competitive nature of science are equally wide ranging. Describing a scientific quarrel between the Greek philosophers Pythagoras and Hippasus in which the former had the latter drowned, he observes that if the story is based on the hearsay of later Greek writers, “the fact of the story, and its credibility to those of us who know scientists (one of my research supervisors hated all his competitors and would have murdered them all), speaks of the perennial nature of the scientific personality” (p. 83).

Readers are also reminded in a discussion of the Second Anglo-American War of 1812 that “the Americans, allied to the tyrannical Napoleon, attacked Britain, the world’s sole defender of freedom. But in 1814 the Americans, from their Blackened House in Washington, D.C., were forced to sue for peace” (p. 347).³ The German-born rocket scientist Wernher von Braun was an “ex-Nazi whose own moral fibre would not withstand much examination” (p. 248). David Lloyd George was “a politician who treated the organs of the state (and the women contained within) as his chattels” (p. 275). The University of Sussex’s prestigious Science Policy Research Unit (SPRU) is a “leading UK lobbyist for government money” (p. 298). The eugenics movement “was born of snobbery” (p. 264) and a desire “to sterilize... unwanted domestic detritus” (p. 268) and long-term “progress” in marijuana’s cannabinoid content demonstrates that agricultural improvements will occur in the absence of government support (p. 160).

One might quibble with some overgeneralizations (for example, for considering the Bronze Age as (almost) one big waste of time), interpretations (his praise of the 1980 Bayh-Dole Act)⁴ or details of Kealey’s account. For

example, his description of Polynesians as “Indonesians” (p. 40); his (admittedly mainstream) use of the words “tragedy of the commons” as opposed to the more accurate “tragedy of open access” (p. 42); and his contention that the Dr Strangelove character was based on John von Neumann as opposed to Edward Teller or a composite of nuclear scientists at the time. The book could also have benefited from better editing, as it contains a number of mistakes in the names of individuals and institutions (Chicago University and Toronto University as opposed to the University of Chicago and the University of Toronto; Nikda as opposed to Nikola Tesla, Puerto Rica as opposed to Puerto Rico, etc.). Yet, Kealey’s main arguments seem to me eminently sensible and sufficiently backed up with evidence. To sum up:

- Human beings are both instinctive traders and predators, but the predominant instinct depends on the institutional environment (presence or absence or property rights, the rule of law and freedom to trade) in which individuals find themselves. As a result, smaller and freer polities (as opposed to large empires or monopoly-granting states) who were less able to curtail individual freedoms have historically contributed disproportionately to economic and technological advances.
- Because intelligence is intuitive and evolved to be adaptive, and because humans are born with a propensity to truck, barter and exchange, the scientific method turns out to be nothing more than the older market method (making an observation; creating a hypothesis; testing the hypothesis; measuring the outcome) applied to different types of problems. As Kealey puts it:

“[T]he scientific method emerged when a trader, Thales [of Miletus], first extended his market method into an abstract problem of the type we call scientific. What the directors of a company or the dealers on the exchanges or the entrepreneurs in the market do today is no different, in kind, from what researchers do in their laboratories, but it was the traders who taught the scientists how to formalize it” (p. 89).
- As demonstrated by neuroeconomists, psychologists and historians of philanthropy, giving money to good causes seems hard-wired in human beings. Rich men and women will therefore always compete to provide “public goods.” Because functioning markets ultimately depend on trust, a successful market society not only fosters trust but also the philanthropic impulse that is an extension of the

commercial one. “The quickest way of destroying philanthropy” is therefore “for the state to support public goods” (p. 201).

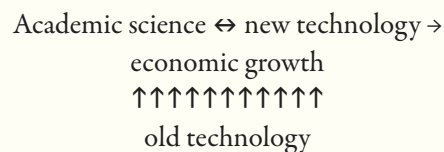
- Scientists, like all other human beings, tend to look for evidence that reinforces their own preconceptions and are always ignoring inconvenient data. Indeed, “because they are working at the limits of knowledge, they have to” (p. 269). While the postmodernists have a point when they describe science as a political activity, their pessimism about universal truths is unwarranted as long as a multiplicity of funding sources are available, for in that context little boys will eventually “show up the big men of science as having no clothes” (p. 272). But while promoting science in a partisan fashion is the only way to eventually discover scientific truths, government funding – despite its greater prestige in the eyes of most academics – should be avoided as it is essentially “other people’s money” and will therefore be less subjected to the test of credibility (the collective judgement of market, civil society and disinterested parties in the scientific community) than funds provided by most other sources.

