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Science in the 21st Century: Knowledge Monopolies and Research Cartels

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Abstract—Minority views on technical issues are largely absent from the public arena. Increasingly corporate organization of science has led to *knowledge monopolies*, which, with the unwitting help of uncritical mass media, effect a kind of censorship. Since corporate scientific organizations also control the funding of research, by denying funds for unorthodox work they function as *research cartels* as well as knowledge monopolies. A related aspect of contemporary science is commercialization.

Science is now altogether different from the traditional disinterested search, by self-motivated individuals, to understand the world. What national and international organizations publicly proclaim as scientific information is not safeguarded by the traditional process of peer review. Society needs new arrangements to ensure that public information about matters of science will be trustworthy.

Actions to curb the power of the monopolies and cartels can be conceived: mandatory funding of contrarian research, mandatory presence of contrarian opinion on advisory panels, a Science Court to adjudicate technical controversies, ombudsman offices at a variety of organizations. Most sorely needed is vigorously investigative science journalism.

Keywords: 21st-century science—knowledge monopolies—monopolies in science—research cartels—bureaucracies and science—institutions of science—scientific institutions

Preamble

A search for information about HIV/AIDS led to reports issued by UNAIDS and the World Bank that are plainly unreliable, incompetent even¹. Evidently, peer review does not safeguard the integrity of what is publicly promulgated by these organizations.

Other worrying aspects of contemporary science include the prevalence of conflicts of interest and of actual fraud, and the ignoring by mainstream science of an array of unorthodox opinions and findings.

Those strands of thought stimulated this essay. Its assertions are sweeping, but the called-for extended argument and documentation are unfeasible at less than book length. The citations and anecdotes given here are offered as illustrative

only, but should suffice to show that my views are not mere figments. Again, it is unfeasible here to acknowledge every exception or to enter caveats wherever called for; instead, I make the overall concession that the contemporary state of affairs is not monolithic. What I call changes are really *trends* whose effects vary from place to place, from field to field, and from time to time. But I stand by the main point: supposedly authoritative information about the most salient science-related matters has become dangerously misleading because of the power of bureaucracies that co-opt or control science.

Science as an Institution

Dysfunction and obsolescence begin to set in, unobtrusively but insidiously, from the very moment that an institution achieves pre-eminence. The leading illustration of this Parkinson's Law (Parkinson, 1958)² was the (British) Royal Navy. Having come to rule the seas, the Navy slowly succumbed to bureaucratic bloat. The ratio of administrators to operators rose inexorably, and the Navy's purpose, defense of the realm, became subordinate to the bureaucracy's aim of serving itself. The changes came so gradually that it was decades before their effect became obvious.

Science attained hegemony in Western culture toward the end of the 19th century (Barzun, 2000: 606–607; Knight, 1986). This very success immediately sowed seeds of dysfunction: it spawned scientism, the delusive belief that science and only science could find proper answers to any and all questions that human beings might ponder³. Other dysfunctions arrived later: funding through bureaucracies, commercialization, conflicts of interest. But the changes came so gradually that it was the latter stages of the 20th century before it became undeniable that things had gone seriously amiss⁴.

It remains to be appreciated that 21st-century science is a different *kind* of thing than the “modern science” of the 17th through 20th centuries; there has been a “radical, irreversible, structural” “world-wide transformation in the way that science is organized and performed” (Ziman, 1994: 5, 7). Around 1950, Derek Price (1963/1986) discovered that modern science had grown exponentially, and he predicted that the character of science would change during the latter part of the 20th century as further such growth became impossible⁵. One aspect of that change is that the scientific ethos no longer corresponds to the traditional “Mertonian”⁶ norms of disinterested skepticism and public sharing; it has become subordinate to corporate values. Mertonian norms made science reliable; the new ones described by Ziman (1994) do not⁷.

Symptoms

One symptom of change, identifiable perhaps only in hindsight, was science's failure, from about the middle of the 20th century on, to satisfy public curiosity about mysterious phenomena that arouse wide interest: psychic phenomena, UFOs, Loch Ness Monsters, Bigfoot. By contrast, a century earlier, prominent scientists had not hesitated to look into such mysteries as mediumship, which had aroused great public interest.

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My claim here is not that UFOs or mediumship are phenomena whose substance belongs in the corpus of science; I am merely suggesting that when the public wants to know “What’s going on when people report UFOs?”, the public deserves an informed response⁸. It used to be taken for granted that the purpose of science was to seek the truth about all aspects of the natural world⁹. That traditional purpose had been served by the Mertonian norms: Science disinterestedly and with appropriate skepticism coupled with originality seeks universally valid knowledge as a public good.

These norms imply that science is done by independent, self-motivated individuals¹⁰. However, from about the middle of the 20th century and in certain situations, some mainstream organizations of science were behaving not as voluntary associations of independent individuals but as bureaucracies. Popular dissatisfaction with some of the consequences stimulated “New Age” movements. In the 1980s, some scientists were led to form new organizations—notably the Society for Scientific Exploration and the International Society of Cryptozoology—specifically to pay attention to matters of public interest that mainstream organizations had been ignoring.

