

CORRESPONDENCE

Conservation sites

SIR — Since private landownership and private incentive are among the basic tenets of Western ideology, I have to agree with Muir (*Nature*, 12 March, p.82) that the populace must suitably entice landowners if it expects them to conserve rather than utilize their land. But it is a callous and immoral science that will not use funds to intervene in natural selection or in "the very evolution of the inanimate world" if these are observed to be proceeding in a deleterious direction. Surely the spending of funds on research directed towards new forms of medical treatment, or of flood or erosion control, is not an "affront to reason", bearing condemnation, and no-one is being misled by the professed importance of these or similar interventions.

Also, thankfully, I know of no science which claims that we can study anything in nature to the limits of its information content so that "nothing new will be learned by preservation". Such would be a conceited science indeed. And, a science that attaches no value to the existence of an object, save for its information content, shows a blatant contempt for existence itself. As Santayana has written (in *Reason in Science*), "If science deserves respect, it is not for being oracular but for being useful and delightful, as seeing is".

Unique usefulness and ability to delight are also properties of jewels or "gems" and of conservation sites, although Muir, in his derisive analogy, has conveniently overlooked these. He has also ignored the one striking difference between them: the virtual indestructibility of jewels as compared with the fragility of ecological systems.

So, must we look forward dispassionately to Muir's future world with its myriad rats, biting insects and noxious weeds, with its computer data banks full to overflowing, but without museums, zoos or conservation sites? Or, should we intervene to ensure a better future where usefulness and delight remain and where Muir's biologically deficient species are not extinct before their time?

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Literature search

SIR — PhDs normally take longer than three years to complete and their exact purpose is not agreed upon (*Nature* 22 January, p.217). As an SRC-supported research student, I would like to make a few relevant comments.

I have spent several months in my library carrying out the customary literature search. As time progresses, more and more literature has to be searched and one can only presume that the time to complete a PhD will increase! However, because I spent so long "doing" a search, I found cases of "published rediscoveries" which are attributable I think to: (1) a lack of time spent on a literature search, and (2) a language problem.

The time factor is overcome, at present, only by carrying out a minimal literature search (which in all likelihood will turn out to be inadequate) and by ignoring the language problem altogether by ignoring the literature published in a foreign language. The dilemma

facing a research student is obvious. If he/she tries to carry out a thorough literature search and learn a new language then the time spent doing this bites into those three years of support. At a recent course which I attended, which was specifically designed to teach scientists how to translate scientific Russian or German, only five people attended. The conclusion is (from albeit scanty evidence) that researchers choose to ignore the language problem.

Regarding actual literature searching it is only recently that I have found out about "computerized" abstracts, although, I'm told, they have been available for a few years. I would urge the SRC to look into the use (or lack of use) of "computerized" abstracts, if they are not doing so already, as such facilities will become increasingly important and have the potential for saving a lot of time.

I suggest that it would be beneficial if research students were given, from the outset, a course on library and information science so that they are aware of all possible sources of information. I would also suggest that it be made compulsory for research students to learn a foreign language relevant to the scientific discipline. These proposals may take up money and indeed time but to me, at least, appear a necessity if good efficient research is to be carried out. On reflection, what I have suggested favours a more "training for research" type of PhD.

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Avoiding fraud

SIR — The recent alarms about fraud in American science raise the more general problem of quality-control in research. As you correctly observe (*Nature* 9 April, p.433), peer review must be supplemented by "full and frank discussion within individual laboratories". But the process cannot stop there. When I analysed this problem in my book (*Scientific Knowledge and its Social Problems*, Oxford University Press, 1971), I remarked on the inherent difficulty of the quality-control operation in science, since there is no possibility of creating an external inspectorate for assessing the products of the complex and subtle craft skills of science.

Research is therefore necessarily a largely self-regulating activity in this respect, accomplished by peer-review and journal refereeing; but the problems of iteration, "who guards the guardians?" are then even more severe. My conclusion was that integrity and morale, at the highest professional levels, are more crucial to the health of science than perhaps in any other organized social activity.

The various moral imperatives of science, propounded by Merton, Popper and Polanyi, can thus be seen to be very relevant to the survival of worthwhile science. However, they are not so much *a priori* definitions of "science", as descriptions of attitudes and commitments whose presence and effectiveness are entirely contingent. The variability of standards of quality between fields and between milieux bears this out.

When so much of scientific information relevant to public policy is now produced not

as "public knowledge" but rather as "corporate knowhow" (in state bureaucracies or private firms), the traditional ideals and norms of science lack an appropriate social context for their reinforcement and maintenance. Under these circumstances it becomes implausible to maintain that only a prejudiced or malcontented opposition can doubt the factual veracity of any piece of technical information used as official testimony in policy debates.

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Cladistic clues

SIR — It is unfortunate that the attempts of Dr Miles and the Department of Public Services of the British Museum to display the most logical basic level of analysis of organisms (the level of relative organism-to-organism comparison) is misinterpreted as an attempt to coerce the general public into accepting "a fundamentally Marxist view of life". As one may perceive from the series of replies to L. B. Halstead and the cladistic literature, cladistics is a method which links many very different individual biologists working from very different sets of preconceptions. However, they seem at least to share the opinion that we learn something about organisms by studying what they are made of. The cladist may converge on the Marxist idea that events occur by "taking the form of a leap from one state to another." The cladist may similarly converge with the catastrophist creationist. However, the cladist's stand can be just the opposite of a dogmatic stand, that is, it can be an admission that there are not enough biologists to fill in all the holes in our knowledge of the history of life, and that our inadequate sample of the history of life allows us to see so little "gradualism" that one cannot dogmatically claim that it is the rule.

Halstead's point that public scientific institutions are accountable to the public is well taken. However, publicly employed scientists are accountable to the public for their salaries with ideas and interpretations which the public at large does not have time to make, as well as being accountable for actual specimen displays. Like any curator in history responsible for exhibitions, Dr Miles shares some ideas with scientists of his day, and has some ideas of his own, all of which are reflected in the exhibits he edits and presents to the public. Like any editor, he is forced to make editorial decisions; as one who studies the taxonomic group that Dr Miles has spent most of his career studying, I see no more competent individual than himself.

However, I share some of S. J. Gould's romanticism for great old halls which are closed and renovated into something that is a total stranger to me. Museums cannot help but be places of accumulation, and this catastrophistic kind of replacement of the old with the new does not seem to be the most accurate portrayal of the museum's progress in

Increased majority

In the correspondence "Majority verdict" published in *Nature* 30 April, p.730, R.L. Batten should be added to the list of signatories.