CONCLUDING DISCUSSION AND SUMMARY

Editorial note. The final session of the colloquium took the form of an open forum in which many of the points raised during the previous two days were discussed at considerable length; an attempt was made to define the key problems related to the curation of palaeontological collections, and to suggest courses of action for their remedy. The main themes of these discussions have been summarized here by the chairmen of the various colloquium sessions; we have expanded on some themes where necessary, and also included points from some of the papers themselves in order to provide over-all conclusions and recommendations as a synthesis of the meeting as a whole.

THE Oxford English Dictionary defines a curator as, 'One who has the *care* or *charge* of a person or thing' (our italics). In its original root and meaning the emphasis was on charge or management, and only more recently, particularly in association with the museum profession, has the element of care been incorporated in the interpretation of the word. Museum curators are certainly employed to be in charge of collections, but probably the one most striking point to come out of this colloquium is that many geological specimens are either at risk or are potentially at risk because of a lack of concern or proper care. Many institutions with important collections do not employ a trained geological curator, and this situation must be viewed with alarm, not only by the museum profession but also by other geologists who use the collections as working reference tools.

This note of pessimism should not, however, detract from the considerable amount of thought and work now being invested in curatorial problems; the Cardiff meeting in itself emphasized that there is a body of opinion that does care. The emergence of the Geological Curators' Group in recent years has brought many aspects of curating into sharp focus, and through its *Newsletter* the Group has the potential to set and recommend minimum standards for adoption by all institutions holding geological material. Formulation of such standards must be seen as an urgent objective if some of the recommendations incorporated in this summary are to become universally implemented.

Preserving the heritage of palaeontological collections

Doughty's paper (p. 17), highlights the serious shortage of trained curatorial staff in charge of palaeontological collections. The problem is probably most acute in Britain, where there is a rich heritage of private collections and numerous small museums derived from the 'heroic' and 'golden' ages of natural history in the eighteenth and nineteenth centuries, but fairly certainly there are similar situations in other countries.

As a discipline, palaeontology has singularly failed to attract widespread *public* interest and support, apart from in 'spectacular' fields such as dinosaur studies. Other subjects, and in particular archaeology, have demonstrated the value of massive publicity in gaining public sympathy and support, with the result that 'rescue' work

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is now being carried out by trained staff recruited specially for that purpose. Administrators and others responsible for the running of institutions must be made aware of the serious threat to geological collections, and convinced that fossils are as much a part of our heritage as archaeological remains. In Britain recently the Victoria and Albert Museum's travelling exhibition on the 'Destruction of the Country House' was extremely successful in drawing attention to a particular area of neglect; palaeontology could use the media in similar ways to attract its own attention.

In the long run palaeontological collections will only be properly maintained if curated by trained geological staff; the profession must convince those who run our museums, at all levels, that specialist support is needed to protect this part of our heritage, and that it has been severely neglected for far too long.

Roles and responsibilities

Over and above the general concern that curators and institutions should have for palaeontological collections as a whole, there are other areas in which the profession should be examining its role. Few museums have a stated collection policy, with the result that over the years material has been accumulated in piecemeal fashion, often regardless of the direct aims or location of the institution, or the interests of the staff at the time. Curators tend to be acquisitive by nature, but if the haphazard growth of collections, with the accompanying diffusion of information, is to be controlled, then some policies may need to be formulated. The adoption of particular responsibilities and priorities for collecting and housing certain groups of fossils (see Rolfe, p. 27) could be one way in which specialist care could be built up in particular centres; such policies would be in line with the widely held views of a few years ago that 'centres of excellence' should be encouraged in the museum structure. The question here is one of balance, since there are certainly dangers inherent in any museum adopting too restrictive a policy. Pursuance of the philosophy of centres of excellence could possibly lead to the strong museums becoming even stronger, with the weaker ones being forced to close down, to the detriment in the long run of services to the public. In this way acquisitiveness and possessiveness, coupled with a general attitude of superiority and unapproachability, could well develop among the larger institutions unless the greatest care were taken. Of course some museums do currently adopt specialist collecting roles; for example, regional museums often seek to collect and house material from their particular region, and this policy should continue to be encouraged. The question of specialist responsibility will arise in these cases only when a museum is offered material from outside its region. Again, however, such restrictions need not necessarily be rigid, and many museums in this category will want to maintain a broader coverage for educational and comparative purposes. Informal communication among curators will certainly continue to be important in determining the collecting roles of individual institutions.