A more widely noticed symptom was the marked increase in fraud and cheating by scientists. In 1981, the U. S. Congress¹¹ held hearings prompted by public disclosure of scientific misconduct at 4 prominent research institutions. Then, science journalists Broad and Wade (1982) published their sweeping indictment, *Betrayers of the Truth: Fraud and Deceit in the Halls of Science*. It has become almost routine to read in the *NIH Guide* of researchers who admitted to fraud and were then barred from certain activities for some specified number of years¹². In 1989, the National Institutes of Health (NIH) established an Office of Scientific Integrity¹³. So prevalent was dishonesty that the new academic specialty of “research ethics” came into being¹⁴. Professional scientific organizations drafted or revised codes of ethics. Various groups, including government agencies, attempted to make prescriptive for researchers what had traditionally been taken for granted, namely, something like the Mertonian norms.

This epidemic of cheating in the latter part of the 20th century meant, clearly enough, that an increasing number of scientists were seeking to serve their personal interests instead of the public good of universal knowledge. Scientists have always experienced the temptation to cheat, of course. Like all human beings, they are subject to conflicts of interest between their personal lives and their other activities. But in the latter stages of the 20th century, conflicts of interest became so pervasive, so extreme, as to cast doubt on the integrity of every aspect of science—peer review, publishing, funding (Krimsky, 2003). Articles in the most prestigious medical and nutrition journals are often flawed or biased (Kauffman, 2004). According to Ziman (2000), by about 1980 science had become seriously entangled with commercial interests. Pharmaceutical companies give gifts to physicians and researchers who heap public praise on their products, and they pay doctors and scientists to lend their names to ghost-written articles in professional publications (Krimsky, 2003: 115 ff.). In 2003 it

was revealed that drug companies had made hundreds of payments, totaling millions of dollars, to NIH scientists (Willman, 2003a–f).

An industry-government-medical complex dominates medical science and medical practice¹⁵. Pharmaceutical companies conduct or commission the clinical trials whose results are relied upon by federal agencies in decisions to approve or disapprove drugs as safe and effective. Traditionally, the gold standard of reliability in science was granted when independent researchers had confirmed a given finding; such warrants of reliability are nowadays lacking in the testing of new medications. The result is that large profits are made from drugs with household names whose benefits, in actual proven fact, are at best doubtful¹⁶. The general public is cautioned neither by the mass media nor by the government agencies supposed to oversee and regulate, until so many lawsuits or deaths have ensued that they can no longer be ignored. Warnings are raised chiefly by determinedly contrarian individuals, on off-beat web-sites, and in partisan publications, making it easy for mainstream pundits to impugn the credibility of the unorthodox views through guilt by association¹⁷.

Throughout the history of modern science, the chief safeguard of reliability was communal critiquing (Ziman, 2000). Science begins as hunches. Those that work out become pieces of *frontier science*. If competent peers think it worthy of attention, an item gets published in the *primary research literature*. If other researchers find it useful and accurate, eventually the knowledge gets into review articles and monographs and finally into textbooks. The history of science demonstrates that, sooner or later, most frontier science turns out to need modifying or to have been misleading or even entirely wrong. Science employs a *knowledge filter* that slowly separates the wheat from the chaff (Bauer, 1992: chapter 3; see Figure 1).

This filter works in proportion to the honesty and disinterestedness of peer reviewers and researchers. In the early days of modern science, before knowledge became highly specialized and compartmentalized, knowledge-seekers could effectively critique one another's claims across the board. Later and for a time, there were enough people working independently on a given topic that competent, disinterested critiques could often be obtained. Since about the middle of the 20th century, however, the costs of research and the need for teams of cooperating specialists have made it increasingly difficult to find reviewers who are both directly knowledgeable and also disinterested; truly informed people are effectively either colleagues or competitors. Correspondingly, reports from the big science bureaucracies do not have the benefit of independent review before being issued—hence the deficiencies mentioned in Note 1¹⁸.

The dramatic rise in conflicts of interest has brought the integrity of the peer-review system into jeopardy. The NIH permits reviewers to have conflicts of interest “when no other competent reviewers are available” (Brainard, 2004); yet one may reasonably doubt that such “peer review” could be a satisfactory analysis of the results being reviewed or an impartial assessment of a grant proposal¹⁹. Nevertheless, reviewers who are competitors of those whose work is being examined could still be very effective, provided they were able to be

