

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