CURRENT SCIENCE

Volume 78 Number 9 10 May 2000

EDITORIAL

Gresham's Law

In the mid-16th century, Thomas Gresham, a financial adviser to the English Crown, postulated a principle that simply states, 'bad money drives out the good'. Textbooks of economics have elevated this statement to the level of a 'Law', which appropriately bears Gresham's name. In the world of economics Gresham's law enters discussions of bimetallic standards (gold and silver, of course) and is stated in somewhat more formal terms: 'When two kinds of money equal in nominal value but not in terms of demand are in circulation the less desirable will drive the better money out of circulation'. Gresham's law in its simpler form, quoted out of context inevitably, seems an appealing statement of a condition that does not seem to be bounded by any discipline, 'bad drives out the good'. Does a form of Gresham's law operate in science? More specifically paraphrased, 'Does bad science drive out the good science from our institutions?'

It is not entirely simple to define good science and bad science. A great deal of science that is practised may simply be pedestrian or indifferent, but is often carried out with the best of motivations. It is not uncommon to find a large body of data, often gathered without a guiding hypothesis or a purposeful goal, forming the bedrock on which major scientific advances are based. At its best, science provides revealing insights into the world around us. The most widely used technologies generally rest on a sound base of fundamental science. It is not often appreciated in lay circles that in the past some of the most dramatic technological revolutions have been born as unheralded curiosities, in the setting of an isolated laboratory or in the minds of far-seeing individuals. Faraday's discovery of electricity and Franklin's demonstration of the remarkable calming properties of a spoonful of oil on the turbulent waters of Clapham pond are etched in the pages of the history of science. More recently, few would have imagined that the nuclear magnetic resonance (NMR) images produced of two glass tubes nestling inside a larger tube, in the early 1970s, would lead to the flowering of a new and remarkably powerful mode of medical diagnosis, magnetic resonance imaging (MRI). Readers might note that by a clever sleight of hand public acceptability of the technique was assured when the word 'nuclear' was dropped in the name.

Few will argue with the definition of outstanding science; most will agree on what constitutes good science and many will have little difficulty in identifying what constitutes reasonable (and essential) scientific research. What then constitutes 'bad science'? Here, opinions may vary sharply and public postures may be completely at odds with private practice. But to any discerning observer of the teaching of science and the conduct of research in publicly funded institutions, bad practice is easily recognizable.

In our universities and academic departments across the country research done towards a Ph D degree is of extremely variable quantity and quality. In the best of institutions, the requirements for Ph D awards match international standards. In many others, limited facilities and resources constrain the nature of research carried out. But in poorly endowed institutions the flag of 'good science' is carried by a few sincere and scholarly researchers, who go to great pains to teach their students the methodology of research and the importance of dispassionately viewing the results of experiments, even when they run contrary to a pet hypothesis. Unfortunately, these intellectual islands are far and few between. They are isolated outposts in an arena where Ph D students are treated as a commodity to pad the mentors' curriculum vitae, with a large number of 'research students guided'. Quite often, students (of varying quality) are recruited to carry out research which has little relevance to contemporary science and, even more disturbingly, is not of even of passing interest to the mentors. Ph D theses are produced in a time-bound fashion; ironically the poorer theses are completed in very short times giving their authors a head start in a job market, which places great store on degrees. The 'autonomous' character of academic institutions ensures that no standardization of research requirements is possible. The Senates, Syndicates and Academic Councils of educational institutions are a bulwark against the outside world.

At the level of advanced research we have the spectacle of mega research projects which promise the desirable, knowing fully well that deliverables are never going to ap-

pear. The creation of centres and institutions based on flimsy promises, which siphon a major share of the money for scientific research, is a disturbing trend. Institutions which will be hard pressed to recruit qualified and motivated researchers then become a focal point for the practice of what may be termed as 'bad science'. The signals sent to the scientific community by the continued support of projects on which the results obtained are obscure, is a means of shoring up and encouraging bad science.

The teaching of science is another area where it is important to recognize the 'bad'. In staff rooms across the country there are an increasing number of teachers who do not teach inside the classroom, but get away with impunity. There is a wonderful market for teachers in the parallel academic sectors – the mushrooming tutorial classes, which coach students for the ever-increasing number of entrance tests. The truly inspiring teachers who motivate students towards a career in science are an endangered species. The atmosphere in most staff rooms is hardly conducive towards maintaining the enthusiasm and interest of committed teachers. The distractions of an environment, where a significant number actively shirk the work for which they are paid, cannot be underestimated. In an effort to encourage research in colleges, agencies over the years have been keen to fund small projects to teachers in order to sustain their interest in original science. The takers have been relatively few and a common complaint is that the local ambience is generally very discouraging. The rise of 'information technology' and the demands for courses in this area have also created a new problem. More computer courses are likely to be offered commercially, while the very same classes within academic institutions are going to be approached with extremely limited enthusiasm. The lure of money is irresistible, and the 'new science' of the internet appears to have a direct connection to Mammon.

There will undoubtedly be many opinions on what constitutes 'good science and bad science'. Both facets of science may appear in many different manifestations. But, like in the simple tales of childhood, the 'good' appears to be constantly threatened and is in danger of being overrun by the 'bad'. Since I began with the somewhat unrelated issue of Gresham's law, it is appropriate to return once again to economics. In his famous textbook Paul Samuelson (*Economics*, McGraw Hill, 1973, p. 651), comments: 'Today no one, not even a Kansas farmer favours bimetallism'. Maybe we should all try to only favour good science.

P. Balaram