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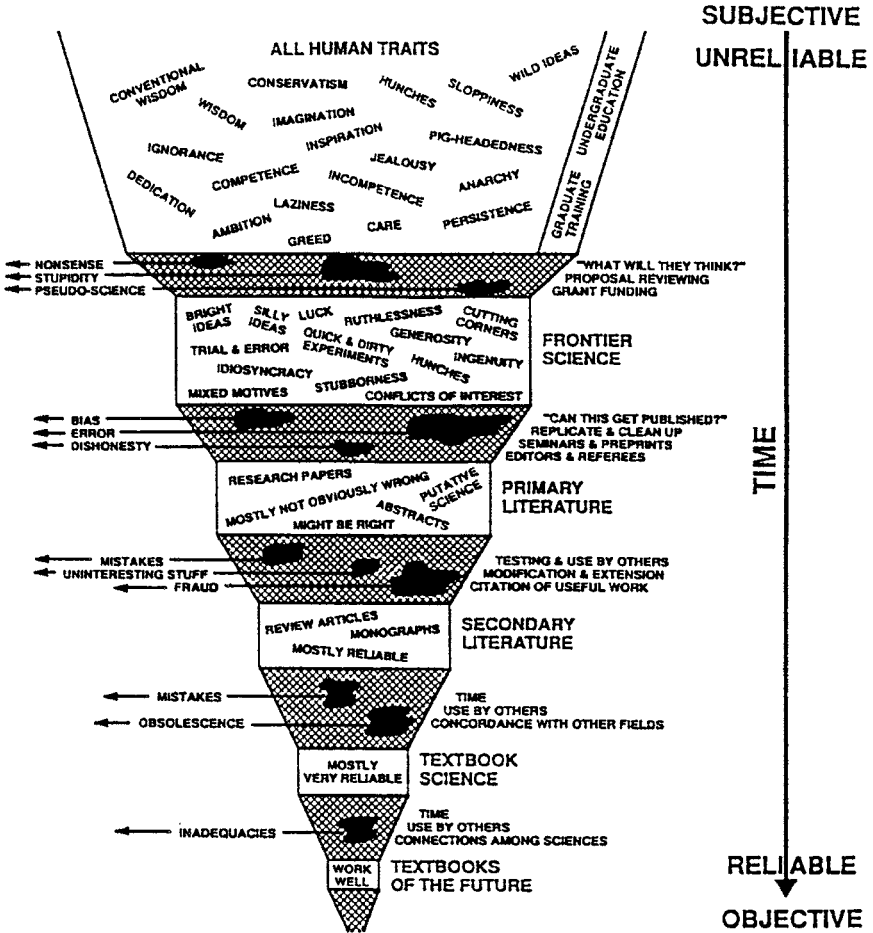


Fig. 1. How peer review over time acts to filter-reliable scientific knowledge from the guesses, claims, mistakes, and mis-deeds that are part of the human activity of doing science (from Bauer, 1992, by permission).

intellectually honest: they have a vested interest in showing their competitors to be wrong and have a great incentive to find flaws in the work being reviewed. On the other hand, reviewers who are colleagues have the opposite incentive, *not* to find flaws. With the increasing dominance of large research teams and large institutions, whereby the “only competent reviewers” turn out to be collaborators, the traditional safeguard of peer review has essentially dissipated.

Causes

Price (1963/1986) saw the exploding costs of research after WWII as a likely mechanism for bringing to an end the era of exponentially growing science. The

mentioned symptoms may indeed be traced to the escalating costs of research and the continuing expansion of the number of would-be researchers without a proportionate increase in available funds. The stakes became very high. Researchers had to compete more and more vigorously²⁰, which tended to mean more unscrupulously. The temptation became greater to accept and solicit funds and patrons while ignoring tangible or moral attached strings.

Politicians unable or unwilling to provide adequate public funds encouraged scientists in academe to collaborate with business and industry. Thereby the purpose of science, to seek the truth as a public good and no matter where it leads, becomes distorted by the drive to find profitable applications and technologies²¹. This was perhaps most obvious most recently during the “dot.com” and “biotech” bubbles, when fortunes were made by hawking farfetched promises based on speculative ideas masquerading as scientific. In the 1980s, universities were forming joint ventures with industry despite concern that the disinterested search for truth by scientists was being compromised; medical schools in particular were teaming up with pharmaceutical and biomedical companies (Krimsky, 2003, especially chapters 3 & 5).

It is ironic that a contributing factor to the demise of trustworthy science was its very success in bringing useful applications. The triumph of the Manhattan Project to develop an atomic bomb during WWII encouraged unbridled euphoria or “irrational exuberance”²² about what science could accomplish if sufficiently supported²³. On the part of the public and politicians, expectations became dysfunctionally unrealistic. Science was asked to deliver the impossible through ventures like the National Science Foundation’s “Research Applied to National Needs” in the 1970s or the NIH’s “war on cancer” declared in 1971 by President Nixon. In that spirit, scientists are encouraged to solicit funds for populist pipe-dreams like panaceas from gene therapy or from stem cells.

Unrealistic expectations coupled with misunderstanding of how science works led to the unstated presumption that good science could be expanded and accelerated by recruiting more scientists. Instead, of course, the massive infusion of government funds since WWII had inevitably deleterious consequences. More researchers translate into less excellence and more mediocrity²⁴. Journeymen peer-reviewers tend to stifle rather than encourage creativity and genuine innovation. Centralized funding and centralized decision-making make science more bureaucratic and less an activity of independent, self-motivated truth-seekers. Science attracts careerists instead of curiosity-driven idealists²⁵. Universities and individuals are encouraged to view scientific research as a cash cow to bring in money as “indirect costs”²⁶ for all sorts of purposes, instead of seeking needed funds for doing good science²⁷. The measure of scientific achievement becomes the amount of “research support” brought in, not the production of useful knowledge²⁸.

Commercialization may presently be most obvious in the medical sciences, but every field that offers opportunities for remunerative practical applications seems headed in the same direction; the computing-information-technology

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complex is not far behind (if at all) the medical sciences in displaying the unhappy consequences of excessive and excessively rapid commercialization. Indeed, already during the 1960s, economics and business faculty at elite universities had established companies using statistics, systems analysis, and behavior psychology to market “social problem solving”, drawing on their university-provided resources for personal profit (Ridgeway, 1968).

