GEOLOGICAL CURATOR

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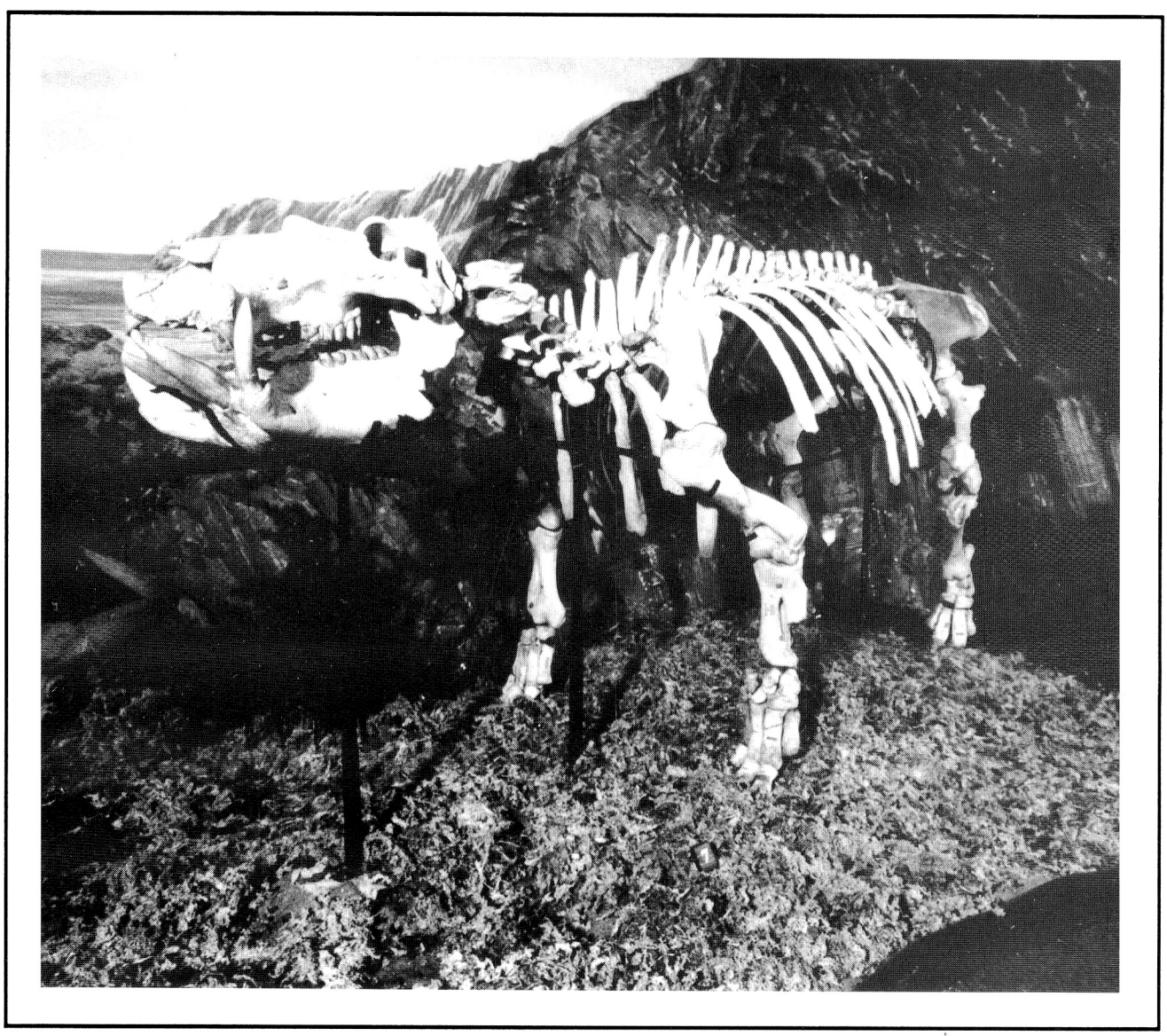

GEOLOGICAL CURATORS' GROUP

The Group is affiliated to the Geological Society of London. It was founded in 1974 to improve the status of geology in museums and similar institutions, and to improve the standard of geological curation in general by:

- holding meetings to promote the exchange of information
- providing information and advice on all matters relating to geology in museums
- the surveillance of collections of geological specimens and information with a view to ensuring their well being
- the preparation of a code of practice for the curation and deployment of collections
- the advancement of the documentation and conservation of geological sites
- initiating and conducting surveys relating to the aims of the Group.

1994 COMMITTEE

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Cover: *Hippopotamus amphibius*. See article by Caroline Buttler on 'The conservation of the Sedgwick Museum Barrington (Quaternary) Hippopotamus skeleton.' (pp. 3-6).

THE GEOLOGICAL CURATOR

VOLUME 6, No.1

CONTENTS

EDITORIAL 2

PAPERS FROM THE 1ST SYMPOSIUM FOR PALAEONTOLOGICAL PREPARATORS AND CONSERVATORS: BRISTOL, SEPTEMBER 1992

THE CONSERVATION OF THE SEDGWICK MUSEUM BARRINGTON (QUATERNARY) HIPPOPOTAMUS SKELETON
by C.J. Buttler 3

PREPARATION OF A DISARTICULATED *OPHTHALMOSAURUS* SKELETON TO RETAIN IMPORTANT TAPHONOMIC DETAILS
by R.J. Twitchett 7

AUTHIGENIC MINERALS IN VERTEBRATE FOSSILS FROM THE WEALDEN GROUP (LOWER CRETACEOUS) OF THE ISLE OF WIGHT
by J.B. Clarke 11

A VICTORIAN FOSSIL WHOLEMOUNT TECHNIQUE: A CAUTIONARY TALE FOR OUR TIMES
by A.R.I. Cruickshank 17

OTHER PAPERS

A BOREAL PERISPHINCTID AMMONITE IN AUSTRALIA - A CASE OF NINETEENTH CENTURY TRANSPORTATION?
by S.R.A. Kelly 23

APTYCHOPSID PLATES (NAUTILOID CEPHALOPOD OPERCULA) FROM WALES
by C.H. Holland 25

NOTES

RESONANT ROCKS, 'ROCK GONGS', IDIOPHONES AND LITHOPHONES
by M.C. Fagg 16

NEWS FROM THE MUSEUM OF ISLE OF WIGHT GEOLOGY
by J. Radley 28

BOOK REVIEWS 30

LOST & FOUND 32

GEOLOGICAL CURATORS' GROUP - 18TH ANNUAL GENERAL MEETING 34

GEOLOGICAL CURATORS' GROUP - 19TH ANNUAL GENERAL MEETING 39

AWARD OF THE FIRST A.G. BRIGTON MEDAL TO CHARLES WATERSTON 44

GEOLOGICAL CURATORS' GROUP - April 1994

EDITORIAL

The last 15 issues of *The Geological Curator* have been edited by Peter Crowther, who when he took over responsibility in 1985 inherited a journal which played an important rôle in disseminating information to geologists, curators and others, but which looked somewhat scrappy. He immediately tackled the problems of the journal's appearence, and has produced a style that is hard to improve on. In recent years (as Paul Ensom remarks in the latest issue of *Coprolite* (13)) staffing problems in Bristol have resulted in Peter's resignation as Editor. The Group owes him much thanks for his work and for the further development of a fine and professional journal. In addition thanks are due to Judy Marvin, Monica Price and all at Leicester who organised distribution.

It is inevitable that a new editor brings to the job some new ideas and that the end product will not always match that with which we are familiar. Flicking through these pages you will immediately notice some alterations to layout style. Many of these are small but I believe important. Addition of an abstract of each major article will I hope lead to these being used by geological abstracting services thus resulting in a wider distribution of the contents of *The Geological Curator*. I have also added the GCG logo to title pages of major article, partly to balance the abstract and partly because it is visually appealing.

Although I am a historian of geology as well as a curator, I have for sometime, been worried that the pages of the *Curator* show a bias towards the history of collectors, collections and institutions, and that not enought coverage is given to to practical considerations of our profession such as curatorial methods and problems, as well as to conservation. There has also been a trend for articles and book reviews to become longer, and this has led to there being perhaps less of interest to the reader than previously.

However, the editor can only consider for publication what is submitted, and if collection history is the flavour of the year then so be it.

I am happy to consider any topic for publication in the journal, and would encourage short articles and notes in particular. Contributors at GCG meetings are especially urged to submit suitable articles.

Intending authors are asked to check the notes for authors on the inside back cover for details of requirements. In particular please ensure that references are given in the style of the journal. Submission of articles on disk (where possible) should speed up turnaround time.

At the moment many books of interest to members are being published, and *The Geological Curator* will attempt to review as many of them as possible, by restricting the length of reviews to less than 500 words.

Recently problems at Bristol have resulted in the non-appearence of a number of issues. It has been decided by the Committee that *The Geological Curator* will appear twice yearly, in March and September. A definite publishing schedule makes it more attractive to the printers and the distributors.

The present issue contains six papers (four from the 1st Symposium for Palaeontological Preparators and Conservators, held in Bristol in September 1992), two notes, some regular items such as Lost & Found and Book Reviews, as well as the AGM minutes for 1991 and 1992, and the account of the award of the first Brighton Medal to Charles Waterston.

Patrick N. Wyse Jackson
Dublin - 13th April 1994

THE CONSERVATION OF THE SEDGWICK MUSEUM BARRINGTON (QUATERNARY) HIPPOPOTAMUS SKELETON

by Caroline J. Buttler

Buttler, C.J. 1994. The conservation of the Sedgwick Museum Barrington (Quaternary) hippopotamus skeleton. *Geological Curator* 6(1): 3-6.

The Barrington hippopotamus skeleton has been on display at the Sedgwick Museum in Cambridge for over 60 years. During a recent loan to the National Museum of Wales, the opportunity was taken to clean the specimen and carry out conservation work including consolidation, renewal of some mounting bolts and the crowning of a broken canine. Techniques and materials were chosen to minimise damage and maximise the possibility of future reversal.

Caroline J. Buttler, Department of Geology, National Museum of Wales, Cathays Park, Cardiff CF1 3NP, Wales, U.K. *Revised version received 15th November 1993.*

Introduction

In December 1991 a temporary exhibition entitled 'Mammoths and the Ice Age' opened at the National Museum of Wales in Cardiff. Included within this exhibition were two dioramas depicting the area of Three Cliffs Bay in the Gower, West Glamorgan, during glacial and interglacial periods in the last Ice Age. The scenes were based on drawings by Sutcliffe (1985, p.118-119). A Quaternary hippopotamus (*Hippopotamus amphibius*) (Figure 1) skeleton was borrowed from the Sedgwick Museum, Cambridge, to form part of the inter-glacial diorama. In exchange for the loan, extensive conservation work was carried out on this specimen in the Department of Geology Conservation Laboratory at the National Museum of Wales. This work was essential before the specimen could be displayed.

A range of conservation techniques was used on the skeleton. This paper presents a case study of the work.

Preconservation condition

The Quaternary hippopotamus skeleton is Ipswichian in age and was collected at Barrington in Cambridgeshire, where some of the best preserved hippopotamus bones in Europe have been found. The remains of a whole herd, including individuals of all ages, have been found (Reynolds, 1922). The Sedgwick Museum skeleton is the only mounted specimen from this locality; it is a composite and only 25-30% of the bone is from one individual animal. An unusual feature of the skeleton is the pelvis, half of which is male and half female. The skeleton had been on display in the Sedgwick Museum for over 60 years. The specimen originally had a glass case covering it, which was removed in 1984, when the specimen was moved from the centre of the museum to a side bay, where it has been on open display ever since.

The skeleton is mounted on the original metal frame. Holes were bored into the bone to allow bolts and metal rods to pass through. The surfaces of the bones were coated with a layer of resin, of unknown composition, which has degraded with age. The resin now has a low glass transition temperature and becomes tacky if the bones are held in the hand.

Cavities in the larger bones, for example the pelvis and the skull, were also filled, probably at the time of display. The infillings consisted of a variety of products, including wax, newspaper and resin.

There were also some more modern treatments. Paraloid B72, an acrylic resin, had been applied to the skull and to the ends of the ribs in an attempt to consolidate the bone.

The state of the hippopotamus skeleton was examined prior to taking it to Cardiff. The skeleton had become very dirty as a result of being on permanent open display. Some of the bones had broken and cracked, the ribs and neural spines appeared especially vulnerable. The left front canine tooth had been broken and all that remained was a crumbing stub. At this time measurements were taken of the temperature and relative humidity to be used as a comparison with those at the National Museum of Wales.

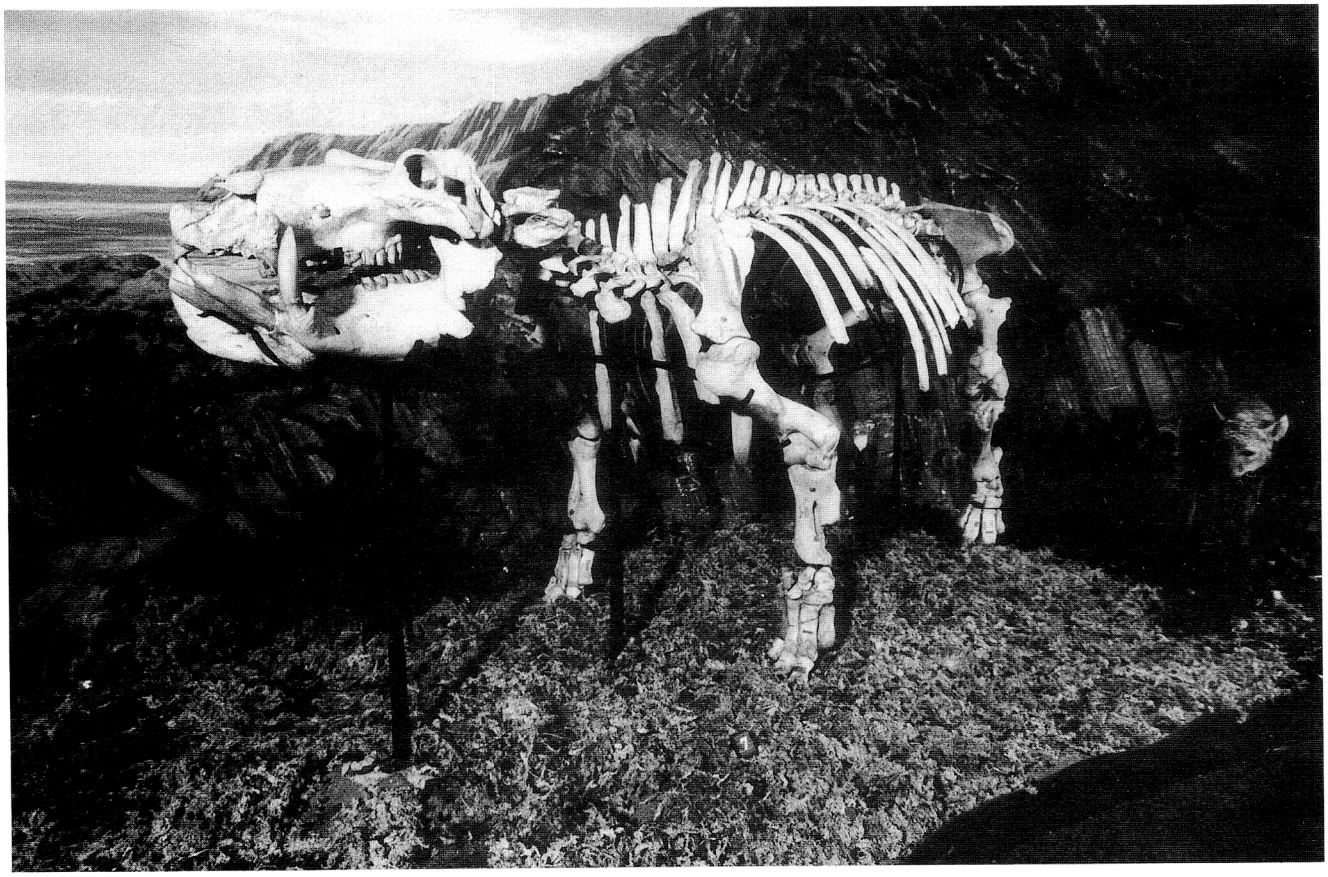


Figure 1. *Hippopotamus amphibius* skeleton on display at the National Museum of Wales in Cardiff.

In order to transport the skeleton to Cardiff it was dismantled, each bone labelled, and carefully packaged.

The metal frame, which supports the skeleton, was rubbed down and repainted prior to exhibition in Cardiff.

Conservation

Cleaning

Over 60 years accumulated dirt coated the degraded resin on the surface of the bones. The skeleton appeared to be grey but once small test sites were cleaned it was revealed that the bones ranged in colour from white to dark cream (Figure 2). The bones were first brushed lightly to remove any loose dirt and then cleaned using water. The amount of water applied was kept to a minimum because of the dry state of the bones. Water alone would not remove all the dirt so the non-ionic detergent Synperonic N was added to it. This combination removed the majority of the dirt from the surface of the bones. On the skull, and on some of the ribs, the acrylic resin Paraloid B72 had been applied as a consolidant but the bones had not been cleaned prior to the application. In these areas the Paraloid B72 was removed with acetone, which also removed the underlying dirt. Water would not dissolve the crosslinked resin so acetone was tried, which removed some but not all. It was decided to not to use any harsher solvents and to leave the remaining resin, to avoid the risk of greater damage to the bone.

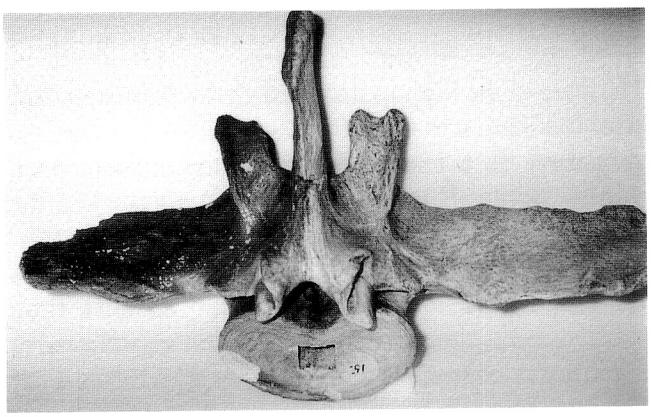


Figure 2. A half cleaned vertebra.

Consolidation

The relative humidity (RH) of the Sedgwick Museum, in Cambridge, is low (in April 1991, at 1 pm, the RH was measured at 40%). At low relative humidities subfossil bone will dry out and often begin to crack, which was occurring with the Sedgwick hippopotamus. In some areas where the bone had become very crumbly, a 10% solution of Paraloid B72 in acetone was injected

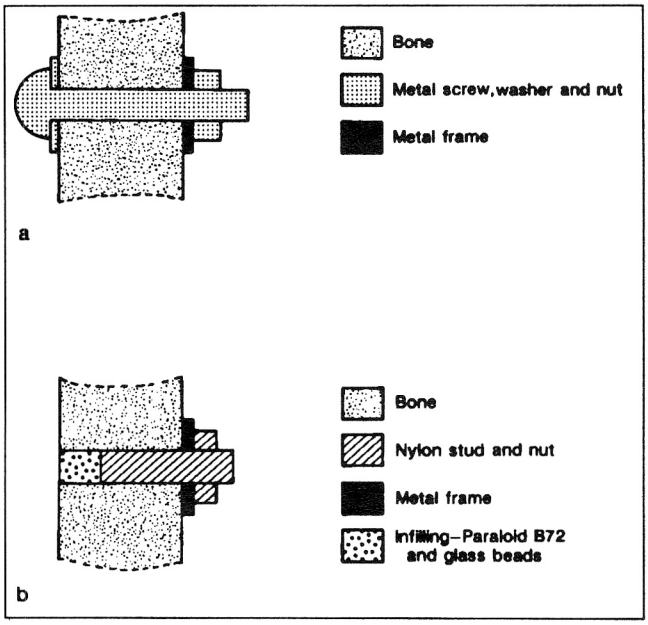


Figure 3a. Original method of mounting the bone onto the metal frame; 3b. New method of mounting bolts onto the frame, used for the feet and some ribs.

into cracks in the bone to consolidate it. Paraloid had been previously applied to the ends of the ribs, it was however very thick and bubbles had formed. The old Paraloid was removed by dissolving it in acetone and a new thinner layer was applied.

Fractures

Several bones of the skeleton had fractures in them, some of which had occurred while it was on display and others when the skeleton was dismantled. The breaks were repaired using Paraloid B72 in acetone. Some fractures were difficult to align and had to be placed in clamps while the joint set.

