THE UNIQUE ROLE OF THE CURATOR IN PALAEONTOLOGY

by CHARLES D. WATERSTON

ABSTRACT. Official reports suggest that universities in Britain no longer regard the preservation of their museum collections as an urgent priority. Curators should no longer assume that the importance of their contribution is understood by the scientific community, and it is suggested that palaeontological curators should articulate clearly what is the centrality of the fossil collections in their care to the future advance of palaeontology. It is suggested that although the paradigms of palaeontology and the wider world of thought change, the curator's essential function, to make fossils available for direct study, has remained constant. Because palaeontology advances through the interplay of theory and re-examination of data in what may well be a predictable pattern, fossil collections will necessarily continue to have an important role in the palaeontology of the future, and the curator's unique role of acquiring and preserving these collections is therefore central to the future advance of the science.

. . . Without the establishment of a tradition of museum preservation, it is difficult to imagine how a science of palaeontology could have emerged. As with the use of illustrations, the importance of museums is not a sign of the immaturity of the science, an indication of a 'descriptive' phase not yet outgrown; on the contrary, museums are a necessary central feature of the activity of studying fossils, stemming (again) from the inherent nature of the material (Rudwick 1972, p. 12).

MOST curators of palaeontological collections would agree wholeheartedly with the above statement by Rudwick, but many other palaeontologists would not. Since they may be expected to reflect the current paradigm of palaeontological opinion, it is of interest to consider the attitude of universities to their museums. In the past university men did regard the museum as 'a necessary central feature to the activity of studying fossils' and, as a consequence, some of the finest palaeontological collections were assembled in university museums. A number of these are still a glory of our scientific heritage. There are universities, however, where this opinion is no longer held and where museums, and even their collections, have had to give way, wholly or in part, to provide for expansion of other forms of teaching and research. Washburn (1975) reports that in the United States 'Some administrators, especially in universities, are questioning the need to retain collections at all—not only natural history collections, a good many of which have been unceremoniously discarded in recent years, but also collections of historical, anthropological, and artistic material'. Evidence for similar disquiet in the United Kingdom is provided in a number of official reports. For example the report on *Provincial Museums and Galleries* ('The Wright Report': Department of Education and Science, 1973), referring to university museums in general, states:

We are convinced that the comparatively neglected state of some university museums is avoidable and we would urge on the university authorities their responsibility to pay sufficient regard to the needs of collections placed in their trust. (para. 13.8, p. 55).

In the same report the following statement of the University Grants Committee is quoted:

There is virtually no prospect of the UGC providing an allocation for a new museum building or a major

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extension to a museum as an independent project, since this could hardly ever be justified in strictly academic terms in competition with other projects. (para. 13.10, p. 56).

One other extract may suffice to make this point. It comes from the latest Report on University Museums by the Standing Commission on Museums and Galleries (1977):

Although universities accepted full responsibility for the conservation, research and custody of the collections in their museums, general curatorial care under the existing financial restrictions appeared to be suffering exceptionally. Even in those departments where the collections had a direct relationship with teaching and research financial pressures made it difficult to make provision for the museum element. (para. 7, p. 2).

I must stress that these reports refer to university museums in general and not to palaeontological museums in particular, but we know from our own experience that palaeontological museums have suffered greatly in many British universities. It must also be made clear that the argument of these reports is connected not only with the academic use of museums but with public responsibilities which they may be considered to have. The thrust of the Standing Commission's report is that even in the finest university museums, financial arrangements require to be altered to stop the undue burden of retrenchment which is being borne by museums at this time of economic stringency. It is not my purpose to discuss these political issues nor to attack our universities which have so many problems of their own to face. What I do wish to do is to emphasize the evidence which the present situation provides for the fundamental attitude of universities to their museums and perhaps also to museums in general. The conclusion appears to be inescapable that even those universities with the finest museums no longer regard the preservation of their museum collections as an urgent priority amid competing claims for financial support, and some, by their actions, have shown that they look upon museums as an irrelevance in modern academic life. In the face of such attitudes among the trend-setters of scientific opinion towards what is an irreplaceable part of our scientific heritage, should we, as representatives of the larger scientific community, be worried? The curator may well say with Alphonse Karr 'plus ça change, plus c'est la même chose'. He will remember that even before the full flowering of the so-called descriptive phase in natural history, which many would regard as the golden age of the museum, Linnaeus himself had to combat similar contemporary views. In the preface to his catalogue of the Museum of King Adolph Friedrich of Sweden (1754) he wrote:

The indefatigable collectors of such objects sometimes have the fate of being reckoned monsters; many people wonder at their great but useless labours, and those who judge most tenderly, exclaim that such things serve to amuse persons of great leisure, but are of no real service to the community (quoted from Murray 1904, i. 223).