But commercialization is not the only force driving science into corporate form. National and international institutions are increasingly co-opting and controlling scientific activity for social or political purposes.

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Skepticism toward research claims is absolutely necessary to safeguard reliability. In corporate settings, where results are expected to meet corporate goals, criticism may be brushed off as disloyalty, and skepticism is thereby suppressed. As Ziman (1994) pointed out, the Mertonian norms of “academic” science have been replaced by norms suited to a proprietary, patent- and profit-seeking environment in which researchers feel answerable not to a universally valid standard of trustworthy knowledge but to local managers. A similar effect, the suppression of skepticism, results from the funding of science and the dissemination of results by or through non-profit bureaucracies such as the NIH or agencies of the United Nations.

While the changes in the circumstances of scientific activity were quite gradual for 2 or 3 centuries, they have now cumulated into a *change in kind*. Corporate science, Big Science, is a different kind of thing than academic science, and society needs to deal with it differently. Large institutional bureaucracies now dominate the public face of science. Long-standing patrons—private foundations like Rockefeller and Ford, charitable organizations like the American Heart Association and the American Cancer Society—have been joined and dwarfed by government bureaucracies like the Centers for Disease Control and Prevention, the NIH, and the National Science Foundation, which, in turn, are being overshadowed by international bodies like the World Bank and various agencies of the United Nations—the World Health Organization, the Food and Agricultural Organization, UNAIDS, and more. Statements, press releases, and formal reports from these bodies often purport to convey scientific information, but in reality these releases are best viewed as propaganda designed to serve the corporate interests of the bureaucracies that issue them. Of course there are exceptions; but as a general rule one should nowadays no more trust a press release from the World Bank²⁹ or from UNAIDS (Note 1) than one issued by, say, the Central Committee of the Communist Party of the former Soviet Union.

The fine print in some of the reports from these organizations actually concedes that they should not be trusted, a disclaimer not found in traditional scientific publications: “UNAIDS does not warrant that the information contained in this publication is complete and correct and shall not be liable for any damages

incurred as a result of its use” (UNAIDS, 2004). Nevertheless, the media based on this report such headlines as “Migration ‘threatens Europe with huge HIV crisis’” (*Sunday Telegraph* [UK], 4 July, p. 24) and “Aids [sic] cases hit new record” (*Daily Telegraph* [UK], 7 July, p. 12). Apparently overlooked was that the numbers in the report show little if any increase in HIV prevalence between 2001 and 2003. In any case, all those numbers are merely estimates yielded by a computerized model, not actual counts—not even the deaths supposed to have occurred in 2001 and 2003. That computer model is based on assumptions described by their authors themselves as tentative, and uses such grossly faulty inputs as that the mean time to death from seroconversion to HIV antibodies is 9 ± 1 years³⁰. Moreover, the quality of surveillance and testing for HIV is admitted to be variable at best, in other words, even the few actual counts fed into the computer model are of doubtful validity (*Sexually Transmitted Diseases*, 80, Supplement 1). Despite all these uncertainties, this UNAIDS report does not hesitate to extrapolate what populations will or would be in 2025, with and without AIDS. Moreover, it insists that 2003 saw the greatest numbers ever of new infections and deaths from AIDS. That insistence represents the typical bureaucratic case that more resources are needed, but it is based on a farfetched extrapolation from anything actually known. Since the incidence of HIV (percentage of people testing HIV-positive) has remained virtually unchanged (*according to the report itself!*), deaths plus population increase must have balanced new infections; but that balance would equally accommodate the possibility that deaths and new infections were at their *lowest-ever* levels in 2003, or indeed at any level at all.

Despite the uncertainties and deficiencies evident in this and other such reports, the media (by and large) pass on as factual and reliable—that is to say without critical comment—statistics and prognostications and recommendations from the World Bank, the World Health Organization, UNAIDS, the NIH, the Centers for Disease Control, the American Heart Foundation, the Ford Foundation, and so on and on. It seems to have been overlooked that these organizations feel free to broadcast claims and interpretations that have not run the gauntlet of critical, competent, *disinterested* peer-review^{31,32}. In contrast, *individual* scientists continue to be severely castigated, including in the popular media, if they dare to announce results publicly before they have been published in a peer-reviewed journal³². The large institutional bureaucracies are not held to that standard as they routinely issue purportedly scientific information.

The upshot is that policy makers and the public generally do not realize that there is doubt about, indeed evidence against, some theories almost universally viewed as true, about issues of enormous public import: global warming; healthy diet, heart-disease risk-factors, and appropriate medication; HIV/AIDS; gene therapy; stem cells; and more.

“Everyone knows” that promiscuous burning of fossil fuels is warming up global climates³³. Everyone does *not* know that competent experts dispute this³⁴ and that official predictions are based on tentative data fed into computer models whose validity could be known only many decades hence (Crichton, 2003).

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“Everyone knows” that diets low in cholesterol and saturated fats are heart-healthy. The actual evidence does not support this claim (McCully, 1998; Ravnskov, 2000).

