The regulation of scientific work

Government research councils, national science foundations and the like have become ubiquitous. The first one seems to have been the US National Science Foundation (NSF), created in 1950; the similarly named organization with an equivalent function in Switzerland was established in 1952; the UK Science Research Council was formed in 1965; and so forth. The mode of operation of these organizations was to issue "calls for proposals" (i.e., general invitations to scientists to submit project proposals) and then disburse funds according to an assessment of proposals received. The main effect seems to have been a general stifling of innovative ideas, since the final decisions whether to fund a given project are made by a committee, which, almost axiomatically, favours the most conservative ideas.

Countries like France and the Soviet Union were organized differently. Financial provision for science was in the hands of centralized bodies such as the Academy of Sciences and most science was carried out the within institutes affiliated to the Academy. An individual scientist wishing to work on a new idea merely had to convince the director of his or her institute of its value. Since the institute constituted a living community, its internal spirit both fostered the emergence of new ideas and facilitated their investigation.

For reasons which are not clear, the Academy-based system has been gradually abandoned. Russia formed its own equivalent to a national science foundation (the Russian Foundation for Basic Research) in 1992, and other countries formerly affiliated to the Soviet Union have done likewise; for example, the Georgian Science Foundation was created in 2005, and France now has its Agence Nationale de la Recherche, founded in 2007. The European Union has adopted a similar approach for its research and technical development programmes.

Apart from the inverse relationship between the novelty of an idea and the possibility of convincing a committee to fund its development, the research council/science foundation approach is impersonal and bureaucratic. The last attribute might seem surprising to an outsider, because was not the Academy a central body? Yes, and it was powerful enough to ensure that it had an appropriate allocation of funds from the state treasury; this power was then efficiently dispersed among the constituent institutes, which were free to spend the money as they saw fit; it was the responsibility of the institute director to ensure a balanced budget. Beyond providing a page summarizing his or her work for the annual report issued to the general public, the scientist's need to provide a written record of activity was fulfilled by publishing papers in scientific journals. On the other hand, if the scientist applies to a research council/science foundation, a lengthy document is required—and if the proposal is not funded, which typically applies to about 80% of applications, then the work in preparing the document is largely wasted; much of the text has to deal with administrative matters such as how the management of the project will be organized. Funded proposals oblige the scientist to provide regular reports to the funding body, detailing every item, large or small, of expenditure. Small wonder that the scientist may then have little energy left for writing a scientific paper; those reporting research council-funded projects are typically rather pedestrian, with an emphasis on what was done in the most concrete sense (a description of which forms the main content of the obligatory reports) rather than developing an idea and its wider implications and consequences.

The purpose of this Editorial is not to criticize the research council/science foundation system, which has been and continues to be done elsewhere, but to point out that these funding bodies essentially function as regulators of science, in the same way that many industries (for example public utilities in the UK) have regulators. Is this desirable? Regulation was introduced in the UK when the public utilities ceased being state monopolies. Since competition, which is supposed to be the guarantor of quality provided to the consumer in a free enterprise economy, is scarcely possible in the case of a monopoly,[1] the regulator is supposed to provide the guarantee. Isambard Kingdom Brunel, opposing the appointment of Government Inspectors of Railways in 1841, has given an eloquent critique: "Railway engineers understand very well how to look after the public safety, and putting a person over them must shackle them. They have not only more ability to find out what was necessary than any inspecting officer could have, but they had a greater desire to do it."[2] In fact, the diminution of risk is considered to be another important function of regulation. It is surprising why this notion persists despite much evidence showing that the diminution of flexibility operational flexibility implied by regulation actually increases danger. A poignant example is the total loss of

[1] Competition exists inasmuch as an inefficient company could be taken over by an efficient one. Inefficiency, however, concerns the returns to investors rather than the quality of service provided to customers.

[2] L.T.C. Rolt, *Isambard Kingdom Brunel*, pp. 217–218. London: Longmans, Green & Co. (1957).

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flight SR 111 in September 1998, which is now known to have been caused by a major electrical fault. The first symptom was smoke entering the cockpit. The captain followed the rule stating that if smoke appears in the cockpit, the cause must be discovered (instead of, for example, using his personal judgment and landing as soon as possible)—until the bitter end when total loss of control occurred.

A cynic might argue that at least the large staff requirements of research councils/science foundations provide employment for ex-research scientists (many of the staff have PhDs), rather like former military officers becoming college bursars. Any such positive feature is, however, outweighed by the negative ones, such as the bias towards conservatism when the final decision whether to fund is made, as already mentioned; the temptation to partiality during the reviewing of proposals (carried out by individual scientists) prior to the final committee meeting; and the transformation of independent research scientists to mere laboratory functionaries (due to the need to follow the contractually agreed research programme of a funded project to the letter[3]). Even two millennia ago, we find in the *Daodejing* (Ch. 58) the admonition that "the more prohibitions there are, the poorer the people". If, since then, evidence to the contrary had been accumulated then the current trend would be comprehensible. Since that does not appear to be the case, discovering the cause of the current trend would form the basis of a suitable proposal (but not one likely to be funded by a research council).

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[3] Lest it be felt that there is at least a trend away from this, the recently (2007) launched European Research Council obliges recipients of funding to keep detailed time sheets and accounts of all expenditure, and restricts their freedom to change direction as the research evolves.