CORRESPONDENCE

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In case some legalistic quibble is to be put on the world "good", Milton clears the point in a famous passage.

> "Good and evil we know in the field of this world grow up together almost inseparably; and the knowledge of good is so involved and interwoven with the knowledge of evil, and in so many cunning resemblances hardly to be discerned, that those confused seeds which were imposed upon Psyche as an incessant labour to cull out, and sort asunder, were not more intermixed. It was from out the rind of one apple tasted, that the knowledge of good and evil, as two twins cleaving together, leaped forth into the world. And perhaps this is that doom which Adam fell into of knowing good and evil, that is to say of knowing good by evil. As therefore the state of man now is; what wisdom can there be to choose, what continence to forbear without the knowledge of evil? He that can apprehend and consider vice with all her baits and seeming pleasures, and yet abstain, and yet distinguish, and yet prefer that which is truly better, he is the true wayfaring Christian."

F.W. COUSINS

London SW1, UK

SIR — I must voice my grave concern that, in the influential editorial pages of *Nature*, reasoned argument has given way to the emotional outburst of your comment "A book for burning?" (24 September, p.245). Amid many heated adjectives you condemn Dr Sheldrake's *A New Science of Life* as "the best candidate for burning there has been for many years" because (a) his claim that it can be tested is "preposterous", and (b) the theory is incomplete regarding the "nature and origin" of the morphogenetic fields postulated by Sheldrake and "the means by which they are propagated". The second reason is, you say, "more serious", adding that "hypotheses can be dignified as theories only if all aspects of them can be tested".

This second objection, if it were partial grounds for making a publication a candidate for burning, would prevent the publication of any hypothesis until it had been articulated to its last detail — a sure method of stifling all innovation.

For the first objection, (a) above, three arguments are advanced: (i) the experiments are time consuming; (ii) it would be possible to explain away negative results; (iii) no grant-making agency would support the experiments. Argument (i) would condemn all research into inheritance, not just that proposed by Sheldrake; argument (ii) applies in principle to any experiment, but is in this case vacuous since Sheldrake clearly states that he would regard failure as disproof; and argument (iii) is equally empty in its appeal to "higher authority" without any indication as to why no agency would support the experiments.

I share *Nature*'s concern expressed in the comment that the public should not gain the impression that science contains irrational elements. But the way to combat this impression is by displaying rationality.

C.J.S. CLARKE

University of York, UK

SIR — In a leading article (*Nature* 24 September, p.245) you reject Dr Sheldrake's morphogenetic fields as "pseudo science" on the grounds that he does not prescribe their nature or origin, or discuss how their laws of propagation might be discovered. But the properties of heat, light and sound were investigated long before there was any understanding of their true nature, and electricity and magnetism originally had exactly the status that you criticized in the hypothetical water-divining example. Were such investigations pseudoscience?

You claim that hypotheses can be dignified as theories only if *all* aspects of them can be tested. Such a criterion would bar general relativity, the black hole and many other concepts of modern science from being regarded as legitimate scientific theories.

The discussion of Dr Sheldrake's proposed experiments and their falsifiability is rendered void since it assumes *a priori* that the experiments will fail.

The rapid advances in molecular biology to which you refer do not mean very much. If one is on a journey, rapid progress on the way implies neither that one is close to one's destination, nor that the destination will be reached at all by continuing to follow the same road.

By referring to "self-respecting grant-making agencies" you show a concern not for scientific validity but for respectability. The fundamental weakness is a failure to admit even the possibility that genuine physical facts may exist which lie outside the scope of current scientific descriptions. Indeed, a new kind of understanding of nature is now emerging, with concepts like implicate order and subject-dependent reality (and now, perhaps iformative causation). These developments have not yet penetrated to the leading journals. One can only hope that the editors will soon cease to obstruct this avenue of progress, and instead encourage reviews of the field.

B.D. JOSEPHSON

University of Cambridge, UK

Non-random survival

SIR — Barrie Pearson (*Nature* 3 September, p.6) states that non-random survival (Flew's revised formulation of the principle of natural selection, *Nature* 16 July, p.192) is "an empirically empty concept if the range of possibilities the non-random survivors were selected from is unknown".

Fortunately, and contrary to what Pearson appears to believe, the "range of possibilities" is known in quite a number of cases in which the variation amongst juvenile members of an animal population can be shown to be far greater than the variation amongst the adults. This has been demonstrated for populations of snails, lizards, sparrows, fossil cave bears and humans: in some cases the selection is stabilizing and in other cases it is directional. Natural selection would thus seem to have a satisfactory empirical basis.

The depressing thing about the evolutionist/creationist controversy is not so much the heated arguments about the "status" of the theory of evolution as the fact that the creationists are attempting to sell as scientific a theory which most scientists had abandoned as inadequate long before Darwin's theory was ever thought of: even Cuvier found that *one* creation was hardly enough! As a theory attempting to explain as much as possible of the way in which the world of living organisms arrived at its present state, without resorting to metaphysical explanations, the neo-Darwinian theory wins hands down over the creationist theory. Thus Pearson's "creatures of reason" are quite right to prefer neo-Darwinism to creationism if they want a theory based — as far as possible — on physical rather than metaphysical grounds. And this, after all, is the essence of the scientific enterprise.

Odense, Denmark MIKE ROBSON

Names for proteins

SIR — We were glad to see the reference by Brian F.C. Clark (*Nature* 6 August, p.491) on the prospects for standardizing nomenclature for an index of human and other mammalian cell proteins separated by two-dimensional gel electrophoresis. Lest disproportionate resources be spent on a catalogue of specialized nomenclature, we would urge that parallel projects yielding precise chemical identification (where feasible) are essential.

We believe that it is well within present competence to characterize the perhaps 30,000 protein strucures produced in measurable amount in each species and to tabulate a good deal of accessory information about them. However, the ultimate method for identifying chemical compounds, which is understood by people in diverse fields, is through covalent structure. Proteins are no exception. Determination of only a few residues of an unknown protein can usually serve to identify the group to which it belongs[1] if the sequence of a closely related structure or homologue in another mammal has already been determined. Identity of sequence also serves to clarify the many situations in which proteins of almost identical structure have rather different properties in gels and in which immunological tests are misleading.

It is not generally realized how extensive is the collection of protein sequences already elucidated. We have just completed the integration of data from the *Atlas of Protein Sequence and Structure*, Vol.5, and its three supplements with the more recent data, including that derived from nucleic acid sequences[2]. There are more than 1,600 entries in the collection. (Within an entry we describe information on structures less than 5 per cent different from one another, such as alleles.)

We have also grouped the data into superfamilies and families: sequences in the same superfamily are significantly similar using statistical tests, whereas sequences in the same family within a superfamily typically are less than 50 per cent different from one another. In the current collection there are almost 500 superfamilies and 750 families; over 140 of these superfamilies and 219 families contain at least one mammalian sequence. There are some 200 entries containing human sequences.

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1. Dayhoff, M.O. & Orcutt, B.C. *Proc. natn. Acad. Sci. U.S.A.* **76**, 2170-2174 (1979).
2. *Protein Sequence Data Tape* 81 (National Biomedical Research Foundation, Washington DC, 1981).