“Everyone knows” that it is desirable to lessen or remove “risk factors”. In actual fact, most so-called risk factors are mere statistical correlations that have not been shown to be causes, necessary or sufficient or even partial.

“Everyone knows” that a bit of aspirin each day keeps heart attacks away. What everyone does *not* know is that there are better ways, with fewer side-effects, of doing that (Kauffman, 2000).

“Everyone knows” that AZT was the first medication that could prolong the lives of AIDS patients. What everyone does *not* know is that AZT is a deadly poison (Lauritsen, 1990) avoided by long-term survivors of HIV or AIDS diagnoses³⁰.

The Food and Drug Administration web-site (www.fda.gov) carries a list that should be thought-provoking of drugs once approved as “safe and effective” that have been withdrawn, such as anti-allergy medications like Seldane that did not induce drowsiness but could cause cardiac arrhythmias, or the aforementioned (Note 13) statin, Baycol.

What “everyone knows” about the science related to major public issues, then, often fails to reflect the actual state of scientific knowledge. In effect, there exist *knowledge monopolies* composed of international and national bureaucracies. Since those same organizations play a large role in the funding of research as well as in the promulgation of findings, these monopolies are at the same time *research cartels*. Minority views are not published in widely read periodicals, and unorthodox work is not supported by the main funding organizations. Instead of *disinterested* peer review, mainstream insiders insist on their point of view in order to perpetuate their prestige and privileged positions. That is the case even on so academic a matter as the Big-Bang theory of the universe’s origin³⁵. When it comes to an issue of such public prominence as HIV/AIDS, any dissent from the official view has dire consequences. President Mbeki of South Africa was castigated around the world for his audacity in assembling a fact-finding group that included some representatives of minority opinions. Peter Duesberg, a leading retrovirologist, lost his research support, and found it an uphill battle even to exercise his right, as a member of the National Academy of Sciences, to publish in the Academy’s *Proceedings*. After all, to question whether HIV was ever isolated, or whether it causes AIDS, is not merely to question some research claims, it is to resist the authority of the World Health Organization, UNAIDS, the World Bank, the Centers for Disease Control and Prevention, the NIH, and many other powerful organizations. It is to question the pledges by many governments to spend billions of dollars in the fight against HIV/AIDS in Africa. It is to suggest that many “AIDS charities” have been misled and misguided even though established and advertised by such celebrities as Princess Diana, Nelson Mandela, Bill Gates, Sir Elton John, Arthur Ashe, and others.

How could all those eminences be so wrong? That rhetorical question greets any dissent from what “everybody knows”. Yet initially disinterested journalists

and others have been unable to get explanations of what is incorrect about the minority views on HIV/AIDS (Hodgkinson, 1996; Maggiore, 2000; Malan, 2001; Shenton, 1998). A large number of competent people, including at least 2 Nobelists in molecular biology, question the orthodox view that HIV necessarily and alone causes AIDS, but their letter to that effect was rejected in 1991 by *Nature*, *Science*, *The Lancet*, and *The New England Journal of Medicine*³⁶. Public opinion polls show that the official view is also the popular view³⁷.

It is not that knowledge monopolies are able to exercise absolute censorship. Contrary views are expressed, but one must know where to look for them; so one must already have some reason to make the effort. That constitutes a vicious circle. Moreover, the contrarian view will often seem *a priori* unreliable or politically partisan, as already noted¹⁷. Altogether, people exposed chiefly to mainstream media will likely never suspect—will have no reason to suspect—that there could exist a credible case different from the officially accepted one.

The conventional wisdom about these matters is continually reinforced by publicly broadcast snippets that underscore the official dogma. What other reason might there be to publicize, for example, the guesstimate that global warming will cause an increase in asthma attacks (*Daily Telegraph*, 2004)? This is just another “fact” to convince us that we must curb the use of coal, gas, and oil. Again, when Merck boasts in “public service announcements” on Public Radio about its help in providing access to HIV/AIDS medicines³⁸, that helps make unquestionable the connection between HIV and AIDS. Such snippets are shibboleths (Bauer, 1986) whose value lies not in their truth or in the evidence for them, but in reinforcing the desired viewpoint. This is *propaganda science*, not traditional science.

Of course, minority views and unorthodox claims have always been resisted or ignored, even in science (Barber, 1961; Hook, 2002; Stent, 1972). But different now are the degree of resistance and the power of the official view; in many cases, resistance has become tantamount to censorship or suppression.

Reform?

The ills of contemporary science—commercialization, fraud, untrustworthy public information—are plausibly symptoms of the crisis, foreseen by Derek Price (1963/1986), as the era of exponentially growing modern science comes to an end. Science in the 21st century will be a different animal from the so-called “modern science” of the 17th to 20th centuries. The question is not whether to reform the science we knew, but whether society can arrange the corporate, commercialized science of the future so that it can continue to expand the range of trustworthy knowledge. Ziman (1994: 276) points out that any research organization requires “generous measures” of

- room for personal initiative and creativity;
- time for ideas to grow to maturity;
- openness to debate and criticism;

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- hospitality toward novelty;
- respect for specialized expertise.