Infilling

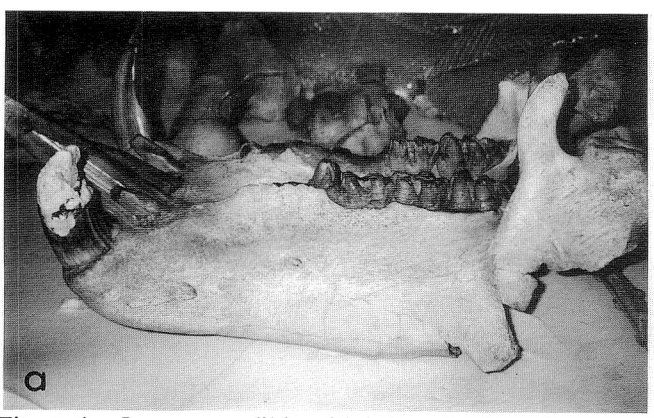
Some of the bones had holes which needed to be filled. These occurred where old infills had cracked and fallen out and around certain of the fractures. If an old fill was still sound then it was left in place. The cavities were first coated with a thin layer of Paraloid B72, then plugged with a mixture of Paraloid (dissolved in acetone) and glass beads. This mixture has the advantage of being reversible and once it has set a smooth surface can be produced rubbing it down with acetone. Paraloid and glass beads can be difficult to work with, with the best results being produced by building the infill up in thin layers. If a large void is filled all at once large bubbles can form, due the surface setting first as a thin skin so that the acetone deeper on the infill is unable to escape. Once completed, the infillings were painted with acrylic paint to match the surrounding bone.

Replacement bolts

To anchor the skeleton onto the frame large metal bolts and washers had been used (Figure 3a). These were unsightly and in places were abrading the bone. The metal bolts in the ribs and the feet were removed and replaced with nylon studs (Figure 3b). In the feet a row of four bolts permanently attached the metatarsals and metacarpals to a metal bar. These were removed and a nylon stud was inserted into the hole at the back of the bones. The stud was fixed with Paraloid and infilled with Paraloid and glass beads. The stud protruded at the back and could be affixed to the metal bar with a nylon nut. The infill at the front was then painted with acrylic paints.

Dental repair

Stuart (1982, Figure 3.54) illustrated the skull and mandibles of the hippopotamus, showing two complete canine teeth. However in the last 10 years the left front canine tooth had been snapped off, whilst on display in Cambridge, leaving a crumbling stub (Figure 4a). For aesthetic reasons it was decided that a complete tooth was required. There were two options, one was to remove the stub and replace it with another hippopotamus tooth or with a copy; the second option was to reconstruct a new tooth up from the stub. The second solution was decided on because it was considered that more damage could be caused by removing the tooth stub.



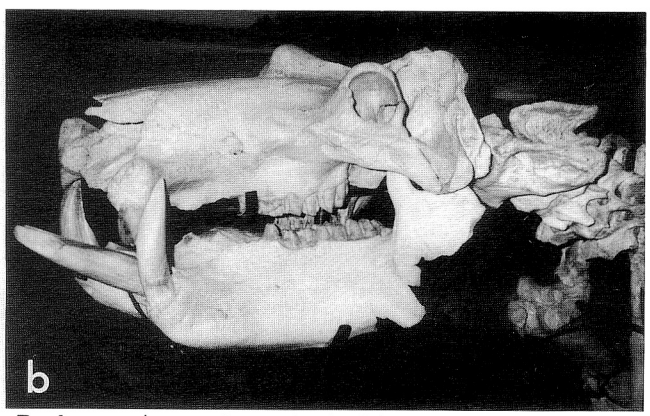


Figure 4a. Lower mandible with left canine tooth broken; 4b. Broken canine tooth repaired with an epoxy putty crown.

Before a new tooth could be built the stub required consolidation, this was done using Paraloid B72. This layer of acrylic resin would also act as a separator between the tooth and the replica. Milliput, an epoxy putty, was used to build the new tooth. Milliput is easy to model, sets very hard and can be sculpted. The disadvantage of this product is that it is not easily reversible, however the separating layer of Paraloid prevents direct contact between the putty and the original tooth.

The Milliput tooth was not modelled to be an exact replica (Figure 4b). From a distance it looks genuine but can be easily identified with a closer examination. The new tooth was painted with acrylic paints to match the other canine tooth.

Future care

The hippopotamus skeleton was put on display in the temporary exhibition at the National Museum of Wales. The environmental conditions were computer controlled and the relative humidity was 55% RH. This is higher than that of the Sedgwick Museum in Cambridge but no deterioration was noted whilst the specimen was on display. There are no windows in the gallery and light levels were kept low.

At the end of the exhibition at the National Museum of Wales the hippopotamus was returned to the Sedgwick Museum. There is still resin on the bones and this will encourage dust to adhere. The skeleton should therefore be dusted regularly to prevent pollutants becomming trapped. There should be regular conservation checks to monitor any cracking that may develop due to the low relative humidity conditions in Cambridge.

Acknowlegements

The hippotamus skeleton was kindly lent to the National Museum of Wales by the Sedgwick Museum, Cambridge. I would like to thank Bob Child for critically reading this paper and Mike Dorling for providing useful historical information on the specimen. Steve Howe gave invaluble help with the dismantling and erecting of the skeleton and Gaye Evans drafted Figure 3. Mike Lambert assisted with the transportation from Cambridge to Cardiff and Colin Knapman repainted the metal frame.

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PREPARATION OF A DISARTICULATED *OPHTHALMOSAURUS* SKELETON TO RETAIN IMPORTANT TAPHONOMIC DETAILS

by Richard J. Twitchett

Twitchett, R.J. 1994. Preparation of a disarticulated *Ophthalmosaurus* skeleton to retain important taphonomic details. *Geological Curator* 6(1): 7-10.

The preparation of vertebrate specimens for display or sale often leads to the destruction of important taphonomic information. For example, a huge variety of organisms (from nematode worms to fish) may utilise a rotting carcass and leave traces on the bones. These are rarely preserved at time of burial, and if present are seldom retained by preparators. Bones covered in iron oxide are especially susceptible to loss of surface detail as the matrix is harder than the fossil. Application of the Waller Method allows full removal of the iron oxide without losing any of the taphonomic information preserved beneath.

Richard J. Twitchett, Department of Earth Sciences, University of Leeds, Leeds LS2 9JT, U.K. *Revised manuscript received 15th November 1993.*

Introduction

Fossils, unfortunately, do not fall out of the rocks in pristine condition ready for display or study: all have to undergo some form of preparation. Clearly, this should be a process that enhances the scientific importance of the specimen. However, more often than not, information is totally destroyed. This problem is especially acute in vertebrate fossils when they are "improved" for display or sale.

The removal of colonising epibionts is a good example. These organisms can tell us much about taphonomy (e.g. the position of the carcass in the sediment), environmental conditions and palaeoecology. However, these organisms are often removed by preparators to reveal the attractive bone surface beneath (Flessa, Kowalewski and Walker 1992).

This account describes the techniques used to prepare an ichthyosaur carcass with the specific purpose of studying the encrusting organisms. An astonishing variety of organisms have left their marks, either literally as traces, or as body fossils. These include encrusting oysters and serpulids, endolithic algae, worms, sponges, grazing echinoids, scavenging vertebrates and various burrowing animals. In most cases, all that is required to reveal the fossils is a little care during preparation.

Abbreviation used in text: BRSMG = Bristol City Museums and Art Gallery.

Materials and Methods

The partial skeleton of an *Ophthalmosaurus* (BRSMG Ce16719) was unearthed during the construction of the Zeals-Bourton bypass section of the A303 trunk road. It was discovered by Murray Edmonds in the side of a road cutting, 175m. south west of the River Stour (National Grid reference: ST 7780 2942). The horizon has been identified as the "Ringstead Waxy Clay", which is the uppermost part of the Oxfordian (Bristow *et al.* 1993, Figure 1).

Fortunately, the collectors contacted staff of the Bristol City Museum, who helped in the excavation, and the specimen was kindly donated. The preserved remains probably account for between one third and one half of the skeleton, part of which is encased in a large concretionary block (Figure 1). All the elements of the skeleton are disarticulated. This study concentrates on preparation of the bones preserved outside the concretion.

Preparation started on October 1st 1991 and continued (on and off) through to April 15th 1993. In total 82 half days (approximately 250 hours) were needed to complete the preparation of the isolated bones and the majority of the concretion.

Mechanical preparation

This was performed under a binocular microscope, and employed both airpen and airbrasive. Airpen vibrations can easily damage the encrusting organisms, and so the tool was of limited use. Greater success was obtained through use of the airbrasive machine, with its relatively gentler sodium bicarbonate powder. The preparation method was especially good at retaining the encrusting bionts and the casts of burrows (from the matrix just above the bone surface).

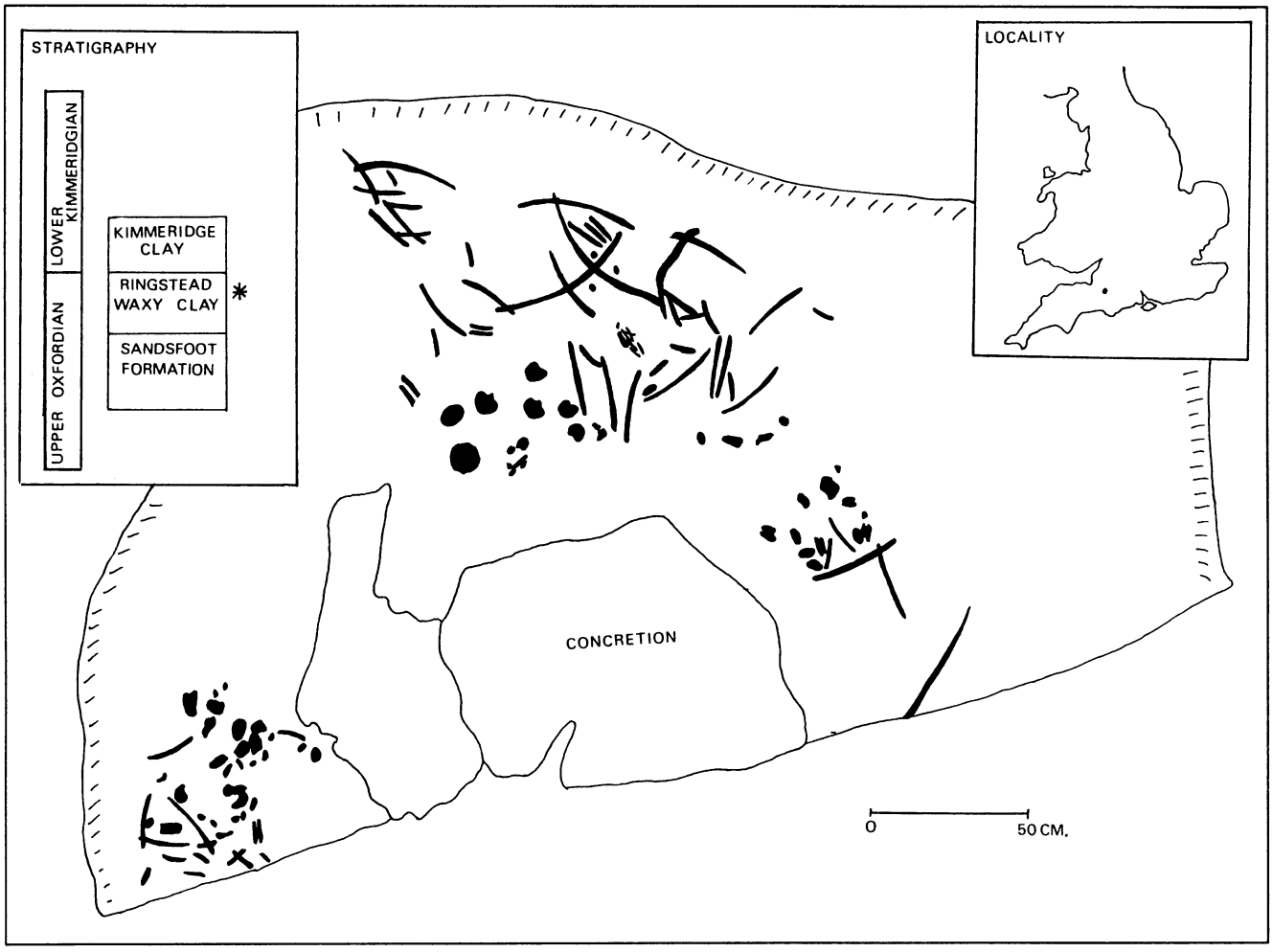

Figure 1. Stratigraphy, locality and site plan of the excavation. Stratigraphy after Bristow *et al*, 1993.

The surface borings and grazing traces (e.g. *Gnathichnus pentax* Bromley 1975) were usually found beneath a thin (0.5mm) layer of iron oxide. This layer was harder than the bone, and its removal often led to the bone itself being polished by the powder, thus removing the trace fossils. This problem solved in part by using high air pressure with reduced powder flow. The nozzle, held at a low angle, was then moved quickly across the surface of the bone in a single direction. This emphasised the grazing traces by retaining the red iron oxide in the depressions, whilst leaving the surface clean.

Chemical preparation

Maisey (1991) used a chemical technique (the Waller Method) to remove iron oxide coating on some of the Santana Formation fish. This procedure was initially described by Waller (1980) to remove rust from mineral specimens. A solution containing three sodium compounds was used to remove the iron oxide while keeping the system buffered. Experimentation at Bristol showed that the Waller Method also successfully removed the iron oxide layer from our ichthyosaur bones.

First of all, a stock solution of sodium citrate (to sequester ferrous ions) and sodium bicarbonate (the buffer) was made up. It contained 71g of sodium citrate and 8.5g of sodium bicarbonate in every litre of distilled water. This could be stored indefinitely. To make an active solution, 1g of sodium dithionite (to reduce ferric to ferrous iron) was added to every 50ml of stock solution used. This solution remained active for 12 hours and so was only mixed when needed.

The bones were first washed in tap water to remove any loose clay. They were then placed in a beaker and the active solution added. The amount of solution used depended on the size of the bones. Usually they were covered to a depth of about 1-1.5cm. The open end of the beaker was covered to prevent oxidation and evaporation. It was then placed in a fume cupboard. After 12 hours the bones were removed, washed thoroughly and left to dry.

Discussion

The Waller Method proved to be an extremely valuable method of preparation. The total removal of the iron oxide allowed the three dimensional aspects of the surface grazing traces to be seen, compared with the two dimensional results from the airbrasive. Figure 2 shows delicate *Gnathichnus pentax* traces which have

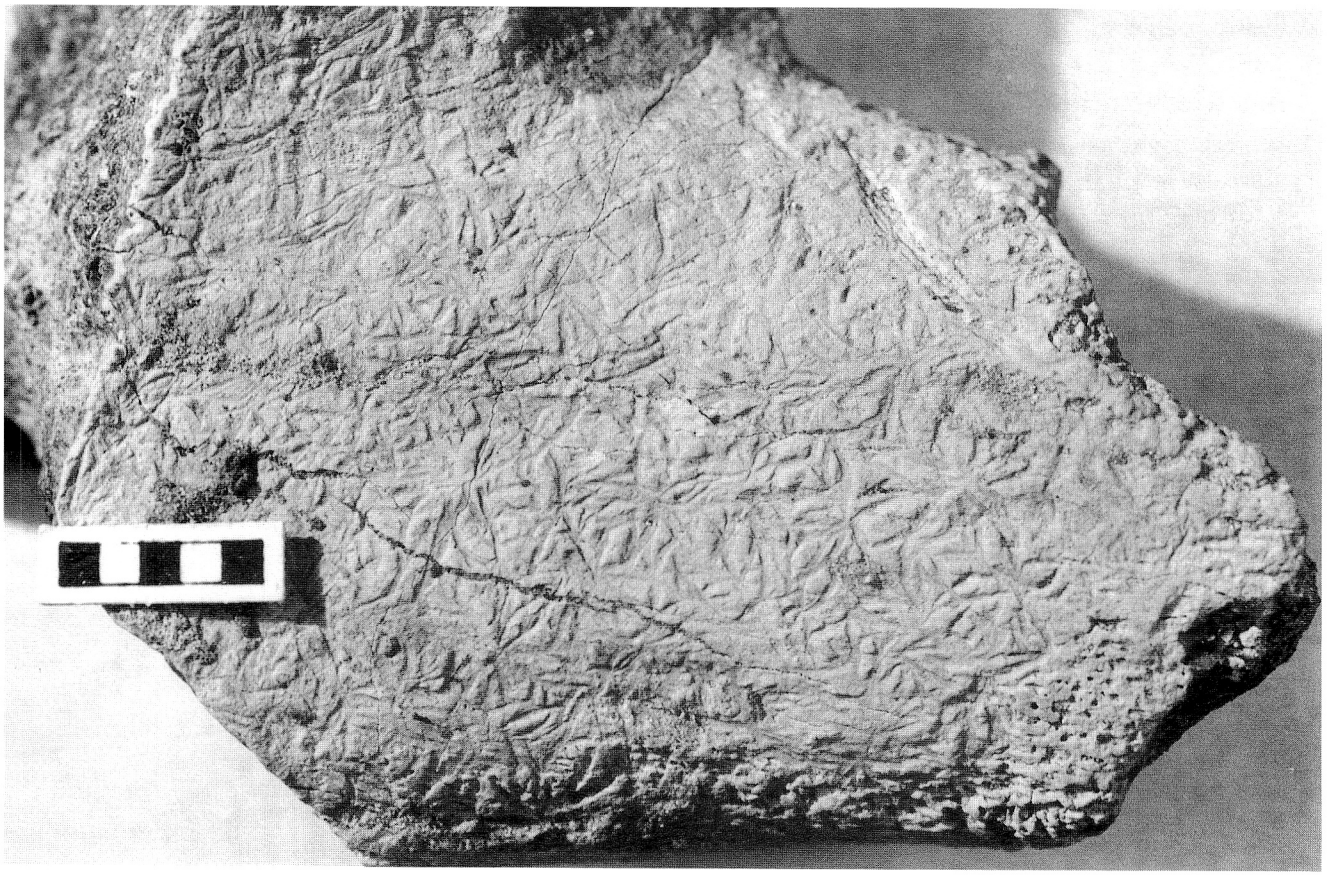

Figure 2. Fragment of rib showing *Gnathichnus* trace fossil as revealed by the Waller Method.

been revealed by this technique. Also, the technique allows many skeletal elements to be prepared simultaneously and so saves time.

Waller (1980) warns that calcium ions are also sequestered by this technique. Some evidence of this was visible when encrusting organisms were present. Although still identifiable and measurable, the surfaces of encrusting bivalves occasionally had a roughened appearance due to some calcite loss. However, the bone surface itself showed no such effects. Following the advice of Waller (1980), checks were made on the condition of the bone surface. To date, the bone has shown no signs of instability.

Blum, Maisey and Rutzky (1989) have shown that the Waller Method has no serious drawbacks when used as a preparation technique. The use of the technique as outlined here, can only support this view. Preparation of this ichthyosaur is believed to be the first time that a large marine reptile had been subjected to the Waller Method. Previous work had only involved fossil fish (Maisey 1991). In view of this, and the special taphonomic features of the ichthyosaur, a few minor stages in the preparation were added.

First, careful mechanical preparation had to be undertaken to reveal the layer of iron oxide, in readiness for treatment with the Waller Method. This was carried out under a binocular microscope, as some traces (e.g. ?nematode burrows) were invisible to the naked eye. Also, particular care was taken in removing sediment just above the bone surface as burrows were often preserved here.

Encrusting organisms are often reported in the literature (e.g. Martill 1987). However, other trace fossils on bones (such as those found here) are virtually unknown. How much of this is due to preservation, and how much to preparation? The presence of the iron oxide layer around some of the bones has clearly preserved traces that would normally have been lost through pre-burial abrasion. This is shown by the presence of sponge borings on those oysters that are covered by an iron oxide layer. Neighbouring ones without such a layer have no preserved sponge borings.

Conclusions

Despite the fact that no two specimens are identical, if a marine vertebrate has any visible encrusting organisms extra care should be taken during preparation. Firstly, all mechanical preparation should be performed under a binocular microscope. Secondly, if any iron oxide layer is present, it is very likely that traces are preserved beneath. This layer could then be removed using the Waller Method in order to preserve as much important

data as possible.

Acknowledgements

This work could not have been carried out without the assistance of David Hill (now at AMCSW), Roger Clark and Pete Crowther at the Bristol City Museum and Art Gallery.

