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sufficient money to cover its costs. Current income from sales and services is >£25,000 per annum; however, this is only a fraction of the full economic costs of running the collection.

Undoubtedly, increased sales and the expected expansion of biotechnology will increase the income generated. However, these alone can not justify the expense of running CCAP. The major justification, has to be the scientific and historic value of the collection. The vast amount of scientific literature citing CCAP strain numbers make the collection effectively irreplaceable. Even to contemplate the collection, reisolation and purification of a replacement for CCAP's current holdings would probably cost 1 - 2 million pounds. In addition, increased interest in taxonomy and the need to conserve biodiversity, both *in situ* and *ex situ*, particularly post-Rio convention, provide additional political and scientific justification for CCAP. The role of conserving biodiversity is particularly relevant as CCAP currently retains 50% of the algal strains maintained in culture collections (Table 4).

### Future developments

At present culture strains are primarily maintained by serial sub-culture, although approximately 30% of the algal strains and 2% of the protozoan strains are cryopreserved (stored frozen at -196°C). In order to maintain genetic stability most effectively, research is continuing to develop protocols to increase the number and diversity of cryopreserved organisms in the collection. Increasing the number of cryopreserved organisms, not only guarantees their genetic stability, it also reduces the amount of manpower required and hence costs of routine maintenance. This method has one major disadvantage, that is the loss of the ability to respond immediately to a customer's request for a culture. Only small volumes of certain cultures can be successfully cryopreserved, therefore frozen material needs to be thawed, used as an inoculum, and a fresh culture generated prior to dispatch to a customer.

Other planned future developments include: increasing the number, and diversity of strains in CCAP; improving the availability of data on-line, accessible to customers; expanding the key research areas of preservation, taxonomic and biotechnological research; expanding CCAP's role in secondary and tertiary education. All of these are dependent on the future structure and stability of culture collections within the UK. The recent Office for Science and Technology review on culture collections (1994), has suggested major restructuring of the UK microbial culture collections. It is however envisaged that CCAP will form a key component of the proposed UK culture collection and will be retained in its current format. This review has still to be accepted as government policy and its acceptance will be directly linked with the results of the Governmental efficiency scrutiny on public sector research.

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### **STROMBUS LISTERI GRAY, 1852 (MOLLUSCA; GASTROPODA); MORALS TO BE LEARNT FROM DAMAGE TO ONE OF THE OLDEST KNOWN DOCUMENTED MUSEUM SPECIMENS - A RETROSPECTIVE VALUATION.**

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### Introduction

Between 31 August and 6 September 1986, the Ninth International Malacological Congress (Unitas Malacologia) was held in Scotland. The main sessions were held in Edinburgh but one of the days included the opportunity for delegates to view an exhibition on the "History of Shell Collecting" curated by F.R. Woodward, and installed in Glasgow Museum and Art Gallery especially to coincide with the congress. This in itself included the launch of the new edition of the work by Dance (1966) *Shell Collecting: an Illustrated History*, retitled as *A History of Shell Collecting*, which took place on 3rd September, 1986. One of the items featured in the exhibition and the book, a mollusc of great interest, had met with a most unfortunate accident the day before. The story of the shell and the lessons to be learnt from this event are described below.

### The specimen

The history of the shell, which has connections with the oldest public museum in Britain and is one of the oldest known documented natural history specimens, was only realised in recent years. This brief history of *Strombus listeri* is based on Dance (1986) and Dance & Woodward (1986). Glasgow University housed the specimen, the only one known to have come from Tradescant's 'Ark', as the result of having acquired Dr John Fothergill's (1718 -80) collections through those of Dr William Hunter (1718 - 83), whose bequest formed the basis of the Hunterian Museum in Glasgow. (Not to be confused with the Hunterian Museum founded four years later in 1811 in London at the Royal College of Surgeons of England which has at its origin in the collections of William's brother, John Hunter (1728 - 1821).)

In 1852, Thomas Gray<sup>1</sup> described *Strombus listeri* as a species new to science using the specimen from Hunter's collection. He referred to the similarity between it and an illustration in the first edition of Martin Lister's *Historia Conchyliorum*, a pioneer iconography of shells of the world, published between 1685 and 1692. Gray even conjectured that it may have been the same shell because of its apparent age and physical similarity to the figure although he had no means of proving this assertion (Gray, 1852). This is not the place to give the detailed evidence confirming this, which is planned for separate publication.

