Natural Science Collections

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As a specialist in maintaining an insect collection in what could hardly be described as a typical museum I feel I am here under false pretences. Furthermore, I am not able to detail the standards required to conserve our natural science collections for the very good reason that I don't know them and neither, it appears, does anyone else.

However, as a natural scientist who is responsible for the maintenance of a collection containing biological material I am aware of three things. First, the seminar held in Perth in 1973 was a milestone in the conservation of cultural material because it recognised that biological materials required conserving, though it only discussed zoological and palaeontological material. I would hope therefore that the botanical collections in our herbaria are considered in the future, especially as I believe that herbaria pre-date museums historically.

Second, I am aware of our abysmal lack of knowledge about the conservation of biological material and third, I am aware of the desperate state of many of our natural science collections.

When it is realised that the majority of materials being handled in both art galleries and museums are organically based, the neglect of these materials in the past is incomprehensible. It has stemmed from the traditions in which natural science collections have always been steeped; from the early thoughts that the material was replaceable; and more recently from the sheer mass and variety of these materials. Over half the holdings in the major Australian Museums are biological, ranging from Diprotodons to Diatoms, and yet I find only four other biologists at this conference.

Perhaps we as biologists have ourselves to blame for this: there are still those who feel that biological specimens are not really cultural objects, and others that biological material is already adequately preserved. Some claim they do not want to improve their techniques as a good specimen would be hard to compare with the shrivelled and distorted specimens they have become used to studying.

Our natural science collections are no longer replaceable, being made up of material that no longer exists or at least comes from localities which today bear little or no resemblance to the places where the collections were originally made. Furthermore, material we are collecting today will be equally irreplaceable in the years to come.

Yet when we look at how these collections are housed we find them in tin sheds, basements, attics and other similar places; rarely are they stored in adequately conditioned premises. We find them in climates ranging from the tropics, through the dry interior to the colder and wetter climes of the south east. The storage containers they are held in, be they large cabinets of stuffed mammals or vials of minute invertebrates, probably include a representative sample of every container ever made regardless of its suitability.

To make matters worse, a great deal of this material, collected a long time ago, was not adequately stabilised for long term storage and future examination.

Well, what *do* we know about conserving this material?

If one looks to the literature for guidance one quickly becomes disillusioned. A recent treatise on preserving natural history specimens includes many pages of various formulae that would have done justice to a medieval apothecary; indeed some of the formulae probably originated then as the amount of research in this field since has been infinitesimal. A UNESCO handbook on museums explained quite clearly why conservators have ignored biological materials in the past and I quote: "But alas, there is an inexorable law which spares no works, past or present; all living matter is subject to decay and must one day perish: we (the curators) can only do our best to delay the deadly process".

Not deterred, I tried to obtain further information but the best I could come up with was to find how to store "Botanical, Zoological and Entomological collections" in a very generalised way. Palaeontological collections did not rate a mention. These general parameters were much as we have heard over the last few days for other materials.

The collections should be kept at a relative humidity of between 50-60% with an optimum of 60%, in a temperature range of 16-24° with an optimum of 18°C, and that a fluctuation in either of these factors was likely to cause problems. I also discovered that one of the greatest catalysts of physical and chemical change to specimens was likely to be dust particles, apart from the products of combustion. Further, the air in our storage areas or cabinets should always be circulated and never allowed to become still. Lastly, our specimens should always be kept in the dark.

However, none of these factors have been adequately researched specifically for biological materials, and nowhere did I find the finer detail of micro-environment or medium, which should directly surround any of the infinite variety of natural science objects we have in our care. I found no information dealing with the correct labelling of specimens and yet without adequate labelling, with labels having the same degree of indestructibility as the specimen, the specimens become valueless.

It must also be realised that we do not only have the problem of keeping the material as we find it; it must be kept in such a way that it may, at a later date, be thoroughly examined and possibly dissected so that internal and other structures can be studied.

All this lack of knowledge was appreciated following the Perth seminar by the Australian Biological Resources Study – Interim Council when they granted funds for Dr F. H. Steedman to visit this country and report on the fixation and preservation of biological material in our natural science collections. Dr Steedman, a former Reader in the School of Biology at Bath University, was for some time a UNESCO consultant on biological techniques. He visited most Australian museums and universities and if his visit did nothing else it highlighted the fact that nowhere in Australia is there anyone carrying out any research into the stabilisation and long-term preservation of our biological materials. Nor is there any means at present for those involved, to either know what their colleagues in other museums are doing at a technical level, or for them to get specialist information or advice on techniques or equipment should they feel the need. The standardisation of storage containers has not yet been considered with the resultant chaos and confusion we see so frequently.