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AUTHIGENIC MINERALS IN VERTEBRATE FOSSILS FROM THE WEALDEN GROUP (LOWER CRETACEOUS) OF THE ISLE OF WIGHT

by Jane B Clarke

Clarke, J.B. 1994. Authigenic minerals in vertebrate fossils from the Wealden Group (Lower Cretaceous) of the Isle of Wight *Geological Curator* 6(1): 11-15.

The presence of authigenic minerals, deposited in the voids of vertebrate bones during diagenesis, can be used by preparators and conservators as indicatorswhen deciding on the treatment of an individual specimen. A pathway can be drawn for each specimen which traces the different diagenetic environments through which the bone has passed, and hence indicate the present condition of the bone itself, whilst the presence of apatite crystals and some forms of pyrite in the voids indicates complete disintergration of the bone.

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Introduction

This paper is based upon work undertaken as part of an M.Phil. thesis "Diagenesis of Lower Cretaceous vertebrate fossils from the Purbeck Formation of Durlston Bay, Dorset, and the Wealden Group of the Isle of Wight" (The Open University, 1993). It was suggested to the author that the techniques employed in this study may be of interest to preparators and conservators. The author is not conversant with conservation techniques and no attempt has been made to advise on specific treatments; however, the presence of specific minerals indicate the condition of the fossil bone and may assist conservation. This paper discusses a technique used for mineral identification and makes some suggestions on the practical implications. Specimens studied came from the Wealden Group of the Isle of Wight and are held in the collections of the Museum of Isle of Wight Geology (MIWG) and the University of Portsmouth (PU).

Techniques

A thin section of the bone is cut from a fragment of bone associated with the specimen (or a minute core taken from an unobtrusive area), stained with potassium ferricyanide (to identify carbonates) and analysed petrographically using standard procedure (Dickson 1966). If an SEM microprobe is available, this can also be used to aid the identification of minerals either through an uncovered, polished thin section, or from a rough sample. If histological detail of the bone is required then the thin section has to be left fairly thick (≈70mm), approximately twice the thickness normal for rock samples. The most satisfactory sections are obtained when the thin section is finished by hand, the process stopping when the researcher can detect sufficient histological detail in the bone trabeculae.

The order of deposition of the minerals and a reconstruction of the diagenetic pathway for an individual specimen can be obtained by observing the relationships between the mineral phases. Sometimes minerals have been precipitated in concentric layers within the voids, with the minerals being deposited in chronological sequence from the outer edge of the void towards the middle. A sequential diagenetic pathway, of changing diagenetic conditions, can be drawn on an Eh/pH diagram (which indicates precipitation conditions required for specific minerals; Eh = redox potential, pH = acidic/alkali conditions, after Krumbein & Garrels 1952; Figure 1). However, often the story is more complex and sequences of mineral deposition are interspersed with brecciation events, dissolution and mineral migration.

Observations and discussion

Bone diagenesis appears to be a continuous process starting with the death of the animal and the destruction of soft parts, passing through aerial/subaqueous oxic weathering, anoxic alteration in the sulphide reduction zone and finally burial in the sediments accompanied by diagenesis. Results from this study indicate that every individual bone has its own diagenetic pathway; associated or adjacent bones sometimes display similar

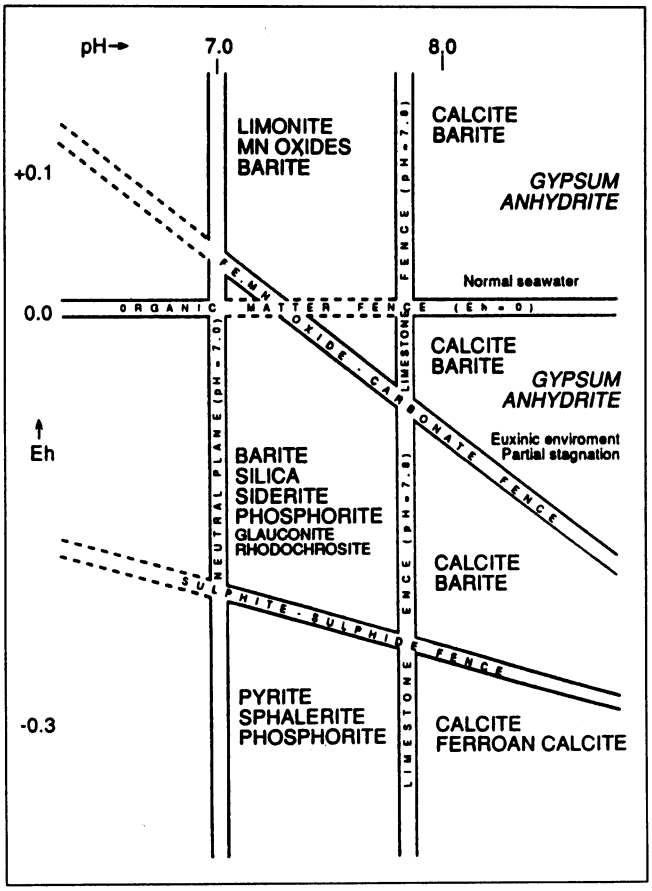

Figure 1. Eh/pH conditions under which commonly occurring authigenic minerals are precipitated (after Krumbein & Garrels 1952)

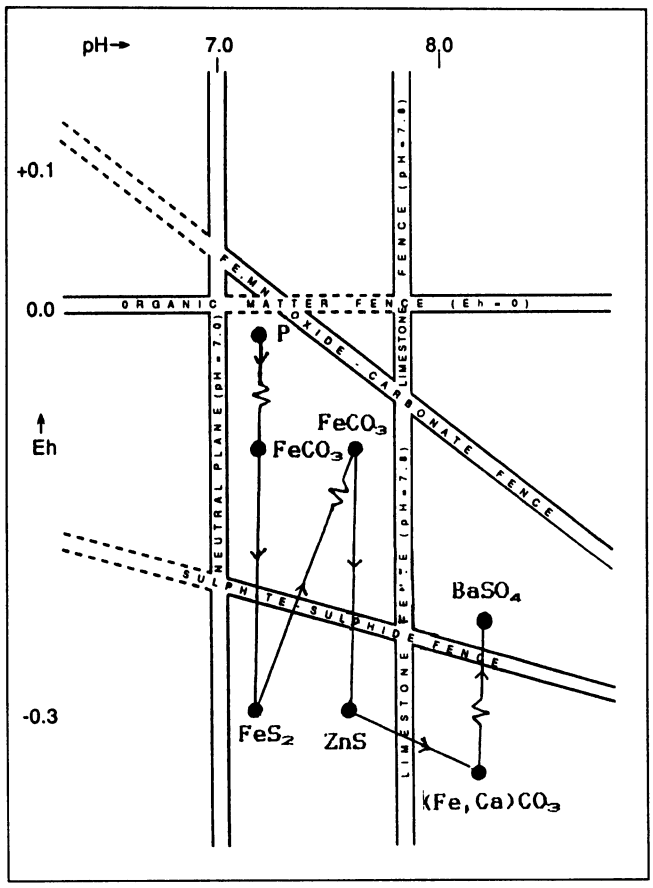

Figure 2. Diagenetic pathway for an *Iguanodon* dorsal vertebra (MIWG 5196) from the Vectis Formation, Isle of Wight, displaying two oxidation/reduction cycles separated by a brecciation event (depicted by a zig-zag notation) (Clarke 1991)

pathways, but this is not always the case. Throughout diagenesis, ions are continuously exchanged between the bone and the percolating groundwater, the amount of change being a function of the amount of ions present in the groundwater, the rate of diffusion of the ions and the time over which exchange takes place (Parker and Toots 1976), so no clear stages can be defined.

Some fossil bones have an outer, light-coloured layer of uniform thickness from which most of the histological detail is absent. This is typical of a bone that has initially weathered in an oxic environment (Behrensmeyer 1978, Martill 1991) in which the organic content of the bone appears to have altered. This affects the physical properties of the bone and the affected layer is often unstable and, if the weathering was subaerial, produces a friable surface. Sometimes the whole bone is affected rendering it liable to crumble. Subsequent burial and diagenesis may/may not have a cementing effect. It is suggested that any bone found in this condition would have to be treated with extreme caution as the bone is likely to disintegrate when disturbed.

In the fossils so far examined pyrite (FeS_2) is often the first mineral to be precipitated within the voids as the anaerobic decay of local organic matter releases abundant S ions which combine with Fe ions in solution. Preparators and conservators are familiar with pyrite and have standard methods of dealing with it. However, early diagenetic pyrite can completely fill the voids and and provide stability to the delicate structures; eg pterosaur bones are often preserved in this way. Pyrite can also be formed in later diagenesis and is then encased by other minerals such as calcite and barite. Under these conditions the pyrite is unlikely to oxidize unless the surrounding minerals are etched away during preparation. Judging from specimens examined in this study equant/euhedral pyrite appears to be the most stable form (Figure 3), framboidal pyrite appears less stable, while disseminated/massive/nodular pyrite (overpyrite) often "rots" easily under surface conditions, the latter two producing a limonitic (rusty) end product. Two other sulphides found in the cavities of fossil bones, sphalerite (ZnS) (Figure 6) and chalcopyrite ($(Fe,Cu)S_2$), do not oxidize as readily as pyrite.

Figure 3. SEM showing bladed barite crystals with framboidal (upper right) and equant/euhedral crystals of pyrite. Lithified bacterial mucilage (now kutnohorite) covers the bone in the lower left of the frame. Etched sample of *Iguanodon* rib (MIWG 6670).
Scale bar = 100 μm.

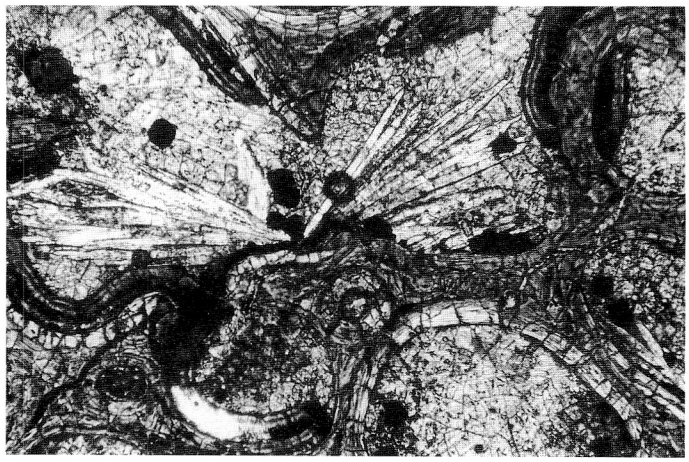

Figure 4. Authigenic minerals filling a cavity in the cancellous zone of an *Iguanodon* rib (MIWG 6670). The lithified bacterial mucilage appears as a layered film of uniform thickness lining the cavity. Bladed barite growing from the exposed bone surface and black cubic pyrite crystals are surrounded by a final infill of calcite. Mag x116, thin section, plane polarised light.

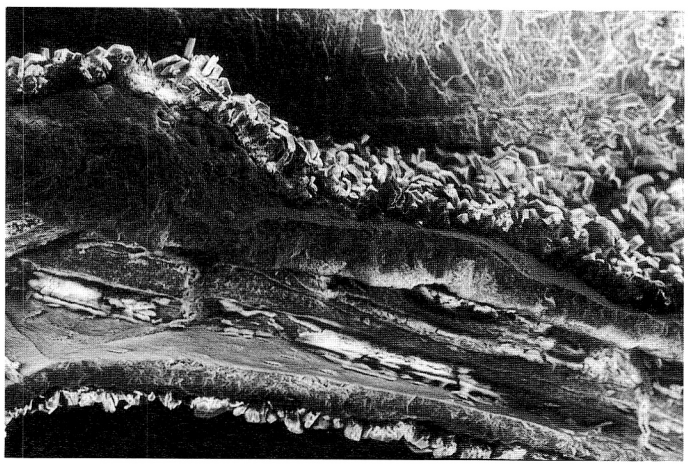

Figure 5. SEM of a disintegrated bone trabeculae (lower half of frame) surrounded by a lithified mucilage (now limonite). Apatite crystals are precipitated on the mucilage and the final infill is calcite. Etched sample of *Iguanodon* caudal vertebra (PU 97/2).
Scale bar = 100 μm.

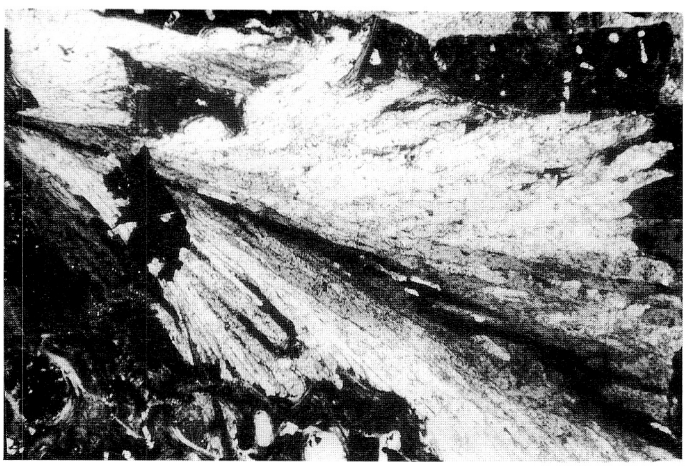

Figure 6. Fasicular-optic barite, composed of acicular crystals, in the voids of an *Iguanodon* dorsal vertebra (MIWG 5196). Sphalerite crystals are visible in the upper left. Mag x40, thin section, crossed polars.

Siderite ($FeCO_3$) commonly occurs as an early diagenetic mineral in vertebrate fossils from freshwater horizons and is precipitated in freshwater environments when there is an absence of S ions and an abundance of Fe and CO_3 ions in solution. Bacterially-induced siderite sphericules have been observed precipitated adjacent to bone trabeculae. Siderite will decay to limonite under surface conditions, the effect is similar to "pyrite rot". Again, siderite is often encased by later authigenic minerals, so will not "rot" unless exposed by the removal of these later minerals.

Other bacterially-induced features have been observed. Lithified remains of bacterial mucilages, now kutnohorite ($CaMn(CO_3)_2$) are present within *Iguanodon* bones, indicating initial immersion in a freshwater environment (Figure 4) (Clarke and Barker 1993). Bacterial "mats" draped over organic remains, create anoxic conditions within and around the bone, thus isolating it from the surrounding oxic environment (Jørgensen 1982) and facilitating precipitation of minerals requiring anoxic conditions.

In some specimens apatite crystals occur in the voids. In all cases examined by the author apatite crystals were contained in fossils where the bone structure has completely disappeared, leaving just an Fe-rich powder which disintegrates when disturbed (Figure 5). Apparently the fluorapatite of the bone dissolved, the fluorine was removed in solution and apatite precipitated in the voids. Thus the specimen is held together by its authigenic mineral content, any attempt to remove the minerals will result in complete disintegration of the specimen. It is strongly recommended that any vertebrate fossil containing authigenic apatite crystals be treated with great caution and no treatment with acid attempted.

Barite ($BaSO_4$) and Calcite ($CaCO_3$) are common authigenic minerals. Non-ferroan and ferroan calcite and bladed and massive barite are relatively stable. However, both can dissolve under changing diagenetic conditions and dissolution surfaces indicate changes in pore-water chemistry surrounding the bone. Calcite will dissolve when the porewater becomes acidic (when pH falls to below 7.8) and will re-precipitate when the solution becomes more alkaline (pH rises). Sometimes there is a long time gap between the initial calcite dissolution and subsequent precipitation and the final calcite infill is often ferroan. Barite will dissolve when it is the only sulphate phase available in the presence of sulphate-reducing bacteria (Boltze *et al* 1974) and its dissolution is enhanced by the presence of chlorides (Deer *et al* 1966) or a rise in salinity (Barbier 1976). Generally, the presence of major dissolution surfaces between phases of authigenic mineralisation can be regarded as representing a hiatus in the diagenetic pathway of the specimen, either a exhumation/reworking event or a drastic change in porewater chemistry. It is suggested that since specimens showing such features have been subject to drastic chemical changes, so they must be treated with appropriate caution.

Compression occurs during burial and if the voids in the bone are empty, or only partially filled with authigenic minerals, crushing and brecciation of the bone occurs. Sometimes brecciation occurs after the precipitation of one or two authigenic minerals which are brecciated along with the bone trabeculae. Any subsequent mineralization will fill the remaining spaces. The sequence of events can be ascertained through petrographic examination of the thin sections - (ie observing the relationships between bone and minerals).

Occasionally minerals display unusual habits which may be unstable. Fasicular-optic and spherulitic calcite and barite can be precipitated from solutions where nucleation is difficult and composition of the pore-fluid causes crystal splitting to occur (Figure 6) (Spencer 1925, Spry 1969). The abundance of crystal faces of acicular habit may allow deeper penetration of etching fluids than in drusy or crystalline fabrics. It is suggested that any specimens containing minerals displaying these crystal habits must be treated with caution if acids are to be used.

Diagenetic pathways which display more than one oxidation/reduction cycle may indicate a reworking/ exhumation event or a drastic change in groundwater chemistry (Clarke 1991). This may help to explain the presence of a fossil from a horizon not noted for that particular species (Figure 2); it may have been reworked from another stratigraphic unit. This technique may also assist in identifying bones from a single animal which have been exhumed over a length of time and are therefore not obviously associated; bones from associated specimens examined by the author have all shown similar diagenetic pathways. However, disassociated bones from the same horizon have shown dissimilar pathways.

Acknowledgements

Thanks go the Steve Hutt, curator of the Museum of Isle of Wight Geology, for supplying specimens for destructive analysis and to Professor John Vail, Geology Department, University of Portsmouth, for allowing the use of the JOEL SEM JSM-35C System 860 Series 2 X-ray analyser.

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RESONANT ROCKS, 'ROCK GONGS', IDIOPHONES AND LITHOPHONES

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Geological Curator 6(1): 16 [1994]

I have been studying the uses of resonant rocks, and compiling a gazetteer of 'rock gongs'. These are found worldwide, and are naturally placed and naturally tuned rocks, boulders, stalagmites and stalactites, which have been used as lithophones - in contrast to other lithophones (Chinese chime stones and "bar-xylophones" of stone) which are artificially tuned and are portable. It is puzzling why some rocks ring and others do not.

Listed are all rock types known to have been used as idiophones (Tables 1 and 2). Dr Brian Atkins (University Museum, Oxford) has kindly provided a petrographic description of eleven of these rocks (Table 3) and crystallinity appears to be essential for resonance. Surprisingly there are no phonolites in the lists. It would be interesting to hear of phonolites which have been used as musical instruments, and of any other geological reasons for the resonance of rocks.

TABLE 1. Rock used for 'Rock Gongs.

Granite (61 sites) in South Africa, Zimbabwe, Tanzania, Uganda, Kenya, Niger, Nigeria, India, Sweden, Scotland, Guernsey and Canada.
Limestone (12 sites) in Namibia, Kenya, Zaire and England.
Dolerite (8 sites) in South Africa, India and Portugal.
Diorite (3 sites) in France and Scoland.
Basalt (3 sites) in India and Australia.
'Volcanic stone plug' (3 sites) in Tahiti archipelago.
Amphibolite (1 site) in France.
Kentallenite (1 site) in Scotland.
Olivine Gabbro (1 site) in Scotland.

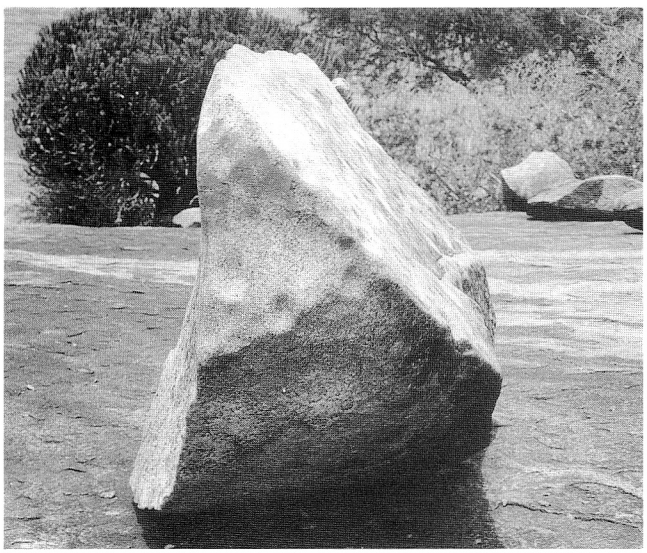

Figure 1. A resonant granite boulder from Tanzania.

TABLE 2. Rock used for other lithophones.

Limestones in China, England, Austria and Ethiopia.
Schist (spotted) in England.
Schist in Indo-China.
Slate in England and Wales.
Granite in Nigeria.
Basalt in Togo.