To correct these opinions Linnaeus went on to examine what he believed to be the 'design and object of such collections'. For the future well-being of science I would urge curators to adopt a similar prophetic role today within the scientific community. They can no longer assume that their contribution to the work of science is understood, much less that it is supported outside the museum. Using the corporate and traditional wisdom of their profession curators must articulate as clearly and rationally as they can what their contribution is—in our case what the centrality of fossil collections is to the future advance of palaeontology. I wish to suggest also that the

community of science will ignore at its peril what, in this field, the custodians of our material scientific heritage are uniquely qualified to say.

Amid the uncertainties of modern life we appear to be united in our expectancy of change. With more scientists alive and active today than the sum of all who have ever lived before, the exponential rate of change in science should not surprise us. For the curator, whose responsibilities span the generations, however, this rapid rate of change presents particular difficulties. In order that his day-to-day decisions may be consistent with the long-term interests of his subject it is important that he should develop a philosophy of curation which may be distinguished both from the present enthusiasms of science and from the current matrix of world thought in which these fashions are developed. To do this he must both look back to the history of his subject and the successive environments of world thought in which it has developed, and look forward. In order that he may better understand how advances are likely to be made, he should study the interactions within the scientific community which appear to point his subject forward. It may be helpful here to indicate briefly some of the considerations which appear to relate to this endeavour.

Looking back

Standard works such as Murray (1904) or Wittlin (1949, 1970) give accounts of the historical development of museums and their collections. The continuing importance of fossil collections in the history of palaeontology has been admirably brought out by Rudwick (1972). It is therefore necessary only to summarize here some of the lessons of history which may better fit the curator to serve the science of the future.

The changing paradigms of palaeontology. Rudwick (1972) considers Gesner's work *De rerum fossilium* . . . (1565) to be the first in which there is a clear expression of a programme of co-operative work on fossils, and ever since palaeontology, like all other branches of science, has been a communal activity. Kuhn (1964) pointed out that the authority of a scientific community supports a particular set of assumptions by means of its paradigms. (Paradigms are 'models' of past scientific work which are accepted by a given group of scientists at a given time.) He suggested that the rare occurrence of major changes of paradigms produces such far-reaching effects that it can be called a scientific revolution and he cites such examples as Copernican astronomy, Newtonian physics, and Einstein's relativity. So it has been with palaeontology. In the sixteenth century there was the recognition, among all those objects which were dug up, of organized fossils or extraneous fossils as those having a causally significant resemblance to organisms. In the seventeenth century men such as Steno demonstrated that organized fossils were indeed the remains or traces of once living things and such ideas as the *sui generis* origin of these objects were discarded. Increasing sophistication of geological theory led to the recognition of the sequential nature of the fossil record and the discarding of the notion that fossils were the result of the Noachian deluge. In the eighteenth century it was recognized that the objects of natural history could be ordered in a hierarchical way and for Linnaeus and Buffon the systematization of nature became an end in itself. In the earlier decades of the nineteenth century, in the work of men such as Cuvier, and through the correlation of strata by their contained fossils, the idea of extinction became established and it was

recognized that faunas and floras had arisen and become extinct to be succeeded by others. The appearance in these successive faunas and floras of more advanced forms led to the idea of progressive development and so to the evolutionary debate and the search for phyletic relationships. In our own day the theory of plate tectonics has revolutionised our understanding of the geographical distribution through time of fossil faunas and floras.