The most serious examples of neglect of fossil collections arise in those museums which have no specialist geological curators, and such institutions should seriously consider the advisability of transferring their material to another which can offer it proper and permanent care; in return the recipient should offer advice and help in selecting specimens that might be retained for exhibition purposes, while guaranteeing the safe-keeping of the transferred specimens.

Most universities fall in a special category with regard to this problem, since although they may have geologists on the staff, there is rarely a specialist curator. Unless it can be properly maintained, research material from university studies is best passed on to specialist museums, and this is particularly so with type collections. Universities have a particular responsibility in this respect as teachers of future generations of palaeontologists; many of the problems could be solved if universities included a basic course in curating for palaeontologists, with an insistence that research collections should be curated to a certain minimum level by the students themselves as part of their degree requirements. University museum collections also often suffer by being misused for teaching, and there is a need in these cases for the function of both research and teaching material to be clearly separated.

The question of type collections is considered separately below, but it is relevant to note that professional societies and editors of journals also have a responsibility to ensure that published research material is properly housed and curated. Journals and their editors should refuse to accept papers dealing with fossil material unless the specimens in question are clearly stated to be housed in a publicly accessible and reputable museum, and unless details are given of the necessary museum data to allow all the cited material to be readily identified in the future.

Type collections

Because of their fundamental role in taxonomy, type fossils (together with other figured and cited specimens) have always been, and will continue to be, in a special category in museum collections. There are divergent views as to whether types should be stored separately or with the main collections, but it is clear that no one rule can be applied to all museums. Security, convenience (for both user and curator), ease of access, and proper storage and indexing are the guiding principles whichever of the two alternatives is adopted (see Bruton, p. 137, for an illustration of these principles). Types should be clearly marked as such and made readily available for study by scientists. This raises the sometimes emotive issue of loans of type material, but again no single criterion can be applied. However, in general, common sense should prevail in assessing whether loans should be made, with the safety of material always being the first consideration; but to bona fide research workers who require material for systematic revision there should be little or no objection, whatever the distances involved. In the case of particularly delicate or bulky material it will always be necessary for researchers to visit the collections.

Preparation of types may be desirable or even necessary under certain circumstances (e.g. see Scrutton, p. 97), again within the bounds of common sense. Curators in charge of material who do not have the expertise to judge for themselves whether types should be either loaned or prepared should consult specialists in the particular field before reaching a decision. Borrowers must be meticulous in respecting the conditions attached to the loan of material.

The repatriation of type material to its country of origin was raised on a number of occasions at the colloquium (e.g. see Worsley, p. 145). Both national and international politics are involved here and it is clearly premature at present to frame any kind of recommendation. Many institutions regard themselves as being international in character and have large holdings from foreign countries. Provided that material

is made freely available for study on request, many of the issues involved in the question of repatriation can be avoided.

Collection and data management

The exponential growth of collections and their accompanying data in recent years has placed increasing pressure on curators to consider the efficiency of various storage and data handling systems. As with collections of type material (see above) no one storage arrangement can be regarded as 'ideal' or 'correct' since different museums will continue to have individual requirements based on usage and convenience. The choice of suitable furniture and fittings in which to house collections (e.g. see Rickards, p. 75; and Gentry, p. 87) is a prerequisite for both protection and information retrieval. Arranged in a systematic and logical manner (whether it be biological or stratigraphical) fossil collections should, to a great extent, form their own index on which secondary indexing systems can be built. Curatorial intuition and familiarity with well-organized and well-housed collections are important factors in dealing with enquiries in most museums, and will clearly continue to be so.

