

CORRESPONDENCE

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most of the students and younger zoological systematists (and now even some botanists) have adopted this strategy of dealing with the empirical world in the belief that they were coming to understand something new about the hierarchical structure of nature. Of course, we should have known all along that something was amiss since most of our older colleagues from an earlier and wiser generation had told us that the spread of cladistics will have an extremely deleterious effect on Mayrian (or Simpsonian, or Darwinian) taxonomy. Well, the damage is done: their taxonomy will never be the same again — wiped out, as it were, by an epidemic of cladistics brought on by thoughtless, unhygienic and scientifically irresponsible cladists.

Some of my colleagues doubtless (in the old sense) will consider it premature for me to write such congratulatory lines about Dr Halstead on the grounds that he knows almost nothing, and appears to be unfamiliar with the literature, of cladistics. But I remind them that with Halsteadian Truth, knowledge of cladistics is irrelevant for cladistics is a theoretical matter. So I say to Halstead that there can be no serious doubt (in the new sense, for I actually seem to be getting the hang of it!) about the importance of his discovery of false doubt to systematics and evolutionary biology. Application of Halsteadian Truth suddenly reveals why all those serious doubters have questioned the usefulness of gradualism as a doctrine. This is because, poor souls, they imagined that (1) the modern doctrine of gradualism as derived from population genetics has no known empirical relationship to the hierarchy of organisms, (2) that population genetics theory was designed to rescue Darwin's theory of natural selection when it faltered because of its untestability, and (3) that the applicability of gradualism as an explanation of taxic diversity is achieved by a simple extrapolation from artificial selection experiments and the changes in gene frequencies observed in nature. I am forced also to include among the serious doubters a variety of embryologists and developmental geneticists who, before the coming of Halsteadian Truth, were thought to be rather distinguished.

The innate wisdom Halstead shows about cladistics and evolutionary theory extends to his philosophy of science and politics. On the thinnest of pretexts he tries to convince us that his certain knowledge that evolution is gradual constitutes a perfect, and necessary, refutation of Marxist doctrine. Would Halstead, I wonder, imagine that the massive extinctions that have taken place in his gradualistic world also carry sinister implications for us? The class struggle? Or did Darwin only predict the end of his own theory? Halstead, this great seeker of truth, must really be rebuked for deliberately confounding science and politics and for attributing the troublesome notions of Social Darwinism to the entirely ethical and clear-thinking scientists and educators of the British Museum.

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SIR — Beverly Halstead has drawn attention¹ to the ideological basis of the present exhibition policy at the Natural History Museum, and its implications. Other aspects of present policy are scarcely less disturbing. They relate to the display of the museum's collections and to the use of the building in which they are housed.

The museum's original exhibits were systematically arranged and a great number of genera and species were shown. The building in which they were housed was designed by Alfred Waterhouse (1830–1905), one of our greatest Victorian architects. It is a superb building and is listed as a Grade I Historic Building by the Department of the Environment. Waterhouse himself took great pains over the exterior and interior detailing and the whole building has an impressive unity.

The original exhibition galleries, whose plan and detailing reflected the order and hierarchy of nature, as then perceived, remained in use until the outbreak of war in 1939. The war led to closure of some galleries, and after the war nothing much happened for a long time. Museums generally were reacting against the old cases and galleries stuffed with objects, and the authorities of the British Museum (Natural History) did not seem to know what to do about the old systematic displays.

Eventually a policy seemed to emerge, exemplified by the new Fossil Mammal exhibit opened in 1972 in what was the old Fossil Mammal Gallery. In place of the dramatic long vista past mounted skeletons of fossil elephants, the continuity of the gallery was broken up and its original architectural character subdued, though some of the detail is still visible. Scientifically the new exhibit is much better than the old one, with a great deal of information on the animals and on the rocks from which they came, attractively displayed. As Halstead has pointed out², everyone, from a specialist to a child, can get something out of it.