These describe a free intellectual market in which independent thinkers interact, and there may be a viable analogy with economic life. Economic free markets are supposed to be efficient and socially useful because the mutually competitive ventures of independent entrepreneurs are self-corrected by an “invisible hand” that regulates supply to demand; competition needs to be protected against monopolies that exploit rather than serve society. So, too, the scientific free market in which peer review acts as an invisible hand (Harnad, 2000) needs to be protected from knowledge monopolies and research cartels. *Anti-trust* actions are called for.

Where public funds are concerned, legislation might help. When government agencies support research or development ventures, they might be required to allocate, say, 10% of the total to competent people of past achievement who hold contrarian views. That would have provided support for people like Linus Pauling (orthomolecular psychiatry and uses of vitamin C), Peter Duesberg and Robert Root-Bernstein (HIV is not the necessary and sufficient cause of AIDS), and Thomas Gold (oil of non-biogenic origin, and many other far-out suggestions). In addition to its immediate and direct effects, such legislation would also serve as a public acknowledgment of how scientific advances actually come about, and it might thereby encourage private foundations to take similar measures.

It should also be legislated that scientific advisory panels and grant-reviewing arrangements include representatives of views that differ from the mainstream. This would be a far more effective way of ensuring intellectually honest advice and reviews than is the restricting of financial conflicts of interest, if only because federal agencies can waive their rules over conflict of interest when they would bar “all competent researchers” (Krimsky, 2003). Since in the eyes of the mainstream the dissidents are not competent, the existence of these waivers is a standing invitation to bureaucrats to seek advice only from insiders.

Where legislation is being considered about public policy that involves scientific issues, a Science Court might be established to arbitrate between mainstream and variant views, something discussed in the 1960s but never acted upon³⁹.

Ombudsman⁴⁰ offices might be established by journals, consortia of journals, private foundations, and government agencies to investigate charges of misleading claims, unwarranted publication, unsound interpretation, and the like. The existence of such offices could also provide assistance and protection for whistle-blowers.

Sorely needed is *vigorously investigative science journalism*, so that propaganda from the knowledge bureaucracies is not automatically passed on. To make this possible, the media need to know about and have access to the whole spectrum of scientific opinion on the given issue. The suggestions made above would all provide a measure of help along that line. A constant dilemma

for reporters is that they need access to sources, and if they publish material that casts doubt on the official view, they risk losing access to official sources⁴¹.

In the bygone era, trustworthy science depended on scientists doing the right thing even when that did not immediately serve their personal purposes. In the new era of corporate science, the desires of individuals to serve the public good do not suffice to ensure that corporate actions will serve the public good.

Notes

¹ As to unreliability, Malan (2001, 2003) has given chapter and verse about how misleading and contrary to evidence are the official releases from UNAIDS. When UNAIDS announced that 250,000 South Africans had died of AIDS in 1999, that figure turned out to be the output of a computer model, which in subsequent “refinements” of the model reduced the number to 65,000. No count was made of relevant death certificates. Similarly, in the 2004 Global Report (UNAIDS, 2004), the text speaks of an alarming spread of the epidemic while the tables contain estimates based on doubtful assumptions and a tentative computer model.

For an example of an incompetent report, see CGCED (2000). Data in the figures do not correspond to statements in the text, the labeling of graph axes is unsound, and citations are imprecise.

² The most widely cited of Parkinson’s Laws is that work expands to fill the time available. But Parkinson’s books contain many other Laws and corollaries that afford timeless insights into bureaucratic ways.

³ Sociologist Herbert Spencer (1820–1903), (in)famous as proponent of Social Darwinism, argued that all of life should take its essential lessons from the findings of science. T. H. Huxley (1825–1895) preached for the Church of Science (Knight, 1986).

⁴ There is a distinction to be made between dysfunction in the internal workings of science itself and a dysfunctional social role played by science. Those distinguishable aspects are not independent of one another, however, one feeds on the other, and for the present purpose these complications have to be ignored.

⁵ Price founded scientometrics, the investigation of scientific activity in quantitative terms: counts of papers, journals, costs, citations, etc. He showed that after WWII, the cost of science was increasing as the square of the amount of science being done. Under the pressures of costs and competition for the best people, the focus of science would no longer be directed by the state of scientific knowledge; it would follow social and political demands. The accuracy of his prediction is illustrated by, for example, the war on cancer.

⁶ Enunciated in the 1940s by sociologist Robert K. Merton.

⁷ As Ziman puts it, scientists were traditionally rewarded by the **CUDOS** accrued for practicing **C**ommunalism, **U**niversalism, **D**isinterestedness,

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Originality, Skepticism. In the corporate world, scientists are rewarded in the work-PLACE for results that are Proprietary, Local, under Authoritarian command, Commissioned, carried out Expertly.

⁸ The typical contemporary response from within science to queries about such anomalous claims is not informed by accurately detailed knowledge of what the claims and the presented evidence actually are. Sometimes this ignorance is openly admitted, as when critics of Velikovsky's books boasted of not having read them (Bauer, 1986).

⁹ Early modern science saw many contributions from ordained ministers who explored the workings of the world as a natural accompaniment to worship of the Creator.

¹⁰ Modern science made its greatest early strides under social conditions that allowed free association and entrepreneurial activity by independent individuals. Following Galileo's unhappy experience with the Catholic Church, the major advances in science came in Protestant Northwest Europe, chiefly Holland and Britain.