TABLE 3. Petrographic descriptions of 11 resonant rocks.

1. **Dolerite** from Prescelly, Wales: principal minerals are Augite, the grains often fractured and dislocated, suggesting forcible intrusion of crystal-mush: weak sub-ophitic relationship with Plagioclase Feldspar, in the sample mostly altered to Sericite. Quartz, a very minor constituent, shows strain extinction. Shreds and anhedral crystals of opaque minerals, probably Magnetite. May also be some Ilmenite and very minor pale green Chlorite.
2. **Granodiorite** from near Ballater, Scotland: principal minerals are Quartz, showing extensive strain extinction in crossed polars, Plagioclase with strong normal zoning, Alkali Feldspar, Biotite, Augite altering to Hornblende. Minerals present in minor amounts - Hornblende, Magnetite. Minerals present in trace amounts - Chlorite, Sphene, Apatite. It is a coarse-grained granodiorite.
3. **Kentallenite** from near Portnacroich, Scotland: minerals present are Olivine, Serpentine, Augite, Biotite, Magnetite, Chlorite, Plagioclase, Orthoclase, Apatite.
4. **Olivine Gabbo** from near Cabrach, Scotland: minerals present are Plagioclase, Olivine, Augite, Magnetite, Biotite, Apatite.
5. **Granite** from Moru Kopje, Tanzania: abundant Feldspar (microcline, orthoclase, and solic plagioclase), Quartz showing strain extinction, and green Biotite. Minor Chlorite and trace amounts of Epidote are probably secondary minerals. It is coarse-granied granite.
6. **Granite** from Bubu River, Tanzania: abundant Feldspar (microcline, orthoclase, and solic plagioclase), and Quartz.Minor traces of green Biotite, Muscovite, Epidote and Apatite. A fine-medium-grained granite.
7. **Granite** from near Kilifi, Kenya: Quartz, Plagioclase, Biotite.
8. **Limestone** from near Kiambere, Kenya: 100% calcite.
9. **Limestone** from near Keld, England: a dark bioclastic limestone, containing crinoid ossicles, bryozoan and shelly fragments. 100% calcite.
10. **Limestone** from near Negash, Ethiopia: an argillaceous limestone. 91% calcite, 9% clay minerals.
11. **Slate** from Skiddaw, England: principal minerals are Chiastolite, Quartz, Biotite, Muscovite and Magnetite.

A VICTORIAN FOSSIL WHOLEMOUNT TECHNIQUE: A CAUTIONARY TALE FOR OUR TIMES

by A.R.I. Cruickshank

Cruickshank, A.R.I. 1994. A Victorian fossil wholemount technique: a cautionary tale for our times. *Geological Curator* 6(1): 17-22.

A description is given of the techniques used to mount a large pliosauroid plesiosaur specimen during Victorian times. Warning is given to conservators and preparators handling historical material to be very careful of past cosmetic treatment applied to such specimens, and to be particularly aware of bizarre and damaging methods used in the past to secure large mounted specimens. These latter include planing the undersurface of the specimen and driving wrought iron nails through a wooden armature into it.

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Brief history of the specimen

The specimen in question, a pliosauroid plesiosaur (LEICS G221.1851; Hettangian; *planorbis* zone; Barrow-on-Soar) has been in the collections of the Leicestershire Museums since 1851, and on display for the greater part of the time since then (Taylor and Cruickshank 1989) (Figure 1). It attracted attention very early in its history "...[the specimen is] worthy, not only of national, but of world-wide celebrity" (Anon, 1852, pp 14 - 15 quoting 'Professor' D. T. Ansted of Cambridge University. Ansted is known to have been Sedgwick's chief assistant until 1844, when he is reported to have become the Geological Society of London's Curator, but we are here talking about the 1850s.) Unfortunately the interests of the Curators of Geology in Leicester Museum during the last half of the nineteenth century, and until recently, did not coincide with the opportunities offered by this and other material from Barrow-on-Soar (Martin *et al.* 1986) Under the circumstances it is hardly surprising that it was not until 1988 that the significance of this particular specimen began to be appreciated.

Two developments aided this appreciation: Taylor (1992*a*, *b*) was about to rework his doctoral thesis on a similar pliosauroid from the Toarcian of Yorkshire for publication, and a preliminary concordance of plesiosaurian material held in the Earth Sciences Section of the Leicestershire Museums had been undertaken by Anne Abernethy, a graduate student in the Department of Museum Studies at Leicester University. The history of plesiosaurian palaeontology revealed by M.A. Taylor (pers. comm.) confirmed that the type of '*Plesiosaurus*' *megacephalus* Stutchbury 1846 had been destroyed in an air-raid on Bristol in 1940 (Swinton 1948). However preliminary comparisons indicated that the Leicestershire specimen was almost identical dimensionally and qualitatively to the type of '*P.*' *megacephalus* as recorded by Stutchbury (1846) and noted by Taylor and Cruickshank (1989). It was therefore considered timely for the Leicestershire specimen to be dismounted and described in full, if only to fulfil Ansted's endorsement of 1851 (Anon. 1852). First results of the functional analysis of the skull have been reported already (Cruickshank *et al.* 1991), prior to the taxonomic and morphological descriptions which are currently being carried out (Cruickshank 1994).

During the process of dismounting the skull for preparation and description, problems were experienced with the mounting techniques used by the Victorians, and as these techniques may be encountered elsewhere, it may be instructive to give an account of them. (See also Timberlake (1985) for an earlier account of the conservation of a long-necked plesiosaur in the Sedgwick Museum, Cambridge.)

The mount and some implications

The mounted specimen comprises an almost complete skeleton exposed from the dorsal surface (Figure 1); geopetal infillings of the skull confirm that the skull was preserved dorsal side upwards (Cruickshank *et al.* 1991), but examination of the skeleton showed that some of the vertebral column, at least, had been

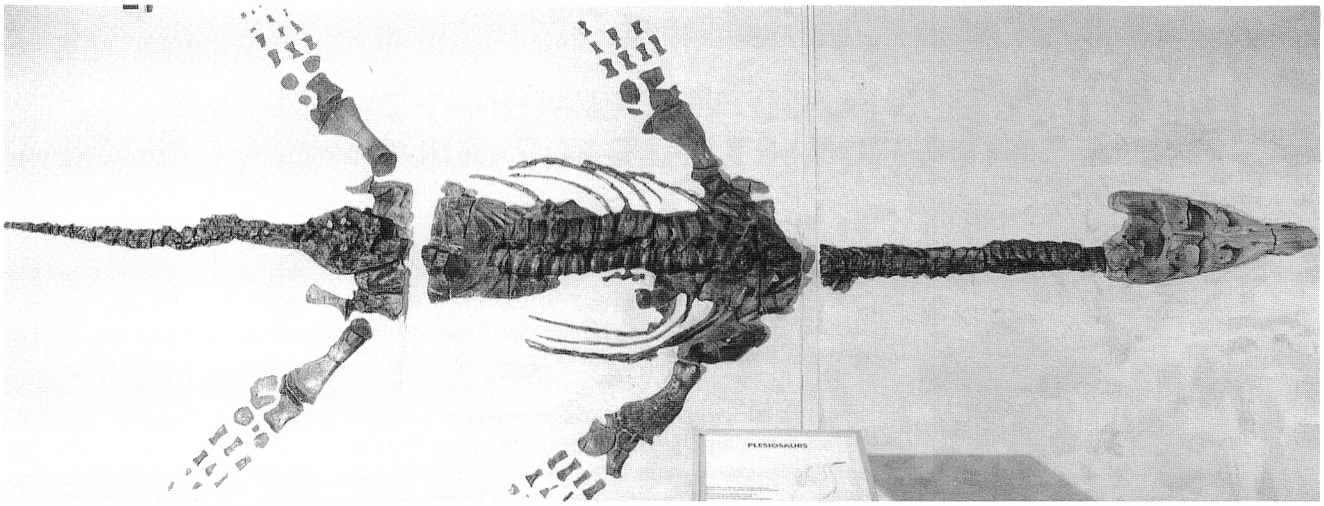

Figure 1. The skeleton of '*Plesiosaurus*' *megacephalus* (LEICS G221.1851) as currently displayed in the Palaeontology Gallery, Leicestershire Museum and Art Gallery. Note that the skull and first few neck vertebrae are a GRP replica; the original has been cleaned of matrix for description and display. The skull is about 650mm long.

rearranged (Figure 2). The skeleton is mounted in three almost contiguous portions, each boxed in its own wooden crate. In addition, natural joints in the original matrix have sub-divided the skeleton, and skull, so that, for instance, a natural break splits cervical vertebra number six (Figures 1, 2). It was decided to use this natural break to form the rearmost boundary of the excised skull section, and to cut the surrounding mount out in a regularly-shaped block. The bone itself is brittle, particularly where it has been in contact with plaster of Paris over the years. The specimen is otherwise very well preserved, notwithstanding the damage caused by the Victorian preparators, and incidental damage accruing over the years from being on an open mount in a public gallery. The assumption is that the animal died and was laid out on the sea floor more-or-less as currently presented, though it is not unknown for Victorian preparators to have 'improved' their specimens to enhance their sale value (M.A. Taylor pers. comm.).

When the skull was examined superficially before removal from its mount, almost the entire backing to the skeleton had a uniform appearance due to the use of a grey paint whose colour matched that of the natural Lias shale very closely. Because of this, it was assumed that a considerable surround of the original shale matrix was present, especially as a repair towards the top of the slab near the head showed a junction between plaster of Paris and shale closer to the skull. Also, ichthyosaur specimens from the same source - William Lee, limeburner and farmer of Barrow-on-Soar (Taylor and Cruickshank 1989) - were mounted with a wide surround of shale matrix, and nothing different was assumed for the plesiosaur. However having chosen to cut the skull free with the use of a disc rock-cutter, it was soon found that there were several generations of plaster of Paris and paint, and that the actual surround to most of the skull was plaster, and not shale. Some shale is present close to the skull, and in the various skull openings but, for the most part, it was plaster of Paris that abutted the

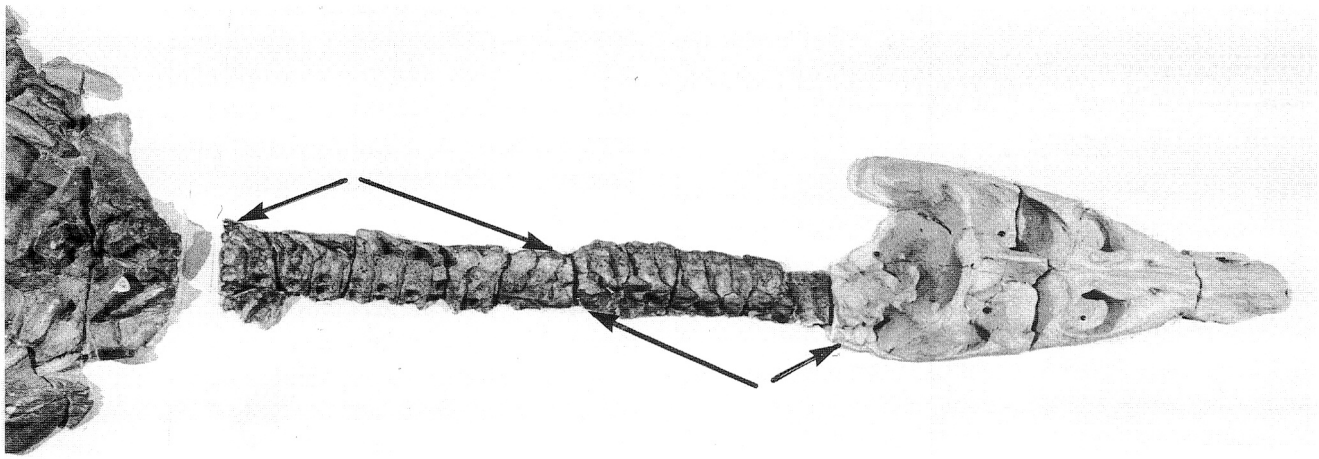

Figure 2. The head and neck region to show variation in orientation of the neck vertebrae. Note that the 'natural break' between the head region and the neck passes through the sixth(?) cervical. Arrows (pointing to the neural arches) mark the different sequences.

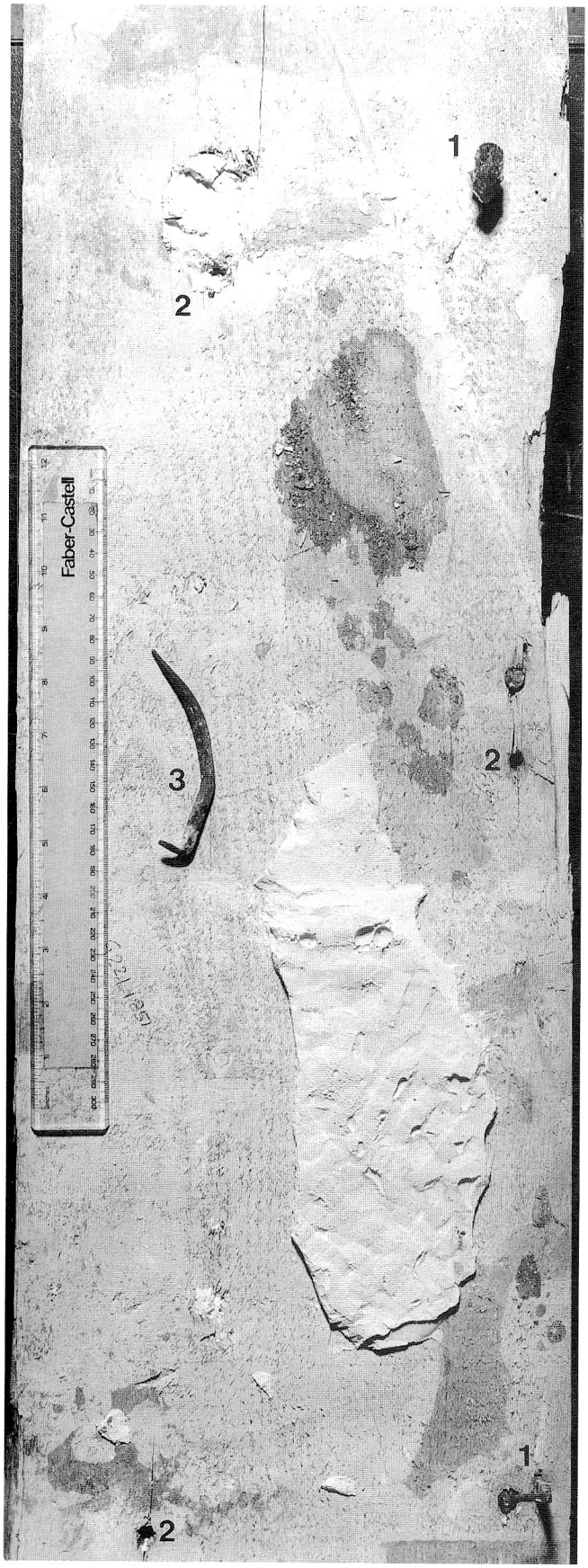

Figure 3. The central portion of the wooden armature supporting the skull in the original mount. Note the large iron nails protruding through the wood, which held the armature down ("1"), and the holes in the wood through which nails were inserted to hold the specimen to the armature ("2"). A single loose nail is marked ("3").

fossil bone. A reconsideration of the problem suggested that less dust would be produced, and hence less contamination of the gallery environment would be caused, if more time-consuming techniques were used, even bearing in mind the use of a polythene sheet 'tent' round the mount. Thus the actual completion of the dismounting of the skull was carried out with hammer, chisel and hacksaw blade, cutting though the plaster at some distance from the skull. Even then further complications followed from the universal pervasiveness of the plaster.

It would appear that the majority of the shale surrounding the specimen had been removed in the nineteenth century, probably before the current mount was made up, thus requiring a replacement support for the now missing shale. The technique used by the Victorians was to build an armature of wood (Figure 3) to follow the main structures of the specimen, and to lock the specimen to the armature and plaster with wrought iron nails of various lengths (Figure 3). In the first place the undersurface of the specimen was levelled, so that a plane surface was created which could then lie flat on the wooden armature. This levelling has caused heavy damage to the undersurface of the lower jaws (Figure 4), particularly in the hind region of each ramus. The chisels used in this phase of the work were about 10-12mm wide. The shale covering the upper surface was removed for display with rather more delicate implements with a blade width of about 3mm (Figure 5), judging from some of the very rare surface damage. The original nineteenth century standard of matrix removal was surprisingly good and has damaged the bone surface to only a small degree, with the exception of the teeth, all of which are now badly damaged. To reconstruct the procedures that were used to make the mount has been difficult, but the following seem to have been the practise.

Having levelled the undersurface of the specimen and built the armature to the required dimensions, long nails were driven through the wood at strategic places to suit the outline of the skull. Holes were then drilled into the bone opposite the nails, whereupon the sharp ends of the nails were bent over and pushed into these holes (Figure 3). With the specimen almost locked home, plaster of Paris was poured round the specimen to reinforce the nails in their holes (Figures 6-8). The wooden supports and specimen were then laid on a bed of thatching reed (*Phragmites* sp.; A. Fletcher pers. comm.) (Figure 9), in wooden crates about 150mm deep, floored with *c.*75mm wide tongue-and-groove planks, and further plaster of Paris poured in and levelled off. A background colour was then painted on to merge the remaining shale with the new mount. This certainly made an almost immovable mount, but as the

Figure 4. Undersurface of part of skull and lower jaw (right articular region) to show damage to bone surface (arrowed) through the use of coarse chisel (10-12mm wide) to level the surface. (Scale in centimetres).

Figure 5. Small chisel marks (*c*.3mm wide, arrowed) on right jugal bar. (Scale in centimetres).

nails were not visible on the outside, working the skull loose caused the ends of the nails to tear out of their bony recesses and this has caused some damage. Most of the bone fragments loosened by this action have been retrieved and replaced, but in some places this has not been possible.

As a result of the dismounting exercise, the skull was in five portions, the junction between each being on original joint planes in the specimen and surrounding rock. During further preparation one additional break occurred on one of these natural lines of weakness. However all joints fit closely and a very distinctive and complete skull will be available for display of its essential features in 3-D, adjacent to the main mount. Thus before preparation was continued, a GRP cast of the skull was made and placed in position (Figures 1, 2), so that the skeleton appears complete. The replacement cast is coloured neutral grey so as not to confuse viewers. It was fixed to a sheet of plywood, which in turn was screwed to the baseboards of the main mount. A coat of masonry paint (Sandtex; Finebuild masonry protection; Silver Birch) has been painted over the entire mount to merge in the backing to the new cast.

The problems encountered in carrying out this exercise confirm that nothing can be taken for granted in dealing with mounts of this age. X-raying specimens of this dimension (*c*.4.5m in length) may not be always practical in a public gallery, but taking samples of 'matrix' from close to the specimen edge is! Drilling to confirm the depth and constitution of the mount is also recommended. In the light of not having much in the way of written records concerning historical material, nothing should come as a surprise. Caveat conservator!

Acknowledgements

I am totally in the debt of John Martin, Keeper of Earth Sciences in the Leicestershire Museums Service for his (almost) unquestioning acceptance that the Barrow Kipper should form the subject of a long-term research project. Chris Collins, previously Conservator in the Section, gave invaluable support and advice during the difficult times we encountered. Grace Griffith has continued this course with wise counselling. Mike Taylor's knowledge of the history of

Figure 6. Left quadrate-articular region to show holes (arrowed) drilled into bone to receive bent over nail ends. (Scale in centimetres).

Figure 7. Undersurface of lower jaw symphysis to show hole drilled to receive support. (Scale in centimetres).

marine reptile research is acknowledged, Funds for the work on this specimen came from the Open University Flexible Fund and a Leverhulme Trust award of a Fellowship to M.A.T. The photographs were taken by Steve Thursfield and processed by Catherine Lives.

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Figure 8. Right quadrate-articular region to show holes (arrowed) drilled into the bone to receive bent over nails. (Scale in centimetres).