### The exhibition and the accident

The exhibition was designed to celebrate both the beauty and history of molluscs, mainly through shells, illustrated books and works of art. It drew principally on the collections of Glasgow Museums but a number of significant items were borrowed from other organisations, one of the most relevant being the example of *Strombus listeri*.

The day before the exhibition was due to open, the last minute touches were being attended to. It was about 8.30am. Some of the cases had been finished and had the specimens and labels in position and the tops fixed or locked as appropriate. Near the entrance, in a prominent position were some free-standing pedestal-type cases with screw down perspex tops. At the entrance a title board was being suspended in its usual position from a portable scaffolding tower when it slipped and fell. It was quite heavy and its momentum knocked over the first two cases like a pair of dominoes. The first of these contained *Strombus listeri* (being in pride of place) and the worst possible occurrence took place. As the case fell, the top was dislodged allowing the shell itself to fall out and be crushed by the weight of the case itself. The second case, as a result of the top being secured, contained some shells which remained almost undamaged within its confines.

The lessons are as follows:

a) operations involving the use of portable scaffolding towers or ladders should be treated in the same way as more permanent overhead work. In other words it should be completed before the objects are positioned anywhere nearby or the cases moved out of the way. Note that the use of portable scaffolding can be widespread in positioning spotlights, changing light bulbs, etc., at any time within a museum gallery (or store). Accidents involving this equipment may be quite common but do not appear to have been quantified

b) all members of the team involved with an exhibition should be present at the same time. In Glasgow Museums, joiners and electricians normally start work at 8.00am and finish at 4.00pm, whereas it is the practise of curators and conservators to work flexible hours. We have now introduced a system whereby work schedules are matched in the crucial times leading up to the completion of an exhibition of other project.

c) the use of free-standing cases with relatively narrow bases needs careful consideration. Ideally they should be screwed to the floor. In the temporary exhibition area being used for this shell display this was not possible as the floor is of marble tiles. An alternative is to weight the bottom of the case with sandbags or something similar, a precaution normally deployed to prevent visitors moving these cases by leaning on them. It is probably best to avoid that design where possible, although they can be very effective for single exhibits requiring some prominence - precisely the most valuable and vulnerable.

d) never leave the case top unlocked or unfixed if unsupervised.

### Insurance and valuation

Whereas many objects in the exhibition were insured for their estimated or known market value, including books, paintings and all the other shells on loan from other museums, *Strombus listeri* was not mentioned on the insurance memorandum. No agreement could be made on its

value which was linked to its history alone which is essentially irreplaceable. The value of any particular object can reside in one factor or a combination of several attributes which in turn can express themselves in monetary terms. There are aesthetic qualities, that is display potential purely in terms of beauty, a culturally controlled aspect of perception. There is also rarity, a factor of significance in the *Strombus listeri* because until about 1960 it was known from very few examples in collections. It was then being sold from D300 to D400. Indeed, for well over a century the Hunterian Museum example was the only one known. As a result of greater awareness as well as changes in technique there is now a plentiful supply of this species and so they can be purchased for as little as D10. It is difficult to extrapolate between prices of 200 years ago and those of today, even if the relative rarity of the shells remained the same, because of change in fashion. This has not been studied in any detail, although examination of the relative prices paid for the Great Auk (*Pinguinis impennis*) have been analysed recently (Bourne, 1993).

Thus sociological factors are at work influencing monetary values over time. The example of *Strombus listeri* was also a type specimen and thus had scientific value. This status has had an effect on monetary value of natural history specimens in the past and may still do so when such specimens are offered for sale. This is thought to be an undesirable phenomenon because such specimens should be the property of the scientific community. Indeed, the current codes of practice strongly recommend the deposition of any newly created types in public institutions which instantly removes them from the whims of the commercial market. There is no doubt that the value of this particular example of a shell lies in its past. The settlement arrived at between Glasgow Museums and the Hunterian Museum was £5,000. This can be divided as follows:

a) as an example of the species	£10
b) the holotype of <i>listeri</i>	£100
c) history	£3,890
d) cost of restoration of damaged shell	£1000

Total £5,000

There are several implications within this breakdown. The figures for historical value and its type status are purely nominal and are difficult if not impossible to test. Even taking into account the changes in fashion mentioned above, direct comparison with the price Fothergill, Tradescant or Hunter might have paid for it is not possible because it never appeared on the open market to our knowledge. So the figure for the value was arrived at after the event in the form of a damages payment to Glasgow University. If a figure could have been arrived at before the exhibition this would not have prevented the accident; merely protected Glasgow Museums from its loss. It is also debateable whether or not the valuation would have been the same figure. Now it provides a precedent for the historical value of a particular natural history museum object with over four hundred years of documentation.