The wider world of thought changes. Palaeontology has not advanced through its successive paradigms in an intellectual vacuum. The contemporary environment of world thought has always coloured the motivation, aspirations, and questionings of those involved in our discipline. (See, for example, the discussion of punctuated equilibria versus gradualism in Gould and Eldredge 1977, pp. 145–147.) Indeed because of the implications of the discoveries of palaeontology for religious thought it has been influenced more than many branches of science by outside opinion. On the material level the things which society expects to gain from the study of fossils has changed—the virtues of figured stones in *materia medica*, for example, are very different from the gains expected from the correlation of strata in coal or oil fields. The philosophical environment, however, has probably had an even greater influence on palaeontology. Europe's view of truth has moved from various forms of deism through rationalism to humanism and scientific materialism within the lifetime of our discipline.

It is perhaps easier to accept that our palaeontological paradigms will change than that the present concepts concerning the nature of truth, which we take so much for granted, will also change, and yet the assumptions of scientific materialism so generally accepted in the first half of the twentieth century are already being challenged. There have been times when it was believed that eternal verities could be discovered in art. This was particularly so during the phase of neo-classicism in the late eighteenth century. Writing of this movement Hugh Honour (1972) says 'Significantly, the aesthetic qualities which artists wished to embody in their work, and which the theorists extolled, had ethical connotations—truth, purity, nobility, honesty'. In the Models of Excellence set out by Sir Joshua Reynolds in his *Discourses* (1837) or in the progress of the discovery of the eternal qualities of art traced by Winckelmann in ancient Greek art these men no doubt discerned truth. With the increasing awareness of the different aesthetic values of different peoples such a connoisseurship would probably find few supporters in the world of art today. We must be prepared to consider whether the 'objective truths' of science—or at least some of them—may be similarly elusive (Waterston 1977). Mathematics and physics, in such ideas as relativity, the quantum theory, the Heisenberg principle, and wave-particle dualism, teach us that even the observed data, or 'facts' of physical science, once thought to be so absolute, vary according to the circumstances in which they are observed or the context in which they are considered. In the face of such ideas the debate continues among philosophers on the nature of scientific theory as it relates to truth. The positivist view of theory as the summary of data has lost ground to recognition of the subjectivity of the data itself. Many would regard theories as useful tools to be used and discarded as required—here there is no insistence that there are real entities corresponding to concepts but it just might be so. Others of the idealistic school such

as Eddington and Jeans went so far as to suggest that the structures of theory are entirely imposed by the mind on the chaos of sense-data. Others would maintain still that the patterns in the data discerned by theory are not imposed by us but originate, at least in part, in objective relationships in nature (Barbour 1966). Clearly the more advanced palaeontological theory becomes, the more sophisticated will become the philosophical implications of it and interplay will continue with the concepts of truth held in the wider world.

The essential function of the curator has remained fairly constant. When in the sixteenth century Gesner combined his collection with that of Kentmann to form his museum, he did so with the primary object of enabling him to examine the specimens for himself so that he need not rely on the descriptions or illustrations of others as to their nature. To make fossils available for study in this direct way has remained the primary objective of the palaeontological museum. The authority of the specimen, rather than descriptions and illustrations of it, is recognized in the type-specimen concept embodied in the International Rules of Zoological and Botanical Nomenclature. The authority of the specimen is implicit also in the repeatability of observation which is essential to the scientific aspirations of palaeontology.

In order that his material should be properly preserved and readily available Kentmann kept his specimens in a cabinet with numbered drawers and Gesner published a catalogue of its contents. The cataloguing, conservation, and ordered storage of specimens have remained essential tasks of the curator and enable him to make specimens available for research as and when required. Techniques employed to accomplish these tasks have changed greatly over the years. Cleaning and conservation of fossil material is now a skilled operation and some of the techniques used have been developed by specialist museum staff (see Kummel and Raup 1965; Allman and Lawrence 1972; Rixon 1976). The ordered storage of specimens in the optimum physical environment is now an expensive operation. Anderson (1973) states that at that time the maintenance cost alone in the Department of Mammalogy of the American Museum of Natural History was $0.24 per specimen per year, which is comparable with the cost per square foot per year in libraries of $1.25. The crude average cost of maintaining the specimens for each research paper using that department's material was $275, but that figure could rise to over $800 if specimens from more than one museum collection were used. In order that collections may yield the maximum information cataloguing and data handling are now sophisticated processes.