So far, the museum had pursued the policy of showing a representative series from the collections which are its *raison d'être*. In this connection it is interesting that the British Museum Act 1963 makes no reference to the public exhibition of the collections. The explanations must be that in the eighteenth century, when the original acts were framed which the 1963 Act replaces, it was self-evident that a museum existed for this purpose.

Those who hoped that Fossil Mammals heralded the modernization of other galleries were soon to be disappointed. There was an abrupt change of policy. The museum's report³ for 1972–74 said that "Unhappily, the existing public exhibition does not match the museum's purpose . . . it has lagged far behind this century's revolution in the natural sciences. . . . it fails to give a clear picture of natural history as the study of the world in which we live with principles which lie at the groundwork of our technologies, and which are the first principles of rational living". The failure seems disputable—the original exhibits largely gave such a picture, and the rest of the sentence is gibberish. (What are the first principles of rational living?)

The report outlined a new exhibition "much larger than the old" designed to "reflect all aspects of modern biology". It

gave four themes which were to be the basis for the new exhibition: Ecology; Life processes and behaviour; Evolution and diversity; and Man. The Hall of Human Biology (opened in 1977; actually a warren rather than a hall), Ecology (1978) and the new exhibits on Man and Dinosaurs criticized by Halstead, are the first fruits of the stated policy.

It is debatable to what extent the museum should set itself up to be the fountainhead of the fashionable parts of modern biological education. In the case of the new Dinosaur exhibit, the sequence of arguments presented in the exhibit is repeated almost word for word in the accompanying booklet. This exemplifies the pointlessness of the new exhibition policy, which employs a great deal of expensive equipment to put over concepts which are better expounded on paper, and which are but distantly related to the collections and function of the museum. There is no coherent relationship between the new exhibits, the collections and the building. The recent exhibits make minimal use of actual specimens (none at all in Human Biology) and are unsuited to the exhibition space provided by Waterhouse's building. Human Biology was built inside former galleries, which it conceals completely, and Ecology was set up in the former gallery of living mammals. (It has recently been moved to the Fossil Reptile Gallery, soon to be demolished, where it looks even more out of place.)

Yet for all these unpromising omens, the museum apparently does intend to show its collections. The "Evolution and diversity" exhibits will, it is stated, "contain most of the material now on show in the Museum", exemplifying 5,000 to 10,000 species. They "will continue to provide . . . the most entertaining aspect of the Museum, halls of monsters and a stuffed zoo." Now this is exactly what the Waterhouse galleries were designed to do. It seems the height of perversity not to use them for the purpose. On the contrary, it is proposed to dismantle the 1972 Fossil Mammals exhibit (an admirable exposition of evolution and diversity) and to demolish a large range of the original galleries. Surely it would be better to do the obvious thing, use the original galleries for displaying the collections, and put exhibits such as Human Biology in a communicating building outside the original structure.

It is clear that the authorities of the museum are, at best, embarrassed by the splendid interiors they have inherited. They do not know what to do with them, or how to make use of them constructively. At worst they appear to regard them merely as an impediment to be concealed and, if possible, removed.

Worse than this, there appears never to have been any coherent plan for the development of the buildings and the site as a whole. Both the original building, admirably suited to its original purpose but quite inadequate for research and storage, and the site are large, but not inexhaustible. For example, the new Palaeontology building (opened 1977) is splendid and fairly well suited for its purpose of research and storage, but it has used up the last available building plot next to the main building. This piecemeal approach exactly parallels the present attitude to the use of the interiors — exhibits and other facilities being

placed wherever there happens to be some space that can be occupied. The whole problem of space and buildings at the museum is in urgent need of review, preferably by an independent body since the Trustees seem to be unable to see the wood for the trees.

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1. Halstead, L.B. *Nature* **288**, 208 (1980).
2. Halstead, L.B. *Nature* **275**, 683 (1978).
3. *Report on the British Museum (Natural History) 1972-74*, 75 (HMSO, London, 1975).