There are some basic lessons which might be drawn from this account:

a) consider carefully the value of the object - if in any doubt consult colleagues with relevant experience or consult with specialist insurance brokers, dealers, auctioneers, etc

b) when lending or borrowing specimens insist on all discussions on valuations or other agreements and security and other relevant working practices being put in writing.

c) do not take risks - always insure

These are simplistic and it is assumed that few curators would not follow such procedures in the case of obviously valuable objects such as those made of precious metals. However, natural history items have long been undervalued both for their monetary value and curators find the intrinsic worth of such material difficult to quantify in terms of hard currency. This is changing, linked with the increasing difficulty in obtaining some specimens and a burgeoning market for certain kinds of material such as fossils (Rolfe, et al. 1988). Also, the development of Registrar sections in at least the larger museums in recent years has helped to standardise procedures and involve a number of different viewpoints in what was previously a dialogue between curators.

### Repair of damage

The fragments of the shell were sent to a ceramic conservator for repair, a proportion of the shell being restored because of the crushing of the shell fragments. The purchase of a live-collected shell in an unfaded condition and without the filed lip, is useful for comparison.

### Incidental discoveries made as a result of the damage.

Inside the apex of the shell was a small amount of sediment which indicated that it was not a live caught specimen. This has been analysed and the combination of planktonic and benthonic foraminifera is reported as typical of the outer shelf of low to moderate latitudes and the aspect is described as Indo-Pacific. These tangible though dubious advantages of the accident are worth reporting and the full list of identified organisms is on file (in litt. R.W. Jones, 23 June 1987).

It is hoped that the rather painful process of setting down these details will be of interest to others. If the morals from it help to prevent similar accidents then it will have been worthwhile.

### Acknowledgments

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### Notes

1. Thomas Gray (1820-1910), a founder member of the Glasgow Natural History Society, was an enthusiastic conchologist and artist whose own shell collection is now in Glasgow Museum and Art Gallery. A biography and account of his collection and artistic achievements is given in Dance & Woodward (1986).
2. Martin Lister (1639-1712), eminent physician and author of numerous publications about natural history and especially about molluscs. For bibliographical details of *Historia Conchyliorum*, Lister's magnum opus, see Keynes (1981)

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## THE EDUCATIONAL VALUE OF NATURAL HISTORY COLLECTIONS

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Natural history museums are important venues for both schools and families, but the public perceive museums, rather than zoos, as places of learning. Zoos are regarded as a more appropriate place to take young children (Rosenfeld, 1980; Linton & Young, 1992). In the period April 1990 - March 1991 the Natural History Museum, London, had over one and a quarter million visitors, of whom thirteen per cent were school parties (pers comm. Department of Public Services). In contrast, London Zoo had over one and two third hundred thousand visitors, of whom five per cent were school parties (Zoological Society of London, 1991). Museums, and indeed zoos, have a role in the education of school children far beyond that of zoology or, in more general terms, science (Goodhew, 1989; Goodhew, 1994; Tunncliffe, 1992a; Tunncliffe, 1992b), yet the primary education function of natural history museums is seen as 'stimulating interest in the natural world' (Stansfield, 1994a:2). Collections, although usually 'a poor substitute for living organisms in their natural habitat', do 'provide opportunities for close examination in a way that is seldom possible in the wild' (Stansfield 1994b: 235).

This paper focuses on the observations and related comments, focused on animal specimens, of primary school children and their accompanying adults in school and family groups. The content of the comments are indicators of the innate interest in animals of this group of visitors and also, therefore, of potential learning/teaching opportunities, that occur in the museum. Whilst the museum data are of inherent interest, they are even more relevant if compared with data for similar groups visiting London Zoo to look at live animals, and may indicate which site has the greatest present, or potential, educational value in terms of learning about taxonomic zoology, which is the fundamental element in biodiversity and conservation education.

Human beings have an inherent need to categorise objects to make senses of their world and such taxonomies render referring to the items less time consuming (Bruner, Goodnow, & Austin, 1956). Berlin (1973;1978) observed the use of a basic term of family/order level for living organisms, psychologists observed that the basic level term is in the middle of the hierarchy and furthermore, is this term that is taught first to children. (Cameron, 1994; Moore, 1973).