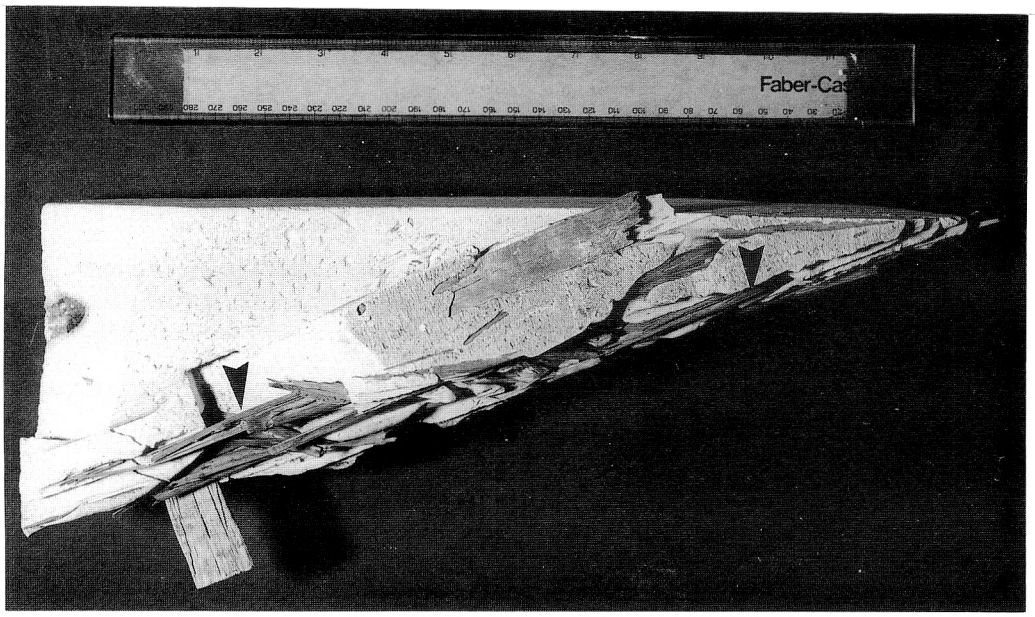

Figure 9. Plaster of Paris, portion of armature and (*Phragmites* sp.) reeds (arrowed) from the skull mount. Scale =300mm (a ruler with lower row in centimetres).

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A BOREAL PERISPHINCTID AMMONITE IN AUSTRALIA - A CASE OF NINETEENTH CENTURY TRANSPORTATION?

by Simon R.A. Kelly

Kelly, S.R.A. 1994. A boreal perisphinctid ammonite in Australia - a case of nineteenth century transportation? *Geological Curator* 6(1): 23-24.

The type specimens of *Simbirskites morvenae* Whitehouse from the supposed Early Cretaceous of Queensland, Australia, are re-identified as *Kerberites* ssp. Their matrix and other fauna suggests a Late Jurassic, English Portland Stone provenance. The occurrence of *Simbirskites* from Australia should be deleted from the record.

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Introduction

During a visit to the Queensland Museum in 1991, I saw a specimen of a large ammonite (Figure 1), strongly reminiscent of the enormous examples of perisphinctids, characteristic of the Portland Stone (Late Jurassic) of southern England. I was surprised to read the label which indicated that it was the paratype of *Simbirskites morvenae* Whitehouse, supposedly from the Hauterivian (Early Cretaceous) of Queensland. Closer examination showed that another ammonite (the holotype of *S. morvenae*) and several gastropods had been artificially cemented to the umbilicus of the larger specimen. The gastropods are internal moulds of '*Leptomaria*' *rugata* (Benett). The matrix of the large ammonite contained bivalves which I identified as *Laevitrigonia* sp. *s.s.* and oysters. The ammonites are referred here to *Kerberites* spp. The whole assemblage is suggestive of an English Portlandian/Tithonian (Late Jurassic) fauna.

The importance of this specimen is that it is one of the few austral records figured of the boreal genus *Simbirskites*. However, it should be pointed out that most of these occurrences have been questioned (Rawson 1971). There has been doubt concerning the Australian provenance of this specimen since the work of Whitehouse (1946), and It had been suspected that it originated from Germany (Rozefelds, Mckenzie and Mobbs 1990). Turner (1982) reported on British fossils in the Queensland Museum, but did not recognise any type or figured specimens. Most of them are Palaeozoic, and although little in the way of Mesozoic collections are mentioned, it was noted that one dealer, Robert Damon of Weymouth, had written to the Museum with the offer of some *Microdon* fish-teeth from the Portlandian near Weymouth (Turner 1982, fig. 2).

The composite specimen was originally donated as part of a collection to the Queensland Museum in 1893, and the locality was given as 'Victoria Downs, Morven'. The donor is unclear and was either a Mr Hurst or a Mr Hunter (Rozefelds, Mckenzie and Mobbs 1990). In this part of Queensland there are extensive outcrops of marine, Aptian, Roma Series sediments (Early Cretaceous). However, no more specimens of *Simbirskites* have been discovered subsequently in the area (Day 1969).

Discussion

The ammonites are characterised by straight to slightly curved, forward swept ribs which pass over the venter with biplicate or triplicate branching. The largest specimen (QMF.1270) is 365mm in maximum diameter and the smaller one 65mm (QMF.16438). They were first described by Etheridge (1909) who believed that they were close to Hauterivian perisphinctids from north Germany. They were formally placed in *Simbirskites* by Whitehouse (1926). The following year Whitehouse (1927) designated the smaller specimen the holotype of *Simbirskites morvenae*, and the larger specimen was the sole paratype. Initially he believed that the specimens were indigenous to Queensland. Subsequently, however, doubts were expressed (Whitehouse 1946, 1954; Day 1969). Rozefelds, Mckenzie and Mobbs (1990) suggested that the specimens were actually north German. The usual matrix for German simbirskitids is mudstone or sandstone (Rawson 1971) which contrasts with the pale cream-brown limestone with much bioclastic debris of the 'Queensland' specimens. The presence of *Laevitrigonia s.s.* in the matrix indicates first that the specimens are broadly Late Jurassic to earliest Cretaceous age, being no younger than Berriasian (Kelly1988, 1992). Secondly they are European. *Laevitrigonia s.s.* is most abundant in the Portland Stone of southern England, of Portlandian/Tithonian

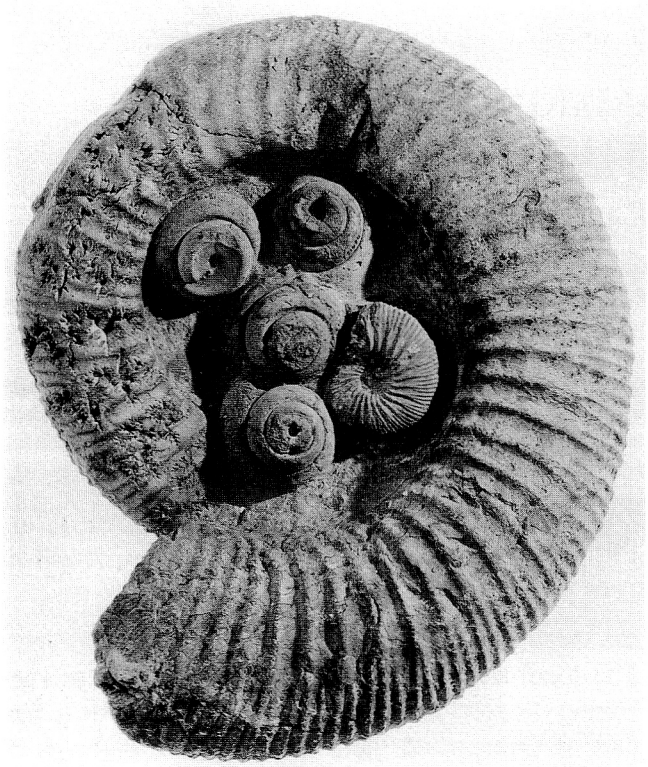

Figure 1. Composite block of large and small *Kerberites* and additional gastropods '*Leptomaria*' *rugata* (Benett), stated to be from the Early Cretaceous of Queensland, but most probably from the Portland Limestone of England. QMF.1270 (large ammonite) and associated specimens; the small ammonite (QMF.16438) is the holotype of *Simbirskites morvenae* Whitehouse. x0.4. Original photograph courtesy of the Queensland Museum.

age. Further information concerning the systematics and more detailed comparison of the Queensland material was published elsewhere (Kelly 1993).

Conclusions

The occurrence of *Simbirskites* should now be deleted from the record in Australia. I am convinced now that a German source for the Queensland specimens is unlikely. The matrix and associated fauna, e.g. *Laevitrigonia* and '*Leptomaria*' match lithologies and fossils from the Portland Stone of England. It is also much more likely that the assemblage was taken out as a souvenir by an English, rather than a German colonial pioneer. The provenance of other material of the Hurst/ Hunter bequest should be treated with caution, until fresh, comparable material has been collected from, or in the vicinity of, the original stated locality for the specimens.

Acknowledgements

I thank J.C.W. Cope (University of Wales, Cardiff), J.A. Crame, D.I.M. Macdonald, M.R.A. Thomson (British Antarctic Survey), R.J. Cleevely (Natural History Museum, London), P.F. Rawson (University College, London), P. Jell and B.D. Mckenzie (Queensland Museum) for assistance during the preparation of this article.

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APTYCHOPSID PLATES (NAUTILOID CEPHALOPOD OPERCULA) FROM WALES

by C.H. Holland

Holland, C.H. 1994. Aptychopsid plates (nautiloid cephalopod opercula) from Wales. *Geological Curator* 6(1): 25-27.

The importance of well curated museum collections of Silurian cephalopods is emphasised. Reference is made to a few specimens of aptychopsid plates, regarded as nautiloid cephalopod opercula, from the Silurian of Wales, held in the geological collections of the National Museum of Wales in Cardiff. Additional well preserved material would be helpful.

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British Silurian cephalopods are frequently ill-preserved or are simply rare. A major revision of these fossils, currently in progress, is singularly dependent upon well curated museum collections, which have been accumulating since the middle of the last century. The National Museum of Wales has a rich collection which, through the kind help of M.G. Bassett, R.M. Owens, and S.R. Howe, I have the opportunity to study. The material includes a few aptychopsid plates. These strange fossils, easily overlooked, have been recognised as nautiloid opercula (Turek 1978; B. Holland *et al.* 1978; Stridsberg 1984; C.H. Holland 1987). In the last mentioned publication I recorded their occurrence in Ireland.

The early monograph by Jones and Woodward (1888-99: relevant part 1892) listed earlier literature and described no less than twelve species and three varieties of these fossils. In a later paper (Jones and Woodward 1893) they added to this list. Yet in some cases the differences between these taxa are slight (Cope 1959) and they have often suffered deformation. I previously mentioned this proliferation of inadequately founded species and the taxonomic problems raised by them, as a few of these curious fossils have actually been found in association with (unidentified) Silurian orthoconic nautiloid cephalopods (Holland 1987). Stridsberg (1984) had also noted the uncertain value of *Aptychopsis* as a generic name. I concluded that proper procedure now seems to be to refer to these fossils as 'aptychopsid plates', indicating the extent to which the three component, dorsal (more rarely seen) and two lateral plates (Figure 1), are present. Turek (1978), who described much material from Bohemia, gave their range as upper Llandovery to middle Ludlow. There appears to be a concentration in the uppermost Wenlock, which I have observed, for example in Scania.

Of the nine Welsh specimens at my disposal, seven are from the Llandovery of Brynllwyd, Corris. Dr Richard Cave kindly informs me that the quarry in question is named Coedig and that the rock exposed here is basal Telychian (Llandovery), probably from the basal part of the *turriculatus* Biozone. These fossils are difficult to see as slightly darker films on dark grey slate. They are more or less strained with the cleavage. One of them (27.110 G694) comprises two small portions of slate which are partial counterparts. They show two separate

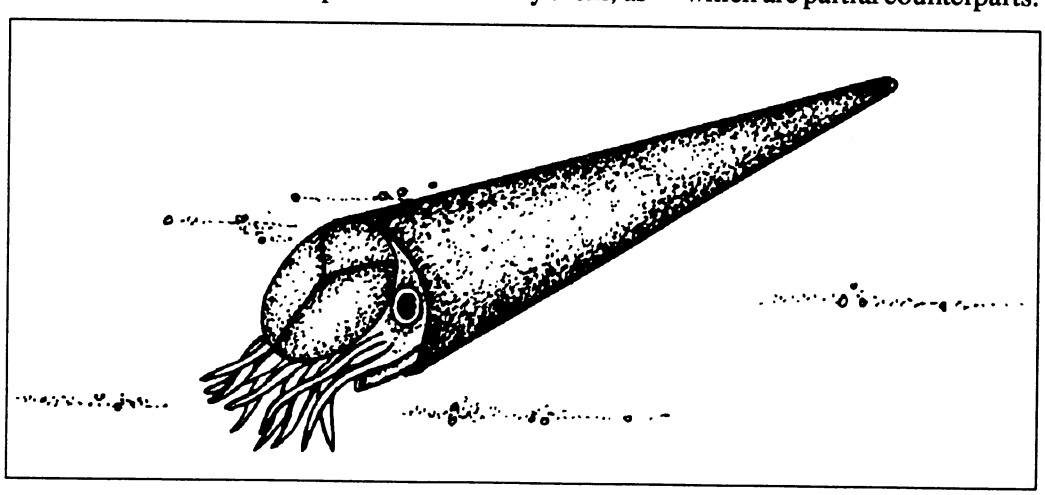

Figure 1. Orthoconic nautiloid cephalopod with operculum in place, showing the two lateral plates and the one dorsal plate. After Turek (1978), Stridsberg (1984), and Holland (1987).

single lateral valves stretched differently along the cleavage. In places the surface is fractured into minute platelets. On another specimen (27.110 G701) there are two very faint impressions of broken fragments. A third (27.110 G695) shows a slightly better preserved single valve. A fourth specimen (27.110 G696) has two small fossils labelled *Discinocaris* and, faintly in pencil, ?*Peltocaris*, the latter seemingly a better attribution. This supposed genus is clearly also of aptychopsid plates and the family Peltocarididae has been taken to include both *Aptychopsis* and *Peltocaris* (see Rolfe 1969, who placed the family in his 'nonphyllocarid and uncertain genera'). *Peltocaris* Salter was distinguished by Jones and Woodward (1892) as a discoidal tripartite shield in which the notch left by the loss of the small valve is rounded. They referred also to a small notch sometimes seen at the bottom of the curved notch and 'sometimes a little escutcheon peculiar to it'. There does appear to be a trace of this in these two small cleaved specimens.

Two of the Welsh specimens are figured here. That illustrated in Figure 2 is from the Castell Formation (Llandovery, Aeronian, *convolutus* Biozone) of Nant-Fuches-Wen, Cardiganshire (Locality F26 of Jones 1909). This is on a small piece of grey slaty rock. Its surface is cracked into innumerable platelets but the shape of the two lateral valves and the dorsal notch (opening at about 60 degrees) are clearly seen. It resembles the form referred to by Jones and Woodward (1892) as *Aptychopsis lapworthi* from the Southern Uplands and Northern England.

The Cardiff collection also contains the holotype of *Aptychopsis williamsoni* (Jones and Woodward 1893) (Figure 3). The curiously pockmarked nature of the surface does not entirely obscure the characteristic growth lines of the genus, parallel to the outer edge. The explanation for the surface appearance is seen in the surrounding matrix which is closely scattered with small ostracodes. Some of the shells are still present but most now appear as small pits in the surface. Jones and Woodward gave one of the characteristics of their new species as a relatively fuller curve posteriorly. They noted that the upper edge is somewhat damaged and yet offered a value of about 120 degrees for the dorsal notch. The specimen is labelled as from the 'upper Silurian (Ludlow?)' of 'Harp Hollow, Welshpool'.

Thus the Welsh material is all of Silurian age and supports the view that aptychopsid plates tend to occur in the graptolitic shale facies. An additional purpose of the present note is to ask curators to look out for these rather elusive fossils and, above all, to please provide information on any occurrences associated with orthoconic nautiloid cephalopods.

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Figure 2. Right and left lateral aptychopsid plates cf. *Aptychopsis lapworthi* Jones and Woodward. O.T.Jones (1909) Locality F26, Castell Formation, *convolutus* Biozone, Nant-Fuches-Wen, Cardiganshire. National Museum of Wales 72.51G 153. X4.

Figure 3. Holotype *Aptychopsis williamsoni*. 'Upper Silurian (Ludlow ?)', Harp Hollow, Welshpool. Figured Jones and Woodward (1893), Plate X, Figure 7. National Museum of Wales 27.110 G32. X4.

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NEWS FROM THE MUSEUM OF ISLE OF WIGHT GEOLOGY

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Geological Curator 6(1): 28-29 [1994]

A lot has happened between October 1992 and October 1993 concerning our collection and collecting activities on the Isle of Wight. Within the museum, a long-term "collection care" programme has been initiated, to help tackle the backlog of undocumented material, and deal with poorly documented, badly stored and unconserved accessioned material. The collection is quite small (approximately 8000 accessions), however much work needs to be done and many aspects of the collection deserve further research.

Finding sufficient time to work on the collection is a considerable problem, considering the amount of enquiries that are received on a daily basis. Nevertheless, the task will soon be facilitated by the introduction of a new documentation system for the Isle of Wight County Museums Service. By using a combination of MDA and "in house" forms, this system will ultimately standardise documentation and pave the way for computerisation. For the meantime, a simple register and index system is still being used in the geology museum.

Storage is currently our greatest headache (Figure 1). Those who know the museum will be aware that our store rooms are full to overflowing, although the re-introduction of old cabinets and general re-arrangement is helping to an extent. Presently, funding for new cabinets and boxes is lacking, so improvisation and old fashioned common sense are the orders of the day.

Environmental conditions within the stores appear to be just about adequate in the short term, and a monitoring scheme will be introduced in the near future. So far, the care programme has only revealed a few isolated examples of pyrite decay in the collection, despite the heavily mineralised nature of many Isle of Wight fossils. In particular, the pyrite within Wealden bones seems to be exceptionally stable and consequently most of our dinosaurs have healthy future prospects. New storage premises have been recently acquired by the county museum service, which will allow a limited amount of geological material to be stored under stable, monitored conditions. It is anticipated that a quantity of invertebrate material will be incorporated into this new facility, allowing better storage for vertebrates at our main Sandown premises.

Storage problems are being intensified by the quantity of new material that is still being brought into the museum, as accessions or loans. Over the last fifteen years or so museum staff and volunteers have collected a large amount of Wealden dinosaur material, ranging from individual bones to partial or near-complete skeletons. Only a small proportion of this valuable material has been properly conserved and prepared, and an even smaller proportion is actually on display.

"Dinomania" during the summer of 1993 has heightened public interest in our collection, as well as boosting visitor numbers and sales. In particular, the partial sauropod skeleton discovered by Steve Hutt in February 1992 has attracted considerable media attention. During the summer of 1993, the owners of the skeleton (on whose land the find was made) have provided premises (a secure barn) at their farm for volunteers to work on the fragile bones. This work has formed the core of a temporary dinosaur display, which has attracted large numbers of visitors over the summer.

During the spring of 1993, a major fund-raising effort was organised, to purchase two locally-found partial

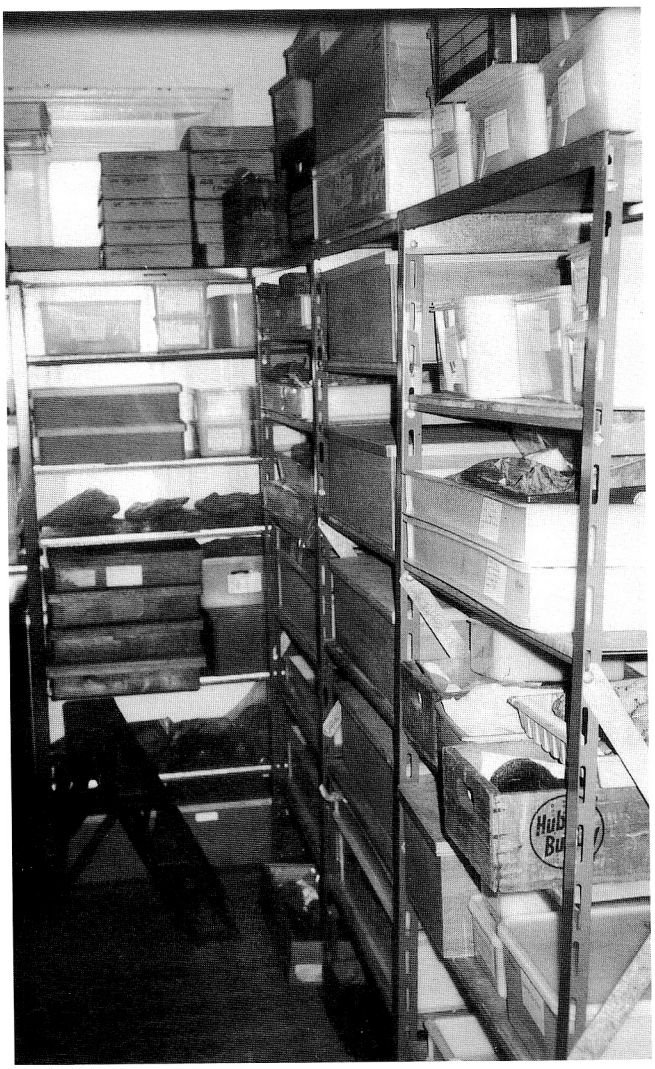

Figure 1. Overcrowded vertebrate storage area.

