

## THE CONTEXT IN REVOLUTION

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Members of the Academy will be familiar with the type of book which has traditionally sought to describe the French Revolution. They will recall that such books invariably begin with an extensive analysis of the reasons which made a revolution inevitable. The form of such texts often comprises an initial societal analysis followed by a blow-by-blow account of the consequences arising from this analysis. It would not be surprising if any record of the present meeting took a similar path.

My argument is that the context within which science is allowed to develop is no longer a healthy one, nor indeed one in which present patterns of organisation can be sustained. Subsequent papers in the meeting may well provide detailed instances where changes are resulting from this problem at the interface between science and society; my hope in this opening session is to indicate very briefly some of the factors which are bringing the context towards revolution.

The crisis can be seen to arise in two broad categories, namely, first in the external perception of science within the wider society, and secondly in the internal workings of the scientific community itself.

I believe that it is fair to say that much of current scientific endeavour is not linked to identified national goals and that this, coupled with the enormous expenditures required for scientific endeavour, suggests that science is to an extent 'out of control'. The notable success of the scientific contribution to defence related matters did win, for what I believe will be a relatively brief period in history, an enviable degree of freedom for scientists to follow inclinations of their own at public expense. Scientists rarely like being asked why they are undertaking a particular development; at the same time, the growing sophistication of their activity means that they must come to public funds for ever increasing degrees of support. This paradox built around high demand but low explanation is one which must surely lead to the writing of a new contract between the scientist and the citizen if a healthy community is to result. We cannot expect that there will be an extension of past practice. Such an extension would risk making science a 'glory in the ruins'.

The present weakness of the linkage to national goals arises from a diminution in the defence imperative or at least in the potential scientific contribution to that imperative. Other roles for science, and notably the one where it is promoted as providing a direct and infallible path to improved economic performance and to such societal benefits as job creation, have fallen into disfavour owing to the continuing lack of hard evidence. The standard linear model for scientific benefit, namely that science leads to technology which leads to industrial exploitation

which leads to societal wealth is seen to be a grotesque simplification of what is a highly complex interaction of factors. Much preferred to the linear model is a parallel model in which science and industry are seen as simultaneous developments each taking advantage of the other as opportunity allows but neither acting as a sufficient pre-requisite for progress in the other.

The public perception of science has not simply adopted a neutral response in recognition of these factors. There is if anything a move against science as a consequence of the perceived threat to cultural values which certain scientific endeavours have incorporated.

Nuclear power is one example. The perceived pollution potential of the chemistry industry is a second. Under these circumstances, scientists are being asked to justify their activity very much in the way that is asked of other participants in society. The special place of the scientist as the unquestioned benefactor (if this ever existed) is now no longer with us.

The second major difficulty which confronts any continuing existence of science in its present form lies in a number of internal problems which can be identified. Aside from the degree of arrogance or hubris which can on occasion be identified on the part of individual scientists in their dealings with the community (the disinclination to explain motives has already been noted above), there are more mechanical elements which can be seen as indicators of malaise. One of these relates to the literature and to the manner in which it is used. A 'literature engine' can be identified wherein all parties have an interest in the continued rapid growth of published papers. The scientist uses the publications list as an indication of contributions made; the publisher draws profit from the exercise; libraries are ever growing indicators of the dominant presence of science in the scheme of things. The literature has, as a consequence of such driving forces, become weirdly unwieldy. The published canon is itself now so vast that it is no longer adequately reviewed by many of those who are themselves preparing publications. A consequence is that work is repeated in blissful ignorance of the efforts of predecessors. Much of science takes on a somewhat pedestrian or 'handle turning' aspect.

A further indication of this inner decay in the science fabric is the occurrence of the recent remarkable examples of cheating where results have been manufactured to advance particular points of view or more commonly to promote career opportunities. Such instances of "outer glory, inner rot" are compelling indicators that certain parts of science are following internal imperatives rather than those established by constructive and respectful debate with the wider society.

In turning from an analysis of the problem to suggestions for its correction it is fair to say that relatively mechanical solutions exist to the internal difficulties. One could, for example, ask that those preparing papers for the literature indicate the work which has been consulted and reviewed in preparing the submitted work. In respect to the wider interactions with society, the issues are naturally more complex and will no doubt receive an airing in the present meeting. It is perhaps worth emphasising, however, that not all cultures have seen their scientific contingents adopting quite the degree of independence which has been exercised in the West. The search for harmony with the wider community and for an intellectual efficiency in the exercise itself is not one of the least appealing aspects of the Japanese system. The evident benefit which that country's economy has drawn from its scientific and technological endeavours offers the promise that the post-revolutionary condition in the West could also be one of general benefit.