While Kealey’s historical survey summarizes and expands on themes often already discussed in *The Economic Laws*, the real value added of *SSP* can be found in the book’s final major section, “What is Science?”

As I see it, the author’s key points are that there is no such thing as ‘science,’ only scientists who need to develop mechanisms to trust each other, and that the private sector will always employ or fund plenty of them. Kealey suggests that corporate managers have no choice in this respect, for they must hire scientists who must be allowed and provided the means to be creative and to publish in order to keep up with other corporate and academic scientists’ relevant research. The real value of company scientists does not therefore mostly derive from their own original work, but from their capacity to understand, import and expand upon the relevant information and know-how (tacit knowledge) developed by others. Although such ‘copying’ might seem somewhat unethical to outsiders to the scientific enterprise, Kealey argues persuasively that scientific copying is not a form of free-riding, but rather an expensive and time-consuming activity because of the actual costs of discovering relevant know-how produced by others, copying (often through reverse engineering), and retaining competent scientists (p. 306).

In the end, the linear model turns out to be “not linear at all,” but rather in need of a “separate origin, a fork and

lots of arrows” (p. 294) along with a reverse arrow to reflect the importance of technology on the generation of new basic science:



Kealey further suggests that science publishing must be understood in terms of vanity publishing, which he ultimately traces back to sexual selection. In short, humans advertise their sexual fitness by competing for esteem and are ultimately not interested in absolute, but relative wealth (i.e., how well they fare against others). In the absence of ownership, esteem is the only currency of science and scientists will go to great lengths to ensure that they are not scooped or disproved. Just as sexual selection gave us cleverness and creativity, so did it give us “science, that cleverest and most creative of activities” (p. 311).

Building on the work of MIT researchers Eric von Hippel and Thomas Allen, Kealey further documents that competing companies routinely share information and that a surprising percentage (about a quarter according to some studies) of a company’s most important innovations come from swapping information with rivals. Corporations share knowledge for several reasons, but the most important one is to widen their knowledge base and opportunities. Kealey goes one step further than these researchers, however, and suggests that “government money is not necessary for knowledge to be shared or unduplicated” (p.314). He further argues that academics congregate in conferences for the same reason – “not to give information away but to trade it” (p. 314). Again, this behaviour is a result of a long evolutionary process through which “humans have acquired instincts for guilt, shame, fairness, honour, generosity and the other emotions that facilitate tit-for-tat and other optimal game theory tactics” (p. 321). The scientific enterprise has therefore always been a collegiate (i.e., a discrete, mutually-selecting club) as opposed to a public good. It had to be so because members needed to trust one another to report their findings honestly. It is no accident that the Royal Society was founded by Freemasons and modelled on Masonic prescriptions (p. 329).

At the end of the day, science can thus be viewed as “a conversation held between researchers who have learned to trust each other and who share similar tacit experiences” (p. 334). The author labels this process an “invisible college good” (p. 336), which he defines as follows:

Any particular area of science is understood by only a few cognoscenti, who trade knowledge for mutual benefit. And the trade is unusual because it is not a simple barter of A for B between two individuals, but, rather, it is more like the pooling of information between peers. Any particular discovery may benefit others more than the discoverer, yet over a period of time, with enough pieces of information being pooled, chance will ensure that the advantages are distributed between all players (p. 336).

The remainder of the section is best described as an abattoir for the sacred cows of mainstream economics (Stanford University's Paul Romer, Kealey's main *bête noire*, chief among them) and policy science research in which he takes no prisoners and shows no mercy, while skewering along the way the need for a patent system (with the exception of the pharmaceutical industries) and the division between pure and applied science which he ultimately traces back to snobbery whereas, in fact, each type of science chisels away "at different faces of the same mountain of ignorance" (p. 397).

Sex, Science and Profits is a courageous, lucid and, in my opinion, persuasive book. Its message deserves to be heard and debated.

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Notes

1. Full disclosure: Dr Kealey is a personal friend and thanks me in the acknowledgements to his book for educating him in scientific co-operations between companies.
2. See, among others, Basalla (1988), Mokyr (1990) and Smil (2005; 2006).
3. Of course, the fact that British North America had in the meantime remained a British colony owed much to the French-Canadian militia.
4. The Bayh-Dole Act transferred the intellectual property rights to technologies created from federal funds to university researchers and their institutions. This Act has been blamed for modifying the behaviour of non-profit institutions in a way that increasingly threatens the norms of open science, mainly by giving non-profit institutions an incentive to sue private companies that allegedly infringe on their intellectual property rights (Nelson, 2001; Feldman et al., forthcoming).