Figure 2. Jaw and skull material from recently purchased *Iguanodon* skeleton [Ruler = 30cm long]

skeletons from an island collector. This important material comprises exceptionally well-preserved elements of an *Iguanodon* (Figure 2) and an undescribed megalosaurid carnosaur, including a considerable quantity of unique skull material. After a few scares, this material was successfully purchased, with the aid of a grant from the Science Museum PRISM fund. Many of the bones had been prepared prior to purchase and are now in storage at Sandown. During the winter of 1993-1994, we hope to put some of this material on display at the museum, along with elements of the new sauropod.

We anticipate that public interest in vertebrates will continue, and from time to time talks have taken place between the County Council and private backers for a new dinosaur museum at Sandown, or elsewhere on the Island. Such an attraction would include the best of our collection as its centrepiece. Whilst this is a real possibility, we are committed to making the most of our current premises. Apart from the recently acquired dinosaur remains, we shall soon be introducing a new replica megalosaurid skeleton into the public gallery, and a long-delayed display of island minerals.

The Isle of Wight is unfortunately gaining something of a reputation for collecting-related "problems". Over the last few years the press have latched onto several stories, and the Geologists' Association and English Nature have become involved in several incidents. In June 1993 a meeting was called between landowners, collectors, museum staff and other interested parties in the hope of reaching some new understanding. Little was resolved, however written response from participants will form the basis of a discussion document, to be compiled and circulated by museum staff in the near future.

Increasing scarcity of time for field work now means that the field activities of curatorial staff are largely limited to school field trips during the spring and early summer months. Luckily, relations with some of the most serious local collectors are generally excellent, and keeping tabs on new finds is usually an easy task. Whilst much of this material ends up in private collections, offers of long term loans to the museum are often made.

We cannot be sure what the future holds for the museum, although in the short term we are making the most of our current premises and resources. Proper management of our important collections (not just dinosaurs!) must be a priority, as must helping to maintain the beaches as places where the public can freely enjoy our rich geological heritage.

BOOK REVIEWS

Howie, F.M. (ed.) 1992. *The Care and Conservation of Geological Material: Minerals, Rocks, Meteorites and Lunar finds*. Butterworth-Heineman Ltd, Oxford. 138pp. ISBN 0 7506 0371 2. Hardback. Price £35.00.

This long awaited text, originally promised for publication in late 1990 forms part of the Conservation and Museology Series published in hard back by Butterworth-Heineman and the first part of two planned volumes on geological materials.

The book consists of nine chapters and four Appendices written by seven authors, references to the text follow each chapter and most of the Appendices. An index is included at the end of the book.

In the Preface to the book, the Editor states that the purpose of the text is "to emphasise more the principals of care through identification and explanation of basic mineral instabilities rather than describe specialised treatment methods for preservation" and in doing this, the book aims to be a "state of the art text".

The book starts with a chapter by Monica Price on the stability of minerals. Beginning with a history of mineralogy and the functions of mineral collections, it goes on to describe the various methods of mineral formation and the reasons for mineral instability once removed from their natural environment. The process of incorporation of a new specimen into a collection and subsequent use are then discussed along with conservation risks to the specimen including that of poor curation.

Chapter 2, by Kurt Nassau covers conserving light sensitive minerals and gems. The chapter begins with an explanation of colour in minerals and covers the various methods of loss, enhancement and change of colour. A list of minerals that will react to light and those species requiring complete protection from light or low levels of exposure is then given.

Robert Waller has written Chapter 3 dealing with temperature and humidity sensitive mineralogical and petrological specimens. It describes the various mechanisms by which such specimens can be damaged and possible methods for preventing deterioration. An extensive list of mineral species and their known stability limits is given, cross referenced to the source of the data, much of this information is published in this form for the first time.

Chapter 4, by Frank Howie covers elements, alloys and miscellaneous minerals, it deals with corrosion of native elements and alloys, moves through humidity control and ends with half a page on the effects of acid vapour emissions on calcareous specimens.

Frank Howie has also written Chapter 5 on sulphides and allied minerals in collections and lists the reactions that can occur with susceptible species. Chapter 6, again by Frank Howie is concerned solely with the mechanism of decay and history of research into the stability of the two sulphide species, pyrite and marcasite.

Dr A.W.R. Bevan provides Chapter 7 on meteorites. The first half of the chapter deals with the nature and types of meteorites, the second half with conservation problems and good curatorial practice for their care and preservation.

Chapter 8 by Charles Meyer Jr. covers the lunar sample collection. The chapter begins with an introduction to the geology of the moon, followed by a description of the curatorial proceedures in the Curatorial laboratory for lunar samples at the Johnson Space Centre in Houston, Texas. Whilst this is very specialised information, the descriptions of the procedures followed in the care of this collection are most interesting.

Chapter 9 again by Frank Howie deals with the hazards likely to be encountered by mineral collectors, conservators and curators. This includes radioactive and toxic minerals, a comprehensive list is included. The hazards likely to be encountered during mineral processing and laboratory and preparation work are then discussed.

Appendix 1 gives an extensive list of the volatiles given off by construction materials and their likely effects on specimens, the author is not named. About one quarter of the appendix is dedicated to the volatiles given off by wood and wood products, which is also dealt with (and cross-referenced) in Chapter 4. Appendices 2 to 4 by Dr Bob King cover collecting, cleaning, repair and consolidation of rocks & minerals.

There are a few slips in the book, such a missing word on page 1 and repeated information without a cross-reference on the degradation of realgar in chapters 2 and 5. Perhaps the photographer of the realgar specimen in plate 5.4b was unaware of the effect of photographic lamps on this species since what is described as "unchanged" realgar has almost as much of a speckled orange coating as the degraded specimen (Plate 5.4a). An additional error was pointed out to me by a colleague, the specimen in figure 5.3 described as pyrrhotine with developing surface oxidation is apparently pyrrhotine replaced by pyrite.

The claim in the introduction that this book is "state of the art" must be queried in the light of the note preceding Waller's references that they were up to data at the time of submission of the manuscript, the most recent reference within this selection is dated 1987. The most recent reference in the entire text is a 1991 article quoted by Price.

In conclusion, this book brings together in one place a wealth of information on mineralogical conservation that was previously only available as reprints of papers and abstracts from a wide variety of publications. Many of the chapters are excellent but because some approach conservation problems by agents of deterioration (for example, light, temperature and humidity) and others by types of minerals (for example, sulphides and elements) the book reads more like a conference preprint than a single flowing text.

The book should prove a useful reference for curators and conservators with mineral specimens in their care with the proviso that the information is a little out of date in places and that research in some areas covered by this book has advanced considerably.

Katherine J. Andrew
Geological Conservator
136 Hillside Road, Great Barr, Birmingham B43 6NQ, U.K.
April 1993

Edmonds, R. 1992. *Charmouth and Lyme Regis Fossil Guide*. Charmouth Heritage Coast Centre. Folded A3 leaflet. Price 40p (multiple copies available from Charmouth Heritage Coast Centre, Lower Sea Lane, Charmouth, Dorset DT6 6LL, U.K.).

This full colour leaflet makes a good introduction to the geology of the stretch of coastline between Lyme Regis and Stonebarrow, which is often in the news. The central foldout contains a map of the area and illustrates various public amenities, and gives details of three collecting localities: Monmouth Beach, Black Ven, and Stonebarrow. It briefly notes which fossils may be found, and stresses that collecting should be from the beaches themselves and not from the cliffs that are common in this area. The reverse side of the leaflet contains three panels which give basic information about rocks, minerals, and fossils.

The leaflet is clearly aimed at the beginner or younger geologist and provides considerable information which is presented in a comprehensible manner. It is a worthy production.

Patrick N. Wyse Jackson
Department of Geology, Trinity College, Dublin 2, Ireland
26th January 1994

Vaccari, Ezio. 1993. *Giovanni Arduino (1714-1795): il contributo di uno scienziato veneto al dibattito settecentesco sulle scienze della Terra.* Biblioteca di Nuncius Studi e testi VIII. Leo S. Olschki, Firenze, xvi+408 pp, 9 figs. ISBN 88 2224062 6. Paperback. Price: 70,000lira.

This book, which is written in Italian, is the most comprehensive study yet attempted of the important eighteenth century geologist Giovanni Arduino. Arduino, who was born in the Venetian Republic in northern Italy, was educated in Verona, and became a skilled mining geologist in the Tyrol.

He was later Professor of Mineralogy and Metallurgy at the University of Venice. He corresponded with many German mineralogists, and sent mineral and rock specimens collected by him from the Veronese area to Nathanael Gottfried Leske. In recent years a number of these specimens have been recognised in collections in Dublin. Perhaps there are more lying unrecognised in drawers in European institutions.

Arduino's major contribution to geological sciences was made in 1760 when he published a paper in which he subdivided the rocks of the Alpine region of northern Italy into four stratigraphic units or "ordini". The "Primary" unit comprised old crystalline basement and was overlain by the "Secondary" unit of metamorphosed limestones. The "Tertiary" unit was made up of clays, fossiliferous sands and volcanic rocks, while the fourth and youngest unit was of river deposits. His term "Tertiary" is still globally used by geologists.

Vaccari's book, which is attractively printed and a pleasure to handle, contains a wealth of information about this geologist who is not widely known outside Italy. I warmly recommend it to those who can read Italian, and hope that an English translation will appear so that Arduino's achievements will become known to those who cannot.

Patrick N. Wyse Jackson
Department of Geology, Trinity College, Dublin 2, Ireland.
17th February 1994

LOST & FOUND

Compiled by Peter R. Crowther & Patrick N. Wyse Jackson

Enquiries and information, please to Patrick Wyse Jackson (Department of Geology, Trinity College, Dublin 2, Ireland). Include full personal and institutional names and addresses, full biographical details of publications mentioned, and credits for any illustrations submitted.

The latest index to 'Lost and Found' was published in *Geological Curator* 5(2), 79-85.

Abbreviations:

CLEEVELY - Cleevely, R.J. 1983. *World palaeontological collections*. British Museum (Natural History) and Mansell Publishing Company, London.

GCG - *Newsletter of the Geological Curators' Group*, continued as *Geological Curator*.

LF - 'Lost and Found' reference number in GCG.

214 Jurassic ammonites from Gibraltar collected by Alan L. GREIG (d. 1988)

GCG **5**(6), p. 231.

David C. Devenish (Wisbech and Fenland Museum, Museum Square, Wisbech, Cambridgeshire PE13 1ES) writes:

In about 1968, while Curator of the Gibraltar Museum, I examined a small storeroom (*c.* 10' square) filled with archaeological and geological specimens from Gibraltar which, I was informed, belonged to an Army Officer who had "disappeared under mysterious circumstances" about 20 years before.

I arranged for the archaeological items (mainly Phoenician pottery) to be sent to the Gibraltar Museum, but the number of rock specimens was so excessive (a few c.w.t. at least) that I could only make a small selection. Is it possible that the missing ammonites could be among those left behind? In any case Dr Rose might well find this collection of interest, if it still exists.

Ted Rose in reply writes:

The Army Officer mentioned was Captain G.B. Alexander - whose "mysterious" disappearance was briefly discussed in Rose, E.P.F. & Rosenbaum, M.S. 1989. Royal Engineer geologists and the geology of Gibraltar. Part II, The age of geological history of the Rock. *The Royal Engineers Journal* **103**, 248-259. It was covered more fully, amongst other matters of historical interest, in a further article by the same authors in the *RE Journal* of 1992.

In the Gibraltar Museum, the new Director Dr Clive Finlayson (since 1991) has adopted a "new broom" approach, which is discovering odd items long buried in storerooms. The ammonites may yet re-appear.

233 Dr Archie LAMONT (1907-1985) and unreturned loan specimens found in his collection.

Bill Baird (Department of Geology, Royal Museum of Scotland, Chambers Street, Edinburgh EH1 1JF) writes:

On the death of Dr Archie Lamont (1907-1985), his large geological collections came under the care of the National Museums of Scotland. Amongst Dr Lamont's own specimens were numerous fossils forming parts of loans borrowed by him from many institutions both here and abroad. Most loans had enough paperwork or titled labels to allow them to be returned to their rightful owners. There were, however, several groups of specimens which we have until now been unable to match up with their parent institution.

A short history of Dr Lamont's career may be able to give some guide as to which institutions the borrowed specimens may have originally come from. After graduation in Glasgow, Dr Lamont moved on to a lectureship at the University of Birmingham. At Birmingham between the years 1936 and 1944 he carried out palaeontological work on material from the Welsh Borders, North Wales and the Midlands of England. He visited many institutions to examine

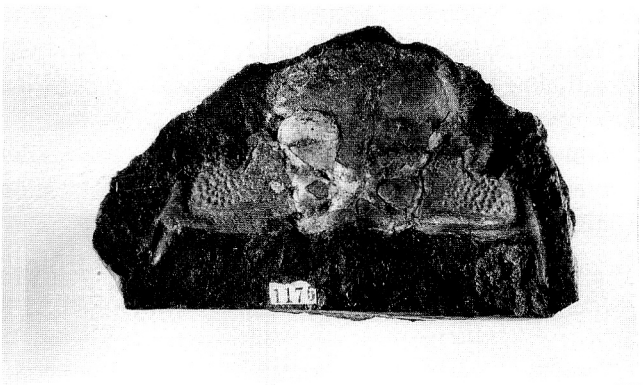

Figure 1. Large phacopid trilobite cephalon, no locality, labelled "1175".

Figure 2. *Spirifer crispus*. Wenlock Limestone, Dudley. Labelled "271, 272, 294, 360".

relevant fossil material and borrowed large numbers of specimens. Unfortunately, at the time of his death Dr Lamont had still not completed certain papers on some of this material and as a result it had not been returned.

One particular group of fossils is causing us some concern as it consists of several hundred small numbered specimens. The age and locality of this material is given as the Wenlock Limestone of Dudley . The specimens are mainly small brachiopods but include a few trilobites. Examples include a large phacopid trilobite cephalon, no locality, with printed number '1176' attached to specimen (Figure 1), and *Spirifer crispus* from the Wenlock Limestone at Dudley with handwritten label and printed numbers attached to specimens '271, 272, 273, 294' (Figure 2); also *Bilobites biloba* from the Wenlock Limestone of Dudley. If you have found that large numbers of such specimens are listed in the catalogue of your collection but at present are missing, please get in touch and I will be delighted to return this material.

The editor writes:

This story has a happy ending. Peter Crowther showed Colin Reid (Dudley Museum) Bill Baird's letter and photographs, and Colin recognised the source of the specimens as the Lapworth Museum, School of Earth Sciences, University of Birmingham. They have now been returned to Birmingham.

Lamont also carried out work on Lower Palaeozoic faunas of Ireland, and his Irish collection has been passed to the National Museum of Ireland (contact Nigel T. Monaghan, National Museum of Ireland, Kildare Street, Dublin 2, Ireland).

GEOLOGICAL CURATORS' GROUP

18th Annual General Meeting

5th December 1991 at Dudley Town Hall, Dudley.

1. Apologies for absence

Received from Bob King, David Hill, Stuart Ogilvy, Ann Bone, Ray Barnett, Mike Boyd, David Bertie, Tony Cross, Tom Sharpe, Gordon Chancellor, Ralph Anderson, Simon Hawkins, Mandy Edwards, Phil Doughty, Rosina Down, John Martin and Monica Price.

2. Minutes of the 17th Annual General Meeting 1990

The minutes of the were taken as read, accepted and signed by the Chairman as a true record.

3. Matters arising

There were none.

4. Chairman's Report from John Cooper

The sad and tragic loss of David Price has overshadowed a year otherwise full of interest and achievement for the Group. David was one of our most respected members, well known throughout his few but memorable appearances at meetings. I remember in particular his unusual but none the less seminal role at a terminology meeting in Brighton which I was hosting in 1985: having discovered that he was to be prevented from attending he promptly got out his tape recorder and sent me his contribution on tape which was duly replayed to an enthralled audience. We shall all miss him. Ironically, for all the outrage that his death has provoked, it will be one of his many successes which should herald the New Year for by then the Brighton Medal will be ready. I can announce now that the Group will be presenting the first medal to Edith Brighton, Bertie's widow and furthermore will be presenting a posthumous Founder's medal to Val Price on David's behalf. More about that in the next *Coprolite*.

And it is the very success of *Coprolite* that makes this report somehow redundant. Having concluded our second year of production it is abundantly clear to me that the membership now hardly needs the annual review of the Committee's work - it has, in effect, already been published. Nevertheless, I shall carry on, pausing only to congratulate Tom Sharpe and Monica Price on their valuable contribution to the Group.

Hot on the heels of the NCC's Earth Science Conservation in Great Britain - A strategy, the Group has entrusted the care of the National Scheme for Geological Site Documentation to a Steering Group chaired by Mike Harley, now of English Nature and RIGS fame. You need have no cause to worry, Mick Stanley and your Chairman are both members. More about that in Mick's report.

The Museums and Galleries Commission approached the Group with an exciting initiative regarding travelling geological exhibitions (*Coprolite* No.5) which we have considered long and hard. The truth emerges that cooperative ventures like this one are going to be extremely difficult to pull off, however willing we might be. Discussions with M.G.C. continue.

Following John Nudd's 'good news' about UFC funding for collections care at the five university centres (*Coprolite* No.5) monies were indeed released. We have reason to be cheerful as Peter Crowther has lucidly explained in his recent editorial. Our congratulations to Jim Kennedy of Oxford for all his hard work.

Peter now has a new look *Geological Curator* in which to expound. Smarter and more professional, I hope that the '*Curator*' has not lost too much of its informal appeal. Committee is confident that we will now be able to turn the problems of late production around and new issues of the 'Curator' will be landing more often on your desk. My thanks to Peter for his outstanding contribution, and again, to Monica Price for her DTP work.

The Group launched a new animal on to the scene this year. The Geological Collector of the Year Competition has proved to be quite a success and attracted a lot of attention. Its significance to the entrants should be judged by the fact that all the prize winners, from as far away as Hull, Stoke on Trent and Glasgow, were keen to attend the awards ceremony at the GA Reunion in November. Committee has yet to consider the frequency of this competition but it will certainly be reappearing in the future. My thanks to Simon Timberlake for so successfully having seen this through.

Another new venture in which the Group is involved is RockWATCH (*Coprolite* No.6). I applaud the initiative of the RSNC and increased work with children. As a Group we are considering the reintroduction of a nation-wide geological walk programme sponsored by museums. Already we are in discussions with RSNC for a timely issue of a new edition of our Thumbs Up leaflet, in time for the public launch of RockWATCH in March. Di Hawkes is doing a grand job of coordination and I am grateful for her efforts on behalf of the Group.

As readers of *Coprolite* No.6 will know, I attended a meeting of INHIGEO on Dresden in September where I announced my intention for a GCG meeting to be held in Brussels with the Institut Royal des Sciences Naturelles de Belgique acting as hosts. I aim to draw European museum geologists together in a way which, I fear, the Madrid, meeting next year may fail to do. I hope I am proved wrong.

Among these successes, not everything in the garden is green. My initiative on Terminology is proving rather slow mostly due to a too crowded diary both for the Group and for myself. I hope that the New Year will see this corrected, as will be the slow work on the production of a new publicity leaflet for the Group. I will need to grasp this more firmly. Outside of the Group, we have seen disturbing developments taking place at Bollon, in Derbyshire, Tyne and Wear and now possibly at the Hancock Museum. In contrast, I am delighted to learn of the appointment of Jane Mee to the post at Ludlow. If we could not have a geologist there, she must be the next best thing.

Having begun me report with sadness, I cannot pass on to my final paragraph without mourning the loss of Bev Halstead. Bev was a good friend of the Group and indeed was to have taken part in two of our meetings in th s past year. I am sure that there was much we could have achieved with his driving spirit.

Finally, my warm thanks to all the Committee members for their able assistance throughout the year. I have already mentioned several individuals; I cannot name everyone's contribution but I must single out Simon Knell's. The job of Group Secretary is not easy and can be tedious, but Simon does it extraordinarily well, so well, it is not often noticed or properly acknowledged. I must also mention and thank the outgoing Committee members, Tony Cross, Amanda Edwards, John Martin and Monica Price. I am looking forward to working with the new Committee in 1992.

Questions:

Roy Clements asked if it was appropriate for a message to be sent from the Group to David Price's widow. John said this had been done and that several GCG members attended his funeral. John also gave a few details of the circumstances of David's tragic death.