¹¹ Through the Investigations and Oversight Subcommittee of the House Science and Technology Committee.

¹² For example, <http://grants1.nih.gov/grants/guide/notice-files/NOT-OD-04-051.html>. Accessed 17 July 2004.

¹³ <http://ori.dhhs.gov/html/about/historical.asp>. Accessed 17 July 2004.

¹⁴ *Accountability in Research* (ISSN 0898-9621) has been published since 1989, *Science and Engineering Ethics* (ISSN 1471-5546) since 1995.

There exists ARENA (<http://www.primr.org/arena.html>), the Applied Research Ethics National Organization. The web-site onlineethics.org was set up in 1995 with government support. Centers and institutes concerned with professional or research ethics have been created at a number of universities over the last decade or two.

A collection of relevant web pages is at <http://www.web-miner.com/researchethics.htm#top> (accessed 17 July 2004). For a bibliography (up to 1997) about research ethics, see <http://www.chem.vt.edu/chem-ed/ethics/> (the last line of the initial page gives an incorrect date of 1 January 1970 for the last update, which was actually in 1997).

¹⁵ *Pace* President Eisenhower's warning about the dangers of the industrial-military complex.

¹⁶ This point alone deserves its own book. Here are a few examples among many possible ones:

Statin drugs like Lipitor and Crestor are aggressively marketed and earn billions of dollars (Reuters, 2002) even as the fine print in their advertisements has to acknowledge that there is no evidence that they decrease the risk of heart attack or heart disease. One statin (Baycol) was withdrawn because of more than 100 deaths and 785 lawsuits (<http://www.adrugrecall.com/baycol/baycol.html>). The serious cited side effects include liver damage and muscle wastage (rhabdomyolysis). It is known that other statins, which continue to be

widely touted and prescribed, have similar side effects (<http://www.fda.gov/cder/drug/infopage/baycol/baycol-qa.htm>, point 9 at bottom of page).

Aspirin superseders, so-called NSAIDs and Cox-2 inhibitors, turn out to have more serious side effects than aspirin (<http://www.adrugrecall.com/vioxx/vioxx.html>; Hensley, 2004).

¹⁷ The dissident opinions on HIV/AIDS or global warming, for example, can be found most commonly in publications associated with conservative political views, for instance the *Spectator* (UK), the *Washington Times*, or books from publishers like Regnery.

In the early 1990s, the *Sunday Times* (UK) and its editor, Andrew Neil, were roundly and widely criticized—including by that supposed epitome of scientific decorum, *Nature*—for printing articles by Neville Hodgkinson that explained the views of HIV/AIDS dissidents and their evidentiary basis.

¹⁸ Indeed, the “Acknowledgments” sections in the cited reports (CGCED, 2000; UNAIDS, 2004) reflect bureaucrats’ mutual back-scratching rather than technically competent peer review.

¹⁹ These waivers indicate a scientific belief that “the scientific method” is an impersonal formula for getting true knowledge. Were that so, then people could not avoid seeing the true results of the method even if they were unpalatable. But that method is a myth (Bauer, 1992), and human beings, scientists among them, are very good at *not* seeing what they do not like and imagining that they *do* see what they would like to see.

²⁰ In 1978, the Chemistry Department at the University of Kentucky surveyed the recent experience of its faculty in getting grants. It turned out that we were writing about 10 grant proposals for every 1 funded by the National Science Foundation. Ten years earlier, the ratio had been 2 to 1.

²¹ For example, in the 1970s the National Science Foundation flirted with “university-industry cooperative ventures”. Those of us who tried to participate found it difficult or impossible to resolve conflicts between our desire to publish our work and industrial pressure to keep results secret and proprietary.

As Ziman (1994: 272, 265) points out, “The scientific enterprise . . . runs on trust, which depends on reasonable conformity with the norm of ‘disinterestedness’ . . . This norm is not compatible with commercial practices. . . . A shotgun marriage between such different cultures may produce offspring that are much less intellectually or technologically fertile than either of their parents”.

²² To adopt Alan Greenspan’s description of the stock market in the heyday of the techno-bio-dot.com bubble.

²³ An historical landmark was Vannevar Bush’s 1945 report to the President, *Science—The Endless Frontier*, widely credited for stimulating massive federal funding of research.

²⁴ Price (1963/1986) found that quality in science is proportional to the square root of quantity. To double the number of *excellent* scientists, the total number of all scientists must be quadrupled.

²⁵ I suspect that many contemporary graduate students and faculty will not find easy to believe just how idealistic a large proportion of students and practitioners of science were up to some period following WWII. A decade ago, when I was giving seminars on research ethics, a department head of my generation told me that he was still having his graduate students read *Arrowsmith* (Lewis, 1925), whose heroes preach selfless devotion to science and whose villains put personal advancement first. Innumerable other anecdotes of idealism can be found in reminiscences of scientists. Andrew Szent-Györgyi recalls that his cousin, Nobelist Albert Szent-Györgyi, “taught me that doing science is a privilege worth sacrificing everything for” (Hargittai, 2004).