Computerization of collection data is a major growth area in museum work (e.g. see Light, p. 149; Brunton, p. 159; Jones, p. 175). The colloquium expressed some disquiet at the fact that different standards and systems are being established and operated, and work towards the compatability of the different systems must be seen as a priority if maximum information and data exchange are to be achieved. Once systems of this kind are established cross-referencing and indexing of collections can be carried out to a depth that is virtually impossible with manual systems, and as a result the potential for enquiry work and data retrieval is considerable. For many museums the costs of setting up and running computerized cataloguing systems are prohibitive, although here the establishment of centralized agencies such as the Museum Documentation Association represents progress. Decisions as to whether to adopt a computerized system will inevitably involve balancing establishment and running costs against the anticipated saving in time taken to carry out an operation that is already being undertaken by other means; estimates of these factors will vary widely from museum to museum, with the result that at present no hard and fast recommendations can be made.

For most museums, computers are envisaged as curatorial tools rather than a direct means of research. It is clear, however, that if computer-stored data are to be used on a national or international scale, then not only must the systems be technically compatable but the data input must also be standardized. Use of standard formats such as IRGMA/MDA cards ensures that the input is structured, but does nothing to standardize the terminology and hierarchies used in the data. Agreement among curators on the terminology and hierarchies to be used for this purpose is urgent and essential if the more exciting possibilities of computer data retrieval are to be realized. In palaeontology, terminology is not a severe problem when compared with other museum disciplines, although there are difficulties in certain fields such as trace fossils. Hierarchies, however, whether taxonomic or stratigraphical, are still subject to the personal preferences of curators. Such agreement is urgent since decisions on these matters are being, or have been made as part of the ongoing work of some

national museums, which may pre-empt any change possibly thought desirable as a result of future discussion by other curators, simply because of the scale of input by these major museums. In taking these initiatives the national museums should recognize their responsibilities to the wider interests of palaeontological curation by making known the terminologies and hierarchies they propose in any field, and inviting discussion so that a consensus may be reached which could be adopted for all collections in that field.

Many speakers stressed the vital but often forgotten fact that the computer will not in itself solve problems of curating and cataloguing overnight—bad curators will not suddenly become good curators, and bad collections will not become good collections. Input of ordered data must be based on well-ordered collections, so that curators must be aware that the secondary retrieval of computerized information will continue to depend on the primary physical arrangement of specimens and their accompanying data.

Site conservation

Pressure on geological sites is increasingly becoming an urgent problem in many parts of the world, and this is affecting the availability of palaeontological material for both teaching and research. Museums are being asked to play a more active part in site conservation, although at present they can normally offer only advice in the absence of legislative powers. Through their collections museums house a great deal of site information, and this information is often sought by collectors, both serious and otherwise. There are divergent views as to whether curators should become involved in site data recording as a primary function of museum work, or whether such information should be passed on secondarily to specialist agencies for co-ordination (e.g. in Britain, the Nature Conservancy Council, see Duff, p. 127), but in either case there is a responsibility to ensure that passing on information about collecting localities does not then lead to site destruction. Attention can be directed away from classic sites towards alternative exposures where no damage can be done, such as working quarries or extensive coastal sections. Leaders of large parties, such as university or school classes, have an equal responsibility to ensure that sites are not over-collected, and certainly in many cases the needs of teaching would be better served by the careful examination of well-curated museum collections; curators could play an active role in site conservation in their local area by setting up a comprehensive teaching collection and advertising its availability. The message that fossils are not a renewable resource must be made clear to all concerned in their collection and study.