5. Secretary's Report from Simon Knell

The GCG held six seminars and training courses in 1991. On the 14th March a seminar at Haslemere Educational Museum entitled Museums, education and the earth sciences examined the way museums can meet the challenges posed by the National Curriculum. From the 16th to 18th April we ran our now annual Natural Sciences Training Course with the University of Sheffield and BCG. On the 4th and 5th June Perth Museum and Art Gallery hosted a lively seminar entitled The words and the stones: geology displays for the public, which examined popular interpretation of geology through displays using examples from museums across Britain. This was after a day in the field which included a pub lunch and ended at a distillery (well done Mike!) - the geology and scenery were good too! The Group's sideshow at this year's Museums Association Conference in Newcastle, debated the contrasting approaches to display of the Natural History Museum and those of us who still hold real specimens in high regard. Held on the 23 July at the Hancock Museum under the banner: The disappearing object: is the orthodox natural history display a thing of the past this meting attracted a good cross-section of delegates from the Conference.

We next met on the 28 August at Plymouth Polytechnic for Geological collections in the South West, a Mason Conference at the British Association for the Advancement of Science. Not only did this give members the opportunity to take part in other Association events but also to visit the Museum's newly opened Dawn of the Dinosaurs exhibition and view the stores and documentation system. For the Group's AGM on the 4th December we were invited to Dudley which has been the centre of major geology-related developments since the Group's last meeting here in 1985. Mining the heritage seam. a case study: promoting and conserving the geological and industrial legacy of the Black Country put these developments into their historical and geological contexts. On the 5th December, after a 'Black Country night out!, we were given the opportunity to see these developments in the field.

Attendances at GCG seminars have not always been high - please try to come along as our convenors put a considerable amount of work into organising them. You don't have to be a member to attend but if you are these meetings really are the best way to keep in touch with what's going on.

I would like to thank our seminar organisers for this year: Di Hawkes, Michael Taylor, Andrew Newman, Mike Bishop and Colin Reid, who must take all the credit for the success of this year's programme. Special thanks must be given to Bob Toynton and Peter Davis for making our training course a success. I would also like to thank all our speakers, tutors and other contributors to these meetings.

The 1992 seminar programme will include a major mineral conservation meeting in Manchester from the 31 March to 2 April. A look at terminology at Sunderland on the 7th and 8th July including a field trip into the Permian. Geology and education workshops will feature at our St Albans meeting on the 29th September. The AGM will take place in Scunthorpe on the 3rd December - a meeting which will also examine fossil digs and provide an opportunity to see the new natural science gallery and explore some of our local geological sites.

The Natural Sciences Training Course will be held in Sheffield from the 5th to the 10th April and the Group will present a seminar on terminology at the Museums Association Conference in Plymouth in September.

A new addition our programme will be the introduction of curatorial workshops. In 1992 these will consist of advanced techniques in mineral identification at Manchester University on the 15th June and microenvironmental control for geological specimens at the Sedgwick Museum, Cambridge on the 6th August. Designed to be attended by a handful of people they will provide an opportunity to examine equipment and try out techniques many of us may not be familiar with. Book early as I am sure these will be very popular. Details of all these meetings will appear, as always, in *Coprolite*.

The Committee would welcome suggestions from any members who would like to organise a GCG seminar in their part of the world. If you have no inclination to organise a meeting but think there are topics we should be discussing please let me know.

The Committee met 5 times in 1991: 13th February (Burlington House), 30th April (Museum & Galleries Commission), 27th June (Hull), 18th September (University College, London) and 19th November (Burlington House). The 1992 Committee will meet on the 4th February, 28th April, 17th June, 2nd September and the 10th November. Members are invited to contact myself or any other member or officer of the Committee if they have any issues they think the Group should discuss or examine.

Comments:

Paul Glasby expressed his appreciation of the seminar held at Haslemere Museum and that some particularly useful contacts were made. Simon mentioned that Kate Pontin will be joining the Committee to develop educational aspects and that there will be another education seminar in September 1992.

The Chairman thanked Simon for his report.

6. Treasurer's Report from Andrew Newman

(i) Membership

There has been a net increase of 2 subscriptions during 1991.

Total membership is 466 and comprises of:

UK personal members	258
Overseas personal	47
UK Institutions	103
Overseas Institutions	58

The membership, as can be seen from the above, has remained about static throughout the year. The need for membership drive will be considered by the committee in the new year. A new membership leaflet is in an advanced stage of development and should be available soon.

(ii) Finance

The accounts for the period 6/12/90 - 4/12/91 are attached.

As may be seen, the balances are in a reasonably healthy condition. This will enable us, once again, to not increase subscription rates. The considerable difference between income and expenditure for 1991 relates mainly to the incorporation of funds collected in the name of A.G. Brighton. This money is kept separate for accounting purposes only. The reminders for 1991 subscriptions had been held back until the group had published the most recent numbers of *The Geological Curator*. So those who had not paid will be hearing from me soon.

I would like to thank P. S. Davis and K. Sedman for their annual audit.
The Chairman thanked Andy for his report.

Question:

Roy Clements asked if the accounts include the money for *Geological Curator* yet to be published. Reply 'yes'. Roy commented that this is not a sensible way to keep the accounts as can't say when *Geological Curator* will be published.

7. Editor's Report from Peter Crowther

(i) 1991

Only one issue of *Geological Curator* has been published this year: Vol. 5, No. 6, pp.217-256, published 25 November. This issue is the first to go through our new production system, whereby Monica Price (Oxford University Museum) enters disk output from either Judy Marvin's (Leicestershire Museums) word-processor or direct from authors straight into 'Pagemaker' running on an Apple Mac. after incorporating the results of my copy editing and sending a proof page to authors for comment, laser printer output provided A4 camera-ready copy suitable for plate-making by our printers (Reprographics Unit, Leicestershire County Council). The whole process 16 much quicker than the old system of pasting up pages at A3 size for reduction, but it involves a considerable amount of work by Monica designing pages on screen and amending the text as supplied on disk, according to my marking up. Vol. 5, No. 6 16 also the first to use the redesigned front cover, incorporating the Group's new logo. Any comments on the 'new look' journal will be gratefully received by your Editor.

(ii) 1992

Vol. 5, No. 7 will be devoted to the proceedings of GC's Dublin meeting in June 1990, under the title 'Gems under green wraps'. Papers by Patrick Wyse Jackson, Nigel Monaghan, Andrew Sleeman and David Harper will describe the collections under their care at Trinity College Dublin, National Museum of Ireland, Geological Survey of Ireland and James Mitchell Museum (University College Galway) respectively. Camera-ready copy will be completed by the end of this year, so distribution to members should be possible before the end of February 1992. Other papers already accepted and scheduled for publication next year are 'John Watson and the Cambridge Building Stone Collection' by Kate Andrew, 'Perpetual excitement: the heroic age of British geology' by Jack Morrell (given at the 1990 AGM in York) and a major biography of 'James Frederick Jackson, 1894-1966' by Steve Howe.

I am delighted to report that 1992 will also see Justin Delair begin to compile an Index to Volume 3, following the same format he used for Volume 2 published in 1990. We expect to be able to distribute it to members in 1993.

(iii) Thoughts on the future

Readers of *Coprolite* will know that I was recently moved to express my concern that the fruits of collections research have come to dominate the content of *Geological Curator*. almost to the exclusion of those many collection care and management issues which, in practice, dominate the day- to-

day work of most curators. I ask only for a return to a more balanced content, but this can only happen if members submit the relevant material. There are so many matters which concern us - training, education, conservation, documentation, management (even), storage, new technology, exhibition design, collecting policies, etc., etc. The purpose of the *Geological Curator* remains primarily to help geological curators exchange thoughts and ideas on shared problems and their solutions.

(iv) Thanks:

Monica Price at Oxford is now fully in charge of production of c.r.c. and the Group owes her and Oxford University Museum particuiar thanks for revolution, in the appearance of our journal. In Leicester, the County Council's Reprographlcs Unit contlnues to print what we want, when we want it, and at an eminently reasonable cost; and those stalwarts of the Earth Sciences Section of Leicestershlre Museums Service - John Martin, Mike Taylor and Arthur Cruickshank - look after distribution, as ever; while Judy Marvin continues to word-process material for us efficiently and effectively. All of this Leicester-based support for the Group's endeavours ultimately depends on the backing of the county's Director of Museums & Arts, Tim Schadla-Hall, for which GCG remains very grateful.

Finally, the traditional 'thank you' to all the GCG members who have submitted material in 1991 - without it there would be no journal.

Comments:

John Cooper invited comments on the new appearance of *Geological Curator*
- very good
- inking on some pages rather pale.

The Chairman thanked Peter for his report.

8. Recorder's Report from John Nudds

Preoccupation with matters concerning the Earth Science Review Museums and Collections Exercise, has led to a delay in the final editing of the proposed GCG Directory of British and Irish Geological Museums, but this will certainly now be completed soon after Christmas. At that stage edited entries will be sent back to compilers for checking and updating before going to press.

Sixty six museums responded to the original request for information, but there are still a few notable omissions: final requests for information will be mailed in January and failure to reply at that stage will result in your museum being excluded or at best mentioned only briefly.

Any individuals that I have failed to contact, but who feel that collections in their institutions warrant inclusion in the Directory should please contact me as soon as possible.

It is hoped to be able to include some illustrative material in the Directorv and suitable contributions 1 black & white or colour, slides or prints) of building exteriors, galleries or of particularly fine or aesthetic specimens should also be sent to me at The Manchester Museum, The University, Oxford Road, Manchester M13 9PL.

Comments:

John Nudds expressed his thanks to all those who had competed the questionnaire and asked for anyone who has not yet. done so to do so as soon as possible. Publication is planned for the end of 1992 .
The Chairman thanked John for his report.

9. Public Relations Officer's Report

None was given.

10. National Scheme for Geological Site Documentation Coordinator's Report - from Mick Stanley.

Comments:

Mick added that he is very pleased that Charlie Copp has stepped in as there are difficulties for Alan Clayton at BGS. Roy Clements asked if Geol. Soc. are still supporting the scheme. Mick replied 'yes' and added that there are plans to rewrite the 'Record of the Rocks' leaflet which the Geol. Soc. may fund.

11. Election of Officers and committee

John Cooper expressed his thanks to the retiring members. The Committee's nominations were given on the agenda sheet andthere being no other nominations they were elected en bloc. John Cooper then welcomed the new members - Roy Clements, Chris Collins, Paul Ensom and Kate Pontin. All Officers of the Committee were elected en bloc for another year.

12. Nomination of Auditors

As Ken Sedman and Peter Davies were happy to continue acting as auditors they were re-elected.

13. Any other business

There was none.

14. Date and venue of 18th AGM

Thursday 3 December 1992 at Scunthorpe Museum.

Finally John Cooper gave a vote of thanks to Dudley Metropolitan Borough Council for hosting the meeting, for use of the room and for the splendid lunch.

Annual Accounts 1990 (6 December 1990 - 4 December 1991)

	1991	1990
Current Account Income		
Subscriptions	2490.82	2234.50
Sale of backnumbers	2.50	274.89
Advertisements	500.00	50.00
Sale of reprints	-	5.00
Meetings fees	118.00	158.30
Inserts	60.00	60.00
'Thumbs-up' sticker	-	2.00
Sale of Vol. 5(5)	-	180.00
Reading Borough Council	-	180.00
Curry Fund	200.00	-
Transfer from Premier Interest Account (PIA)	-	1900.00
Balance	143.08	350.81
	£3514.40	£5395.50

	1991	1990
Current Account Expenditure		
Geological Curator		
Printing	570.71	2445.63
Postage	-	508.15
Typing	100.00	399.00
Meetings		
Committee	108.00	146.30
York	70.00	-
Haslemere	72.00	-
Perth	135.00	-
Oxford	-	75.00
Cromer	-	105.00
Dresden	175.00	-
Coprolite		
Print and distribute	1091.29	771.36
Other expenditure		
Disc transfer	-	43.13
Sundries	-	31.11
Bank charges	-	9.94
Design costs	57.50	112.50
Print new stationery	-	255.30
A. G. Brighton Fund donation	-	250.00
Geological Society	-	100.00
Geol. Ass.	100.00	-
Order Books	64.63	-
NMW	180.00	-
Geol. Coll. Comp.	500.00	-
Working Group Lunch	16.80	-
Balance	272.67	143.08
	£3514.40	£5395.50

Premier Interest Account Income		
Interest	1092.34	1292.92
A.G. Brighton	2376.44	-
Balance	10303.12	10910.20
	£13771.90	£12203.12

Premier Interest Account Expenditure		
Transfer to current account	-	1900.00
Balance	13771.90	10303.12
	£13771.90	£12203.12

Total Income	6840.10	4437.61
Total Expenditure	3241.73	5252.42
	£3598.37	£-814.81

[signed] A. Newman *GCG Treasurer*

[signed] P.S. Davis and K. Sedman *Auditors*

GEOLOGICAL CURATORS' GROUP

19th Annual General Meeting

3rd December 1992 at Scunthorpe Museum and Art Gallery, Scunthorpe.

30 members attended.

1. Apologies for absence

Received from Phil Doughty, Steve Howe, Kate Pontin, Sue Rainton and Tome Sharpe.

2. Minutes of the 18th Annual General Meeting 1991

Mick Stanley proposed that the minutes be accepted, and this was seconded by Steve Tunnicliffe, and passed by those present. The minutes were signed by the Chairman.

3. Matters arising

GCG/BCG merger; Don Steward asked John Cooper to expand on the reported GCG/BCG merger and Mark Simmons pointed out that members had not been informed about this matter and members should have the opportunity of contributing to discussion. In his reply John Cooper stressed that the work of GCG would be diluted by a merger and thought there are many areas where the Groups can work together, they should keep their separate identity. Simon Knell reminded members that there had been several joint meetings between the Groups. Roy Clements also pointed out that the GCG was set up for geologists, not especially for curators. Chris Collins mentioned that he had benefited from attending meetings in America where biological and geological conservators met together. Paul Ensom suggested that an annual meeting along the lines of the Museums Association woth workshops would bring everyone together. The idea of such a joint meeting was supported. Kate Andrew, Nigel Mann and Mick Stanley contributed to the discussion.

4. Chairman's Report from John Cooper

My third and final year as Chairman comes to a close with something of a bang. One of my objectives when I took over as Chairman was to press for the scope of the Group's interests to widen into Europe where so many opportunities for collaborative ventures were appearing. Co-incidentally, the Madrid meeting this year took some edge off this initiative, but nonetheless I was able to suggest in my last report that a meeting of European geological curators, organised by this Group would be held in Brussels. Sadly, our putative hosts in Belgium could not oblige. However, just last week, I had it confirmed that The Senckenberg Museum in Frankfurt, Germany are able and willing to host such a meeting in 1994. Thus, your new Chairman and Committee will have plenty to do in this regard, so watch out for further reports in *Coprolite*.

This year saw the inauguration of the Brighton Medal, with the presentation in March of Founder's Medals to Mrs Edith Brighton and posthumously to David Price, received by his widow, Mrs Valerie Price. At to-day's meeting we have made the presentation of the first award to Dr Charles Waterston. I am proud to have been associated with this marvellous initiative of the Group, conceived by David Price.

Simon Knell's Secretary's Report will detail the meetings and seminars which have been successfully held throughout the year and on one that had to be cancelled. This is a rare event in the Group's history of meetings, and one which we hope will not be repeated in the near future. As Simon will explain, Committee has decided to explore the practicalities of a Membership Secretary during the coming year, and pending a successful outcome of this trial, next year's AGM will be asked to ratify a new Committee Officer post. This move will, I hope, ease the burden of meeting organisation.

Your Committee discussed the various suggestions concerning the possibilities of a new British group for museum natural historians which emerged from the Madrid meeting on the preservation and conservation of natural history collections. One suggestion was a merger with our friends in the Biology Curators Group, another,
that there should be a UK branch of the USA organisation SPNHC. Both suggestions found no support within Committee but we were pleased to endorse the feeling among others that a new group for natural history conservators, including geology, was required. A meeting took place at the Natural History Museum in November where the interested parties present agreed with this conclusion and further agreed that such a group should emerge under the umbrella of UKIC. The GCG will be happy to co-operate in every way with this fledgling organisation and we wish it success.

Two further items are worthy of note in a busy year. John Nudds, our Recorder has been busy finalising the text for a Directory of British Geological Museums, an initiative of mine three years ago, which with John's hard work will bear fruit next year. The preparation is virtually complete and the Geological Society's Publishing House in Bath has agreed to publish the Directory on our behalf. My thanks to John for his remarkable effort. Secondly, we have advanced the Group's new publicity leaflet almost to completion, with only a few alterations to text, plates and cover design needed before printing commences. We hope that this will encourage new members to join and will spread knowledge of our activities far and wide, especially in Europe.

In noting some of these more obvious Group successes, I should not fail to mention the continuing progress in many other areas of our endeavours - *The Geological Curator*, *Coprolite*, and the National Scheme for Site Documentation, which you will hear more of in Officers' reports. In particular, several members of the Group assisted in the preparation of the Museum Association's Standards in the Care of Geological Collections which will appear next year under the capable care of Crispin Paine.

On a negative note, I regret that in the end, my initiative on terminology failed to get off the ground. I had hoped to advance this particular cause during this my last year, but local factors conspired against me. The Group will continue to seek progress in this area.

I must thank not only all my fellow committee members for their hard work this year, but also they and their predecessors over the last three years for their great support and encouragement. I know that I will be leaving the Group in very capable hands and wish Paul Ensom as 'Chairman-select' good luck for the next three years. I trust that I have been able to add a few more bricks to the wall.

5. Secretary's Report from Simon Knell

The Group ran two workshops, a concurrent session at the Museums Association conference, a week long training course and organised 4 seminars during 1992.

The GCG were co-sponsors of Conserving Britain's mineralogical heritage, a major international conference on the conservation of mineral sites which ran from the 31 March to the 2 April at the University of Manchester. Reaching a common standard: control of terminology in geological documentation on 7 July at Sunderland Museum demonstrated the problems of terminology and the different approaches museums were taking. This was followed by a field day looking at some superb mineral and fossil exposures in the North East. Fossil digs: the practicalities of fossil excavation on 3 December examined the role fossil excavation in museums and ways in which this might be achieved. The previous day was spent exploring the impressive Chalk sequence at Middlegate Quarry, South Ferriby and the Lias to be found in the Scunthorpe ironstone mines. Unfortunately, a seminar on Geology and Museum Education due to be held on the 29 September had to be cancelled due to a lack of interest.

The GCG's Museums Association concurrent session, Documenting the landscape examined terminology control in site recording.

A workshop on advanced techniques in mineral identification was organised at the Geology Department, University of Manchester and one on microenvironments for geological specimens was held at the Geological Conservation Unit at the University of Cambridge.

The BCG/GCG/University of Sheffield Natural Sciences Training Course ran from 5-10 April and attracted 12 students. A total of 55 students have taken this course since 1988.

Thanks to all our organisers and helpers: Mike Bishop, Chris Collins, Peter Davis, Amanda Edwards, Steve McLean, Kate Pontin, Sue Rainton and Bob Toynton.

GCG Committee met 5 times in 1992: 4 February (Burlington House); 28 April (Leicester); 17 June (AMSSEE HQ); 2 September (York); 17 November (MGC).

The decline in attendances at our seminars which has been noticed in recent years and which culminated in the cancellation of the St Albans meeting is being addressed in two ways. Firstly, through the pages of *Coprolite* we intend to gather opinions on the reasons for this decline and develop a seminar programme which better meets the needs and resources of the membership. This might mean a reduction in the number of meetings organised each year and the introduction of a major conference instead. Our second line of attack has been to appoint Colin Reid to the Committee to undertake the coordination, development and publicity of the meetings programme. You may remember that Colin organised one of the Group's largest meetings in Dudley last year.

Committee have also given support to the development of a natural sciences course at the Department of Museum Studies, University of Leicester. It is envisaged that this will replace the BCG/GCG/University of Sheffield course. The Sheffield course has been one of our greatest successes largely due to the work of Bob Toynton and Peter Davis, supported by a great many volunteers. It has demonstrated the need for induction level training for museum natural scientists. However, now the Department of Museum Studies is developing a new course which includes modules on natural science collections and the investigation and communication of science. These modules can be taken individually or as part of the full-time or part-time Diploma or Masters course. One of the main advantages of this new course is that anyone opting to take a single module can progressively work towards a recognised qualification whilst still giving the specialist groups input into course development. It is hoped that we may be able to use Bob's talents in other GCG led training initiatives in the near future. Chris Collins at the Sedgwick Museum is also organising workshops and developing a training course in geological conservation.