Dr Steedman felt, and I quote: "... that intensive research into specimen preservation, both of animals and of plants, is a matter of major importance and, indeed, of urgent necessity in Australia. No country in the world has quite the same problems of curatorial applications or requirements as has Australia. Material must not only be preserved under widely different conditions but fixation must be done under an even wider range. Preservation must not only meet the needs of science as they are practised today by taxonomists, etc., but must also attempt to provide for future methods by retaining organisms in conditions which reveal as much as possible of the physical and chemical characteristics of the freshly dead organism. Research should be employed to ensure that techniques develop according to scientific achievement and according to the changing needs of the users of the specimens".

During his visit many of us were also introduced to a fairly recently formulated fixative and preservative which has most of the attributes called for by Dr Ride in 1973. It could go a long way to answering our 300 year old problem. The mixture contains 5 ml propylene phenoxetol; 45 ml propylene glycol and 50 ml 40% formaldehyde, all in 900 ml water. After stabilisation in this fluid which requires about a week, the specimens may be stored permanently in it or, in a similar fluid from which the formaldehyde is omitted.

The formaldehyde in this fluid fixes the tissues, the propylene glycol acts as a fungicide, keeps the tissues pliable and prevents the formation of paraformaldehyde, and the propylene phenoxetol acts as a bactericide, anti-oxidant and narcotic. The solution being 90% water is non-inflammable and there is little or no evaporation problem.

The question now is: who is going to use this fluid for stabilising and preserving their specimens? Without further research to back up these findings some of us may be a bit wary. For all we know, and I am not in any way detracting from Dr Steedman's work on it, specimens preserved in it may undergo unforeseen changes in it in the future. We need research to prove they won't.

We do not want to repeat the great breakthrough of the forties when Dr J. T. Salmon first pronounced on the use of polyvinyl alcohol as a mounting medium in microscopy. We have lost many specimens to this medium, including holotypes, which are now permanently embedded in a shrunken, desiccated and cloudy mass of deteriorated P.V.A. from which it is impossible to rescue even the remains of the specimens. Similarly it was more recently advocated that a small quantity of glycerol be added to alcohol stored material as a precautionary measure: this is a mistake. If by some accident the alcohol evaporates and leaves

the specimen coated with glycerol it becomes an excellent medium for mould growth which quickly destroys the specimen.

Without the glycerol you are left with a badly desiccated specimen but at least it can be restored to some degree. We are learning what to do and what not to do, but the process is too slow. We must improve our performance if we are to retain our collections.

Dr Steedman's visit has laid a good foundation for us to build on; he highlighted our shortcomings; gave us some food for thought; and he has made recommendations for us to act upon.

He recommended that a body be set up to carry out research into the stabilisation and preservation of biological materials, where specialists could be trained. I would hope that this would be the Cultural Materials Conservation Institute as recommended by Dr Werner, the Conference of Museum Directors, the I.C.C.M., the Committee of Inquiry on Museums and National Collections, and more recently by other speakers at this Conference.

He also recommended that a centre be developed to which curatorial problems could be referred from differing regions and disciplines, and to me this is one of the more important of his recommendations. As a result of referring local problems to such a centre these problems could then be considered in the widest possible context and their solutions would be available for application to the broadest fields.

We have all realised at some time in our curatorial lives that we do not have the specialist expertise needed to solve some problem we have come up against. Moreover, few of us know exactly where this expertise lies or to whom we can turn for advice. Problems confronting one group of curators may impinge directly on totally unrelated work being carried out in another discipline, but how do we know? Curators in one museum may have already overcome a problem only just confronting curators in another. A group of museums acting together may be able to obtain equipment or supplies that would otherwise be unobtainable; this applies especially to storage containers.

In listening to the various papers read here this week it has become obvious that between us we probably have the basic expertise, or knowledge of where to find it, that would go a long way towards solving many of these problems. We must also bear in mind that without some sort of basic standards or guidelines many of us may not even know we have a problem until it is too late.

However, before we can draw up guidelines or standards we must evaluate the present position of our natural science collections. We must have more information from the various specialists in each field of activity, their opinions about their collections and their reasons for these opinions. We must know the situation confronting each one of us in the fields of stabilisation, maintenance and storage. Only then can we clearly set down our problems and set to work to overcome them.

As I see it we do not have to wait for a special referral centre to be developed. Initially the "centre" could easily be run within our existing structure, perhaps through the I.C.C.M. working party set up in 1973 or the A.B.R.S. Interim Council. This group could carry out the initial evaluation of our collections and they could also act as a forum through which problems could be channelled. I would like to see some action on these lines arise from this conference.

In 1973 the American Association of Systematics Collections considered the conservation of their biological material and we could well look at some of their proposals as a guide to our own requirements. They were:

1. To establish minimal standards for physical facilities in which collections are maintained.
2. To establish minimal standards for the management of systematics collections.
3. To continue efforts to standardise equipment, materials and procedures.
4. To develop standards for specimen preservation.
5. To consider redistribution of specimens to improve the quality of storage and conservation, and to increase accessibility.

Natural science may well have entered the field of conservation with a handicap but with our collections at stake I feel certain we can overcome it and with any luck have some basic standards to talk about at the next conference.

References

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