SIR—Halstead¹ has criticized the current exhibition policy of the British Museum (Natural History) on the grounds that the new dinosaur and fossil man exhibits are vehicles for the didactic presentation of a cladistic interpretation of evolution and taxonomy. He goes on to suggest that cladism and a saltationist interpretation of the history of life provide support for a Marxist view of history by progressive revolutions.

The political argument was questioned by Hughes-Games² and Rothman³ and is, really, a diversion from the main issue. Marxists and creationists may find support for their ideas in cladism and punctuated equilibria, but the interpretation placed on fact or hypothesis by people with a particular axe to grind should not affect the development of primary research.

Patterson⁴ presents some arguments on the validity of cladism and its relationships to evolutionary theory. This is an area that will probably continue to be discussed for many years (no doubt to the amazement and disgust of all non-participants).

However, the main issue is the exhibitions policy of the Museum. This question can be split into two: "Are the new exhibits balanced reflections of current scientific opinion?" and "Do the exhibits satisfy the public?"

The first point is answered with a resounding "no" by Halstead, and, I think, a partial "yes" by Patterson. Patterson states that "amongst scientists in the Museum there are many different viewpoints on the value and generality of cladistic methods", but this is not reflected in any exhibit yet. Is there any plan for a presentation of the views of "classical taxonomists" who regard cladism as an important analytical tool, but not as the sole aim and guiding principle of their research, or of numerical taxonomists (again with provisos as to applicability)?

The second question has not been asked yet. The new exhibition policy was started in the mid-1970s with the important aim of presenting a dynamic view of biological processes and it was stated that "... the scheme will be worthily carried out only if we can provide instruction and pleasure to the population as a whole ...".⁵ Is this aim satisfied?

I will comment only on the dinosaur exhibition. This occupies the prime gallery of the Museum — the main entrance hall. Large skeletons attract the visitor and strategically placed stalls market books, postcards, badges and models. The alcoves on either side contain the teaching parts of the exhibit and show examples of contemporaries of the dinosaurs and the much-criticized presentation of cladism. However, the interested visitor will search fruitlessly for information about life-style, function and physiology of dinosaurs. My experience from presenting lectures to school children, natural history societies and

adult education classes is that all these groups of laymen want to know if dinosaurs were warm-blooded, why they were so big, how they used their horns, spines and frills, how we collect them, why they died out, and so on. When I mention taxonomy there is a general glazing of eyes, fidgeting and covering of mouths. This may be an indictment of my teaching methods, but I think that it is also a reflection of what people consider interesting.

If the Public Services Department plans displays on dinosaur biology (functional anatomy, ecology, behaviour), I apologise for these remarks. If not, I don't.

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1. Halstead, L.B. *Nature* **288**, 208 (1980).
2. Hughes-Games, M.J. *Nature* **288**, 430 (1980).
3. Rothman, H. *Nature* **288**, 430 (1980).
4. Patterson, C. *Nature* **288**, 430 (1980).
5. *Report of the British Museum of Natural History, 1972-74*, p.76 (Trustees of the British Museum (Natural History), 1975).

Halstead replies

SIR — In view of the seriousness of the criticisms¹ levelled against the Natural History Museum, it seems a little surprising that they failed to elicit any response from the Director or even the Head of the Public Services Department. The only letter from the museum was from a senior member of the Palaeontology Department², who appears to be concerned with roundly condemning the very policies which were the subject of my initial protest.

Patterson² insists that "cladistics is not about evolution" and that there is "no connection between cladistics and one view of the evolutionary process". The "cladistic literature" to which he refers to support these assertions comprises only papers by Platnick³ and himself⁴, and these deal with what is known as "transformed cladistics". This is most definitely not the kind of cladistics being portrayed in the public galleries of the Natural History Museum, to which Patterson appears to be resolutely opposed. The museum's Public Services Department in fact accepts the classic version of cladistics as set out originally by Hennig in *Phylogenetic Systematics*⁵. The title of his book is frequently taken as a synonym of cladistics⁶, a term which refers specifically to the importance of the branching process (speciation) in phylogeny⁶. Hennig's view of the origin of new species involved the splitting of the ancestral species as a consequence of geographical isolation (allopatric speciation)⁵.