The lesson of history would appear to be that although scientific paradigms have changed, as has the intellectual environment of world thought and motivation, the essential function of the curator—the making available of fossil specimens for study by the scientific community as and when required—has changed little. Although the techniques used by the curator have changed, his tasks of acquisition, conservation, storage, and cataloguing have remained constant. It is also clear that at times the relevance of the curator and his collection to the advance of palaeontology has been more apparent than at other times. This has been due more to the deviation of scientific paradigms from the centrality of collections rather than to any lack of constancy in the objective of the curator.

Looking forward

While prediction is hazardous, it is possible to draw attention to some processes and pressures at work today which may encourage optimism for the future of palaeontological museums while others may sound a warning note.

A predictable pattern of progress? Although the historical perspective suggests that there will be further scientific revolutions we do not know what they will be. Within, and affecting, these major revolutions, however, there appears to be a predictable pattern of scientific advance which must have significance for the curator. W. Goffman and his associates have related the transmission of ideas to the mathematical model existing in medicine for the epidemic process and they believe that the discovery process in a single subject develops as a pattern resembling a sequence of overlapping epidemics. There appears to be a predictable periodicity in the occurrence of fundamental discoveries, each of which was seen to both instigate and stabilize each epidemic outbreak; they posed more questions than they answered. Elsewhere (Waterston 1972) I have discussed these views in relation to geology. The conditions necessary for an idea to become 'infective' have recently been considered by Dolby (1977), who recognizes many factors in the transmission of science such as the innovation and its relationship to its intellectual context, the manner in which it is transmitted, and the social context within which the transmission occurs.

These findings appear to have a particular significance for the curator of palaeontological material. He will recognize that the transmission of certain palaeontological ideas leads to an 'epidemic' effect, as expressed in the number of people using the idea and the rate of production of papers in that field. A well-defined example is the application of the pollen diagram to stratigraphy and chronology following its first introduction by von Post in 1916 (see Manten 1966). Other very different examples may be the 'infective' nature of the ideas of Hennig (1966) for taxonomy, or the introduction of Scanning Electron Microscopy to the study of micro-organisms and structures. In such ways the progress of palaeontology is seen to be a succession of epidemics and it is important to note that in each case the infective idea which gives rise to the epidemic, although it arises from the ordering of information, immediately moves the subject into a state of greater disorder. Thus Hennig probably raises more problems than he solves: the successful application of SEM to one fossil creates an immediate distrust of a great deal of information regarding microstructures which has been described using older techniques. This means that as often as such a fundamental advance is made in palaeontology the evidence must be re-examined and the new facts reconstellated, which leads to another epidemic which may in turn culminate in another infective but disturbing paper.

Museum collections are assemblages of facts, many of which, because of the nature of the material and its occurrence, are available to palaeontologists nowhere else. As the transmission of ideas proceeds these facts are re-examined, re-interpreted, and restructured over and over again. That there is at least a suggestion of periodicity in the use of significant fossil specimens, closely reflecting the epidemic cycles in palaeontology, may be seen from references given in the published catalogues of type and figured material in any historical collection.

Some palaeontologists may find the units of information available in a museum

to be irrelevant to their own particular infection of ideas or they may already have ordered this information and for them the museum is 'done'. For such a person to suggest that the museum has no further function is as irresponsible as it would be for a patient newly discharged from the infectious diseases hospital to assert that the hospital should now close. Others may become infected or he himself may require to return with a different infection. Because science advances through the interplay of theory and re-examination of data in what may well be a predictable pattern, museums and their collections will necessarily continue to have an important role in the palaeontology of the future.

Calling the tune. Research and curation require financial support. That support is given by the wider community whose expectations are bound to influence to some extent the direction in which science and museums will move. The academic independence of science and the curatorial integrity of museums must be cherished but those in positions of management know that in a real world they must maintain a balance between what they may regard as ideal and what the public, as the provider of funds, has a right to expect from their institutions.