I still recall, half a century later, how very shocked my cohort of graduate students was when we read *The Struggles of Albert Woods* (Cooper, 1952), which suggested that politicking rather than merit led to such awards as a Fellowship of the Royal Society (F.R.S.). So upset were 2 of us that—in a less than sober moment—we accosted Professor A. G. Ogston, F.R.S., to enquire whether this was true to life. (Ogston, the very exemplar of modesty and a practicing Quaker, was very kind and understanding. My companion on that occasion, Anthony W. “Tony” Linnane, later earned his F.R.S. entirely on merit.)

²⁶ Some time ago, this euphemism replaced the earlier term, “overhead”.

²⁷ In 1966, the Research Division at the University of Kentucky re-wrote the budget of my application for a grant from the National Science Foundation from \$50,000 over 2 years to \$250,000, asking for reimbursement for part of my academic-year salary as well as proportionate benefits, and much “overhead”. To my protests, the Director explained that the Federal Government was using these grants as general support for universities.

From the 1960s on, many colleges developed the ambition to become research universities by trading in this fashion on the availability of federal grants and fellowships for graduate students. There had been 107 doctorate-granting universities in the United States in the 1940s; 30 years later, there were 307 (National Academy of Sciences, 1978). Expenditures for scientific research in universities increased from \$31 million in 1940 to \$3 billion by 1980 (Krimsky, 2003: 27).

²⁸ “[I]n our time a successful cancer researcher is not one who ‘solves the riddle,’ but rather one who gets a lot of money to do so” (Chargaff, 1977: 89).

The University of Kentucky (Wethington, 1997) and Virginia Polytechnic Institute & State University (Steger, 2000)—no doubt among others—have announced the ambition to become one of the 20 or 30 (respectively) “top research universities”, a ranking that depends solely on the total amount of research dollars expended.

In the 1980s at Virginia Polytechnic Institute & State University, the criteria for tenure and promotion in the College of Engineering were stated by its Dean, in meetings of the University Promotion and Tenure Committee, to

be about \$100,000 annual research support from external sources for tenure, and about 3 times that amount for promotion to full professor.

²⁹ Elsewhere I plan to publish a detailed critique of the first World Bank report (CGCED, 2000) that I ever read. I was led to read others that proved to be of equally poor quality, unreliable as to data, interpretation, and citation of sources.

³⁰ Root-Bernstein (1995a) found the period from infection by HIV to actual illness—that is, developing AIDS—to differ profoundly between different groups: 6 months for babies, 2 years for transplant recipients, 6 years for recipients of blood, 10 years for gay men and old severe hemophiliacs, 14 years for young severe hemophiliacs, more than 20 years for mild hemophiliacs. To compare with the UNAIDS guesstimate of 9 ± 1 years, Root-Bernstein's numbers must have added to them the time from developing AIDS to death. That period is itself highly variable. Avoiding AZT and other anti-retroviral drugs, Michael Callen lived for 12 active years after being diagnosed with full-blown AIDS (Hodgkinson, 1996: 14), while Richard Berkowitz was still living 2 decades after his diagnosis (Berkowitz, 2003). For more on long-time survival in excellent health after diagnosis as HIV-positive, see Maggiore (2000).

³¹ As noted earlier, it is by no means easy nowadays to find competent reviewers without severe conflicts of interest. But institutions like the World Bank or UNAIDS give no indication that they even attempt to have their reports examined critically by outsiders before they are issued. It is not the sort of thing that bureaucracies do.

³² For instance, Fleischmann and Pons over cold fusion in 1989.

³³ As shown by public-opinion polls, for instance http://www.americans-world.org/digest/global_issues/global_warming/gw_summary.cfm. Accessed 13 July 2004.

³⁴ See, for instance, the Science & Environmental Project (<http://www.sepp.org/>), whose president is S. Fred Singer, a distinguished environmental scientist.

³⁵ A letter to this effect co-written by a couple of dozen well-known cosmologists was refused publication in *Nature* but was eventually published in *New Scientist* (2004). Mainstream dogma can pour scorn on such views simply by pointing out that “*Nature* refused to publish this letter”, which most people would accept forthwith as casting grave doubt on the letter's credibility.

³⁶ See <http://www.virusmyth.net/aids/group.htm>. Accessed 19 July 2004.

³⁷ “Aid for HIV/AIDS Crisis in Africa: A strong majority supports US aid to address the problem of HIV/AIDS in Africa. An overwhelming majority considers the crisis quite serious and believes that it will effect [sic] Americans, thought [sic] the public is divided on whether it threatens US national security. About half of the public feels the US should do more to help, but strong majorities think other actors such as the Africans, pharmaceutical companies and the UN should do more. A majority feels the US should get

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- involved in the problem of AIDS orphans”; http://www.americans-world.org/digest/regional_issues/africa/africa_sum.cfm. Accessed 13 July 2004.
- ³⁸ For example, on PRI International, often heard during August and September 2004 on AM 1260, Christiansburg (VA).
- ³⁹ See <http://www.piercelaw.edu/risk/vol4/spring/bibliography.htm>: “The Science Court: A Bibliography” by Jon R. Cavicchi. Accessed 19 July 2004.
- ⁴⁰ “Ombudsman” implies independent and disinterested.
- ⁴¹ A very real risk, as Robert Gallo explicitly warned journalist Celia Farber (Hodgkinson, 1996: 160, citing Lauritsen [1994]).

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