In 1993 a workshop will be run at the University Museum, Oxford on Getting to grips with your mineral collection. The Geological Conservation Unit, Cambridge are also organising a number of one day workshops. The Group's meetings will be in Bristol on marketing geology (22 April), the Geological Society on fakes (15 July), Cambridge on building stones (21 September) with the AGM at the Hunterian Museum, Glasgow on learning by our mistakes on the 8 December.

6. Treasurer's Report from Andrew Newman

The Geological Curators Group has total assets of £14960. 72. This together with the surplus of income over expenditure will mean that once again that the group will not increase its subscription rates. I would like to thank members for the prompt payment of subscriptions which has resulted in much higher income from this source than previous years. Pressure on institutions budgets will inevitably mean that committee costs will rise. This has not as of yet become unmanageable but is being monitored. Some of the surplus will be used for the publication of a new membership leaflet in the new year.

(i) Membership

There has been a net loss of 8 subscriptions during 1992 The total membership is 458 and comprises of:

UK personal members	248
Overseas personal	51
UK institutions	101
Overseas institutions	58

This small loss of membership is not a satisfactory situation but may reflect the general economic depression. The long awaited membership leaflet will soon be produced and will hopefully help to rectify the situation.

(ii) Finance

The accounts for the period 4/12/91-3/12/92 are attached.

I would like to thank P. S. Davis and K. Sedman for their annual audit.

7. Editor's Report from Peter Crowther

(i) 1992

Only one issue of *The Geological Curator* has been published this year: Vol.5, No.7, pp.261-300, formally published 21 February 1992 and distributed to members mid-March. It was devoted to the proceedings of GCG's Dublin meeting, held in June 1990 under the title 'Gems under green wraps'. This was a particularly high quality issue, reflecting the efforts of the four contributors in compiling authoritative summaries of the history of their respective collections (Patrick Wyse Jackson - Trinity College Dublin; Nigel Monaghan - National Museum of Ireland; Andrew Sleeman - Geological Survey of Ireland; and David Harper - James Mitchell Museum, University College Galway) It is pleasing to report that, in addition to the 450 copies distributed to GCG members, another 100 have gone to Ireland for resale.

Two further issues are presently passing through the production process described in my report to the 1991 AGM at Dudley. Indeed, the three major articles then promised for publication in 1992 (Kate Andrew - 'John Watson and the Cambridge Building Stone Collection'; Jack Morrell - 'Perpetual excitement: the Heroic Age of British Geology'; and Steve Howe - 'James Frederick Jackson') already exist in camera ready form. Unfortunately, other pressures have delayed preparation of such regular features as 'Lost & Found', 'Notes & News', etc. Nevertheless, the early months of 1993 will see the appearance of Vol. 5, No. 8 and No. 9 in quick succession.

(ii) 1993

A healthy number of articles have been submitted in recent months. Some result from the Group's meeting in Sunderland on 7 July, devoted to controlling terminology in geological documentation. Others were triggered by the one day meeting held in Bristol on 15 September for palaeontological preparators and conservators; this has staged as part of the Symposium on Vertebrate Palaeontology and Comparative Anatomy. I am delighted that such contributions are coming in, to begin to dilute the concentrated fare of collections research which has dominated our journal in recent years. It may consequently prove possible to construct two loosely thematic issues on 'documentation' and 'conservation', for publication later in 1993.

I am also hopeful that 1993 will see the publication of the Index to Volume 3, currently being compiled for us by Justin Delair.

(iii) Thanks:

The Group owes many thanks to Monica Price, whose hours spent wrestling with the intricacies of 'PageMaker' on her PC at Oxford University Museum give our journal an increasingly professional appearance. And all this in addition to preparing *Coprolite*!

In Leicester the County Council's Reprographics Unit turns camera ready copy into finished *Geological Curators* efficiently and economically; every member of the Leicestershire Service's Earth Science Section gets involved in distribution; and Judy Marvin never fails to produce top quality word processing. Only the continuing support of John Martin (Keeper of Earth Sciences) and Tim Schadla-Hall (Director) make this possible. We are grateful to all involved in Leicester.

In Manchester John Nudds, the Group's Recorder, has kindly taken on the unglamorous but essential role of caring for the stock of *The Geological Curator* and its predecessor, the *Newsletter*. As well as providing the now quite considerable storage space required (and we all know how valuable that commodity can be), John is processing all orders for back-numbers.

Once again, I thank all GCG members who have submitted material in 1992 - and encourage those who didn't to take the plunge in 1993!

8. Recorder's Report from John Nudds

The Geological Society has kindly agreed to publish the GCG's Directory of Geological Museums and the text is now with their publishing house. In the end 85 museums contributed to the Directory and this excellent response will ensure the success of this venture. Those institutions that did not respond will still appear in the Directory, but only as a contact address in the appendix. Of the 85 museums, 51 have

returned to me edited copies of the first draft which I circulated. The remainder are relying on my own rather rushed editing of their drafts. The bad news is that only 26 museums have contributed illustrations to the Directory. It now seems that the Geological Society publication will allow us to include one figure for each institution. I have therefore circulated contributors again within the last few days asking, if at all possible, for a print or slide, colour or black/white of your museum exterior, or of a gallery or of a particularly aesthetic or important specimen.

Once again may I thank all contributors to this project. We are hoping for a publication date sometime in the Spring of 1993.

9. Public Relations Officer's Report

None was given.

10. National Scheme for Geological Site Documentation Coordinator's Report from Mick Stanley.

NSGSD Steering Group

The group has met twice since the last report, at Dudley Museum during the last AGM, and at Peterborough in June. Discussions have centred on software development of GDl, and the continuing unsettled relationship between NSGSD and BGS, and RIGS.

Software

Charlie Copp (ANTEC) has re-written GDl, which was demonstrated at Dudley last December; the new software is GD2 which will become GD3 when Advanced Revelation 3 is generally available (a run time version of ARev 3 is likely to be about £120). GD2 is currently at 8 beta test sites, that's pilot development sites to you and me - Avon (Charlie Copp), Brecon (Duncan Hawley), Brighton (John Cooper), Carlisle (Steve Hewitt), Guernsey (Alan Howell), Scunthorpe (Sue Rainton), Somerset (Bill Butcher) and Sunderland (Steve Mclean). Many new features have been developed and this will continue as piloting ensues. GD2 is available free with an installation charge of £200. Contact Charlie Copp for details. Should local funds to install the software be a problem or you don't have the hardware then perhaps your country conservation agency (EN, SNH, CCW) the GA's Curry Fund, Area Museum Council, COPUS (for public display) or the Geological Society may be able to help. GD2 is even more versatile and flexible than GDl.

Geological Records Centre

During the year it was decided that Charlie Copp would hold the NSGSD database until a permanent home was established due to the unsettled position with BGS. Unfortunately that is still the case and the Steering Group is eternally grateful to Charlie Copp for maintaining the database.

Lack of finance is blamed for the inability of BGS to continue to act as a central repository. We hope that BGS will change its mind. 12,000 records are held in the database, a far cry from the 25,000 reported in 1988. 3,000 are held in machine readable form elsewhere, 3,000 were deemed not capable of entry in the time available under the NCC contract, giving a grand total of 18,000 records ie the usual overestimation of records held. Record Centres should have now all received back their paper copies of records and some their computerised records as well. Data was very variable and some centres are revising quite drastically their records after computerisation, including re-surveys and editing.

RIGS

Record Centres are generally involved with RIGS groups especially in supplying site data for RIGS evaluation. 46 groups exist or are nearly formed with new groups emerging in Scotland and Wales. RIGS has materially benefited from the National Scheme and vice versa but the greatest benefit to both has been the recent appointment of Carol Graham as RIGS Support Officer based at RSNC in Lincoln. The newsletter *Exposure* should be landing on your desks in Record Centres in the new year, to follow *Down to Earth* and *Insite*.

Mick explained that he has not had time to circulate requests for annual updates to the Centres so there has been no feedback for two years. He also commented that the leaflet *Record of the Rocks* needs revamping.

11. Election of Officers and committee

Chairman - Paul Ensom was elected (there were no other nominations).
Committee Member - Colin Reid was elected (there were no other nominations).
Officers and Committee Members - all other officers and committee members offered themselves for re-election. They were re-elected en bloc.

12. Election of Auditors

The re-election of Paul Davis and Ken Sedman was proposed by Andy Newman, seconded by Mick Stanley and approved.

13. Any other business

Paul Ensom proposed a vote of thanks to the out-going Chairman John Cooper, and he summarised John's achievements and activities.

Scunthorpe Museum were thanked for hosting the Meeting.

Annual Accounts 1992 (4 December 1991 - 3 December 1992)

	1991	1990
Current Account Income		
Subscriptions	2490.82	2234.50
Sale of backnumbers	2.50	274.89
Advertisements	500.00	50.00
Sale of reprints	-	5.00
Meetings fees	118.00	158.30
Inserts	60.00	60.00
'Thumbs-up' sticker	-	2.00
Sale of Vol. 5(5)	-	180.00
Reading Borough Council	-	180.00
Curry Fund	200.00	-
Transfer from Premier Interest Account (PIA)	-	1900.00
Balance	143.08	350.81
	£3514.40	£5395.50

	1991	1990
Current Account Expenditure		
Geological Curator		
Printing	570.71	2445.63
Postage	-	508.15
Typing	100.00	399.00
Meetings		
Committee	108.00	146.30
York	70.00	-
Haslemere	72.00	-
Perth	135.00	-
Oxford	-	75.00
Cromer	-	105.00
Dresden	175.00	-
Coprolite		
Print and distribute	1091.29	771.36
Other expenditure		
Disc transfer	-	43.13
Sundries	-	31.11
Bank charges	-	9.94
Design costs	57.50	112.50
Print new stationery	-	255.30
A. G. Brighton Fund donation	-	250.00
Geological Society	-	100.00
Geologists' Association	100.00	-
Order Books	64.63	-
NMW	180.00	-
Geol. Coll. Comp.	500.00	-
Working Group Lunch	16.80	-
Balance	272.67	143.08
	£3514.40	£5395.50

Premier Interest Account Income		
Interest	1092.34	1292.92
A.G. Brighton	2376.44	-
Balance	10303.12	10910.20
	£13771.90	12203.12

Premier Interest Account Expenditure		
Transfer to current account	-	1900.00
Balance	13771.90	10303.12
	£13771.90	£12203.12

Total Income	6840.10	4437.61
Total Expenditure	3241.73	5252.42
	£3598.37	£-814.81

[signed] A. Newman *GCG Treasurer*

[signed] P.S. Davis and K. Sedman *Auditors*

AWARD OF THE FIRST A.G. BRIGHTON MEDAL TO DR CHARLES WATERSTON

Address by John Cooper, Chairman of the GCG at the GCG AGM Scunthorpe 3rd December 1992.

On this the last day of my three year period of Chairmanship of the Group it is my great privilege and pleasure to present the first award of the A.G. Brighton Medal to Dr Charles Dewar Waterston.

This medal was inaugurated in March of this year by the gift of a medal to 'Bertie' Brighton's widow Edith - still well though frail at almost 90 years old, and the presentation of a Founder's Medal posthumously awarded to David Price, whose sad death occurred just over one year ago. His widow Valerie received the medal on his behalf. The ceremony took place in the Sedgwick Museum, Cambridge [see *Geological Curator* 5(8) p. 333].

David Price, as Curator of the Sedgwick had recognised through his own work at the Sedgwick, the enormous contribution of Bertie Brighton during his long period of work at the Museum from 1931 to 1968. This Group agreed wholeheartedly with David that as an emergent professional body, the GCG should institute an award to recognise outstanding contributions to museum geology, and that it should be named after Bertie, a recognition never given to him during his own lifetime.

Under the terms of the award, the Brighton Medal is essentially within the gift of the GCG Chairman, aided and abetted by a small number of senior professionals within the Group's membership. On this first occasion, one of these advisors said to me that had I not been putting Charles' name forward, then he would have found it very difficult to help me.

In order to begin to grasp an understanding of Charles' contribution to museum geology, younger members of the profession should read two important publications. The first, *Geology and the Museum* (Waterston 1972) was the written account of his Presidential Address to the Edinburgh Geological Society in 1971. The second made a particular impression on me at the 1978 Colloquium on Curating in Palaeobiology in Cardiff and was entitled *The unique role of the Curator in Palaeontology* (Waterston 1979). The aims of our Group could certainly have been derived from the first paper and the second could have provided a model job description!

Despite this, Charles' introduction to the Group was no push-over: by his own admission he was "suspicious at first" but I am pleased to say that he now considers the Group to be the "greatest influence for good in the curation of geological collections for half a century".

Charles Waterston

Charles Waterston was born in 1925, obtained a first class honours degree from Edinburgh in 1947, followed by a PhD in 1949. His list of scientific contributions is long and embraces aspects of sedimentology, stratigraphy, mineralogy, and biography, but perhaps most famously, palaeontology, through his studies of fossil arthropods, particularly eurypterids. During his career he has held many important offices including those of General Secretary and Executive Editor of the Royal Society of Edinburgh, Secretary and President of the Edinburgh Geological Society as well as sitting on many committees including the Palaeontological Association, NCC in Scotland, Council for Museums and Galleries in Scotland and currently, I believe, the Scottish National Heritage Committee. But Charles' most significant contribution comes through his career in the National Museum of Scotland, in what is now the Royal Museum of Scotland in Edinburgh, formerly the Royal Scottish Museum. Charles joined the Museum in 1950 as an Assistant Keeper of Natural History, was promoted to Assistant Keeper responsible for Geology in 1955 and again in 1963 when he became the first full Keeper of the new Department of Geology, in which post he remained until retiring in 1985. Whilst publishing

nearly 40 papers during this time, he continued to be an outstanding manager, a gentleman and a caring and listening boss. The term 'laird' was mentioned to me as applying to Charles and I would like to think that the title of 'Laird of the Royal Museum' might be appropriate if protocol allowed.

In this short address, I have attempted to crystallise the reasons for making this award, not only for those present, but also for those who read this account in the future. In doing so I would like to remind you of your kindly review of our 1985 *Guidelines* (Brunton, Besterman and Cooper 1985) and since my name is included in its authorship I was more than a little interested. Your story went, in praise of the *Guidelines*:

'I didna ken' pleaded the man before Lord Braxfield. Weel ye ken noo' was his lordship's reply. With the *Guidelines* in our hands ignorance is a plea that will no longer carry."

I will end by quoting your final line and apply it in the hope that with this Award, it will reflect the state of our knowledge about your eminent contribution to our profession: 'we a' ken noo!'

Reply from Charles Waterston

Chairman - when you wrote in July telling me of the Group's decision to give me the first A.G Brighton medal, I was sure that there had been a mistake. Me - why me? I could think of many curators who have done more than I for geological collections and who, I still think, are more deserving of the award. I concluded that the Group may have wished to do honour to my grey hairs before it is too late! "There are so few who can grow old with a good grace" complained Steele long since, and indeed it would be graceless in me not to admit the pleasure that the Group's decision has given me.

It gives me pleasure on two counts. Firstly it is an honour to have one's name associated in this way with that of the late Bertie Brighton. It was with a sense of awe that I met him, during his reign at the Sedgwick Museum, for he embodied all the professionalism to which we younger curators aspired. His achievement in managing the collections of that great Museum will benefit his successors for many generations. His painstaking identification and meticulous recording of tens of thousands of specimens was a prodigious accomplishment the extent of which can be fully understood only by users of the collection.

Secondly I take pleasure in being representative. In honouring me the Group honours someone who has tried to do what you all do. Having been appointed to responsibility for an extensive, but long neglected, geological collection, I did what I could to bring it back to life. I know that I have fallen short of my own ambition for the collection and, being but human, have made mistakes. Such success as I have had has been due to good fortune. Good fortune that I was working at a time when funds were available - although never enough - to provide storage for much of the collection and a working laboratory for conservation and research. More importantly, good fortune that I was able to appoint a team of wonderful people to the task; it is only through their efforts that anything significant was done. Lastly good fortune in the enthusiasm and quality of my successor.

Chairman, in my view the Curators' Groups have done more, in a relatively short time, for the good of museums and for those with immediate responsibility for the care of collections, than any other movement. Is it too much to hope that Ministers of the Crown and Boards of Trustees may yet learn from such groups that their first charge, so far as museums are concerned, is to maintain our collections for the advancement of learning and useful knowledge and enhance them by wise additions using current opportunities which may never recur? By this stewardship they will be judged. Others may entertain, educate and do research, all activities appropriate also to the museum, but the authorities must recognise that only trained curators are equipped to maintain collections and must be given the means to do so. Only by facilitating their curators can these authorities discharge their responsibility to hand on to future generations the collections which they inherited in a better state than they found them.

I salute the Geological Curators' Group for establishing that the care of our heritage of geological collections is a concern of prime importance and through you, Chairman, thank the Group for the great honour they have done me.

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GEOLOGICAL CURATOR

Publication scheme

Two issues of *The Geological Curator* are published for each year (in March and September); a complete volume consists of ten issues (covering five years) and an index.

Notes to authors

Articles should be submitted as hard copy in the journal style typed on good quality paper (A4 size) double spaced, with wide margins, and if possible on disk (preferably formatted for a Macintosh in Microsoft Word or MacWriteII, although other disk types will be accepted - please quote system type and wordprocessing package used). Three copies should be sent to the Editor, Patrick N. Wyse Jackson, Department of Geology, Trinity College, Dublin 2, Ireland (tel 01 7021477; fax 01 6711199). Line drawings should be prepared in black ink at the desired publication size. Photographs for halftone reproduction should be printed on glossy paper. Both drawings and photographs should be proportioned to utilise either the full width of one column (85mm) or two (175mm). References in the text follow the Harvard system, i.e. name and date '(Jones 1980)' or 'Jones (1980)'. All references are listed alphabetically at the end of the article and journal titles should be citedin full. Authors will normally receive proofs of text for correction. Fifty reprints are supplied at cost. Major articles are refereed. Copyright is retained by authors.

If submitting articles on disk please note the following:

1. Do not 'upper case' headings. **Keep all headings in upper and lower case.**
2. Use **italics** rather than underline for latin names and expressions, journal names and book titles. **Use bold** for volume numbers in references.
3. Line spacing. Your hard copy should be double spaced. If possible, **single space** your copy on disk. Use a **single (hard) carriage return** at the end of each paragraph.
4. Single space-bar between words, **double space-bar between sentences.**
5. **Do not attempt** to format your article into columns. Use a minimum of tabs and indents.

Regular features

LOST AND FOUND enables requests for information concerning collections and collectors to reach a wide audience. It also contains any responses to such requests from the readership, and thereby provides an invaluable medium for information exchanges. All items relating to this column should be sent to the Editor (address above).

NOTES comprising short pieces of less than two pages are particularly welcome. Please send contributions to the Editor (address above).

CONSERVATION FORUM helps keep you up to date with developments in specimen conservation. Information on techniques, publications, courses, conferences etc. to Christopher Collins, Sedgwick Museum, Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge CB2 3EQ (tel. 0223 62522)

BOOK REVIEWS contains informed opinion about recently published books of particular relevance to geology in museums. The Editor welcomes suggestions of suitable titles for review, and unsolicited reviews (of 500 words maximum) can be accepted at his discretion. Publishers should submit books for review to the Editor.

INFORMATION SERIES ON GEOLOGICAL COLLECTION LABELS consists of loose A4 size sheets, issued irregularly, which carry reproductions of specimen labels usually written by a collector of historic importance. The aim of the series is to aid recognition of specimens originating from historically important collections. Contact Ron Cleevely, Department of Palaeontology, The Natural History Museum, Cromwell Road, London SW7 5BD.

Advertisement charges

Full A4 page	£60 per issue
Half A4 page	£40 per issue
Quarter A4 page	£25 per issue

Discounts for space bought in three or more issues. Further details from the Editor.

Inserts such as publishers' 'flyers' can be mailed with issues of *The Geological Curator* for a fee of £60. 550 copies of any insert should be sent to the Editor.

Subscription charges

UK Personal Membership	£7 per year
Overseas Personal Membership	£10 per year
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All enquiries to the Treasurer/Membership Secretary, Andrew Newman, Department of Archaeology, University of Newcastle, Newcastle-upon-Tyne NE2 4PT (tel/fax. 091 222 7426).

Backnumbers

Backnumbers of *The Geological Curator* (and its predecessor, the *Newsletter of the Geological Curators' Group*) are available at £2.50 each (£5.25 for the double issues of Vol. 2, Nos. 9/10 and Vol. 3, Nos. 2/3; £7.50 for Vol. 4, No.7 Conference Proceedings) including postage. Orders should include payment and be sent to the Treasurer (address above).