Specimen conservation

The other aspect of conservation discussed at the colloquium was concerned with the more direct museum activities of specimen storage, preservation, and treatment. It is naïve to believe that once specimens enter a museum they are automatically removed from risk of destruction. The papers by Rickards (p. 75) and Gentry (p. 87) emphasize the need for proper arrangement and storage of fossil specimens in order to minimize any loss or breakage, while that by Howie (p. 103) clearly demonstrates the new technologies required for the treatment of material that might suffer from

chemical or bacterial decay. Fossil material is too often considered to be indestructable, but Howie shows that even 'ordinary' everyday factors such as humidity and temperature changes can be as damaging in the long run as to works of art.

Most museums do not have the resources to employ full-time conservators for fossil material, so that such matters are left to the curators themselves. Within the profession as a whole there is a serious lack of training of curators to make them aware of modern conservation techniques, and a great deal of research is required before risks to some parts of existing collections can be overcome.

Palaeontological exhibitions

The traditional role of curators in displaying their material in a systematic way, more or less as an extension of the arrangement of the reserve collections themselves, has changed dramatically in the last decade or so with the advent of new design philosophies and techniques. Most museums now employ specialist design and exhibition staff, but demands on, and involvement by curators will continue to be integral to the planning and execution of displays since they will continue to provide the basic material for interpretation from the collections. Other branches of the media confront the general public with increasingly sophisticated standards of presentation. If curators are to gain support for, and public appreciation of, the value of palaeontological collections, then similar standards of presentation must be adopted in museum exhibits. Miles and Tout's paper (p. 209) stresses the principles involved in applying educational technology to exhibitions; this is a new field, and while the implementation of the new technology will not necessarily always produce similar solutions for different branches of geology, no palaeontologist contemplating a new exhibition should remain ignorant of the full implications of the approach. Equally important are the practical techniques for palaeontological reconstructions described by Chase (pp. 189, 225), involving a high degree of artistic skill. This session of the colloquium clearly pointed to the need for co-operation between curators, designers, and educational psychologists in order to implement more effective exhibits as a means of promoting the subject.

RECOMMENDATIONS

It will be clear from the papers in this volume, and from this summary of discussions, that as in the past the role of the curator is still extremely varied. To some extent he has to be a 'jack of all trades', while at the same time attempting to master specialized techniques essential for the continued protection of collections, yet the majority of curators are still self-taught. If solutions to many of the questions posed at the Cardiff colloquium are to be forthcoming in the near future then certain of the guide-lines outlined here must be pursued vigorously; we believe that these guide-lines can be further summarized as six groups of recommendations which reflect the major themes of the meeting. As co-sponsors of the colloquium, The Palaeontological Association and the Geological Curators' Group have shown themselves to be concerned about the state and status of palaeontological collections; in order to continue the impetus generated as a result of their concern, we also consider that the executive bodies of

both societies should combine in drawing the attention of these recommendations to the appropriate authorities as a basis for future action.

1. Palaeontological collections should be in the charge of specialist geological curators. Museums without such staff should seek advice, and should consider passing important collections to institutions where they will be properly curated.

2. Organizations such as The Museums Association and the International Council of Museums (ICOM) should be urged to establish courses for specialist training in all aspects of geological curating and specimen conservation.

3. Type and other described and cited fossil specimens should be deposited in a reputable and publicly accessible museum. Editors of journals should accept papers for publication only when this condition is satisfied. Types should be made freely available for research purposes; in some cases preparation of such specimens may be necessary and if curators are in any doubt about granting permission they should consult other specialists in the field for advice.

4. Museums with stated acquisition policies should be encouraged to make them widely known.

5. Palaeontological sites, and especially type sections, should be treated with respect through following recommended Codes of Conduct; where necessary sites should be protected by legislation to prevent over-collecting.

6. In addition to computer technologies and data-formats, terminology and hierarchies require standardization if computerized cataloguing techniques are to become widely used and effective for indexing and data-exchange in palaeontology.

The principles involved in these recommendations cut across national boundaries, and we suggest that the time is now ripe for an international assessment of the status and role of palaeontological collections under the aegis of agencies such as UNESCO and ICOM, which have been so influential in framing policies for other museum disciplines. Implementation of rigorous standards is required if important parts of our evolutionary heritage are to remain intact.

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