An example of such a pressure is the increased public demand for education at all levels which, in addition to affecting the allocation of resources in the universities, has probably influenced the ways in which subjects like palaeontology have developed. Three hundred and twenty-one separate Ph.D. and M.Sc. topics in palaeontology were completed in British universities between 1965 and 1974 (Rolfe 1971–1977), which must represent a significant proportion of all palaeontological research done in the country during that period. Each topic was chosen to take account of the aspirations and limitations of the student whose time in the research department was brief. Would palaeontology have developed in the way it did during that period if the motivation for research had come only from the research councils, museums, or the permanent members of university research staffs? Other pressures, such as the now accepted principle that 'Research and Development with a practical application as its objective, must be done on a customer–contractor basis' (Rothschild 1971, para. 6), will affect the rate at which our discipline may develop in certain directions. Such external pressures are bound to continue.

Museums have also responded to public pressure. It is now taken for granted that their appeal to the public will be through well-designed exhibitions supported by skilled educational services. Museums are variously regarded as places of entertainment especially for children, tourist attractions, even status symbols, and they may be all of these things. The American palaeontologist Colbert (1961), although himself responsible for one of the finest exhibitions of dinosaurs in the world, has reminded us that 'a museum can be an excellent institution of its kind without ever attempting a program of exhibition, a fact that frequently is not appreciated by people outside, or even within, the museum profession'. Washburn (1975) has warned that in the absence of clearly defined objectives, many museums have been pushed off course by yielding to outside pressures and now perform less well what should be their unique function in society. That unique function of maintaining collections may be becoming increasingly overshadowed by the very success of museums in their secondary services such as display and education. If museums are now thought of as educational

aids only, as places of entertainment only, or as tourist attractions only, then the balance between curatorial integrity and response to public pressure is wrong. In my view, despite the undoubted importance of their secondary services, the persistence of such an imbalance in public opinion would be detrimental to museums and to the future of scholarship since the less glamorous but more vital museum duty of maintaining collections might then be prejudiced.

The unique function of the curator of palaeontology

The unique function of the curator in palaeontology is to acquire and maintain collections of fossil material for future study. Reasons have been given which suggest that these collections will be indispensable to the palaeontology of the future. The curator's tasks of acquisition, conservation, storage, cataloguing, and research are now expensive if properly done. The curator must play his part by formulating a clear and realistic acquisition policy which takes account of the scope and limitations of his institution, which may change and develop but will be dictated at any time by the money, staff, and space then available to keep the collection (Colbert 1961). Having done so he must pursue his policy unswervingly and yield to pressures for other services only in so far as he can provide them without prejudicing the well-being of the collections which he holds in trust for future generations. The palaeontological community, for its part, must recognize the important place which fossil collections have for the future of their discipline and the contribution which the curator makes on behalf of the community in acquiring and maintaining these collections. It must recognize that in order to fulfil his function the curator requires resources and is rightly entitled to that share of the total resource of the community which will allow him properly to do so.

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DISCUSSION

J. Lavender. With regard to the need to distinguish between the two roles of collections, i.e. essential reference and use for general educational and 'entertainment' purposes, it seems necessary to me to make some decisions, albeit subjectively, on the potential future role of specimens at the time of accession. Can any scheme be evolved to aid curators with this problem of distinguishing between essential reference specimens and others?

C. D. Waterston. I doubt if it is possible to evolve a scheme to aid curators to distinguish, at the time of acquisition, what may become essential reference material and what of general educational value. This is a subjective matter for the judgement of the curator since he cannot know how specimens may be used in the future. For example, when eggs were acquired for natural history collections in the last century, nobody then could have known that they would now form an essential reference—by the thickness of the shell—for studying the effects of poisons on birds. It was not in the minds of the collectors of museum specimens of fishes from Lake Ontario many years ago that these specimens would provide a standard for measuring mercury concentration in the Lake. We cannot foretell exactly what the significance of the material we collect may prove to be, and thus it is not possible to say that a specimen acquired for general educational use will never become a reference specimen.

R. B. Rickards. I think that Dr. Waterston has ignored the intuitive role of the curator. It is very difficult to plan for future needs and the intuition of a curator is very important. In addition, he is answerable to various authorities.

C. D. Waterston. I agree that the intuitive role of the curator is of the utmost importance. That was implied in my reply to John Lavender (above) that any judgement concerning the future role of the material he acquires is a subjective matter. I have attempted in my paper to outline some considerations which may inform the curator's judgement and perhaps quicken his intuition.