The long recognized (in spite of Patterson's contrary assertion²) connection between cladistics and punctuated equilibria, a fundamentally "leap" or saltation view of the process of evolution, has recently been emphasized by Cracraft⁷ and noted by others^{8,9}. Eldridge and Gould¹⁰ formulated the theory of "punctuated equilibria: an alternative to phyletic gradualism" by applying the concept of allopatric speciation, as used by Hennig, to the fossil record. In a subsequent review of the topic and the controversy it had engendered, Gould and Eldridge¹¹ contrasted the concept of gradualism "embedded in the modern history of Western cultures" with that of the "official 'state philosophy' of many socialist nations" where the "laws of change are explicitly punctational", quoting Engels and the official Soviet Handbook of Marxism—

Leninism to this effect. Their basic Marxist approach to evolution has been generally recognized as such, by *inter alia* Gray¹² and Hughes-Games¹³. The latter and Lewin¹⁴ hold the view that the concept of punctuated equilibria is on the way to becoming the orthodoxy of the future. This being so, it is not unexpected that many of its new-found adherents may well be unaware of the philosophy behind the cause they are espousing.

The major controversy regarding the process of evolution and the fossil record concerns the notions of the origin of new species by sudden splitting (Hennig⁵, Eldridge and Gould^{10,11}) — the Marxist model, as against the gradualist model associated with Darwin¹⁵, Mayr¹⁶ and Simpson¹⁷. I am associated with the latter model, not from uncritically accepting the authority of Mayr and Simpson but on the basis of my own research experience.

The death of scholarship in the Natural History Museum is not in my opinion marked by the advocacy of cladistics or even Marxism in the public galleries, as Patterson² seems to imagine, but rather in the manner of the advocacy. The exhibits on dinosaurs and fossil man together with their accompanying books avoid any discussion of the gradual evolutionary versus the revolutionary "leap" concepts, by the simple expedient of accepting the basic assumptions of one and ignoring those of the other¹⁸. It is this crude partisanship which is indeed the unacceptable "strident voice of authority".

The insistence on a chosen received dogma, such as that no fossil species can be considered ancestral to any other, has led the Public Services Department into its obvious differences of opinion with the museum's Sub-Department of Anthropology over *Homo erectus*. That "there is not any serious doubt about *Homo erectus* being ancestral to *Homo sapiens*" is contrary to the rules of the cladistics as applied in the exhibit but is in fact the considered opinion of the scientific staff of the museum's own Sub-Department of Anthropology, and certainly the literature that immediately comes to hand appears to agree with this, including as it does cladistic analyses¹⁹⁻²⁴. The most telling evidence, however, comes from within the covers of the museum's own book, *Man's Place in Evolution*²⁵. I have already drawn attention¹, in this context, to the vitally important Petralona skull, the phylogenetic position of which was recently discussed in detail by Stringer, of the Natural History Museum¹⁹ and by others^{26,27}. The skull figures in the book, but curiously has been excluded from the exhibition itself. It would have served as a dramatic illustration of a transitional form exactly intermediate between *Homo erectus* and *Homo sapiens* but would at the same time have destroyed the credibility of the cladistic dogma being promoted. In the museum's public galleries, it now transpires that, unlike elsewhere in science, "ugly facts" are not to be permitted to "slay beautiful hypotheses".

The Director in his preface writes that, like the exhibit, the book "was planned with the guidance of Museum experts, particularly from the Museum's Sub-Department of Anthropology"²⁵. This gives the entirely misleading impression that what is on display and published by the museum represents the considered views of the museum's own anthropologists. This is most certainly not the case and one cannot help but wonder whether