ISSN 038-681X

GCG

NEWSLETTER OF THE GEOLOGICAL CURATORS GROUP

VOLUME 2 No. 5 APRIL 1979

PHILIP MOORE CALLOW KERMODE

and Nassa kermodei

FRONT COVER

illustrates one of a set of four stamps issued on the 27th February 1979 to commemorate the centenary of the Isle of Man Natural History and Antiquarian Society which came into existence in 1879. Messrs. Philip M. C. Kermode, R. W. O. Rutledge & Edwin Birchall, F.L.S., circulated a letter convening a meeting with the object of forming "a Club for promoting the Study of Natural History in the Isle of Man." Mr. Rutledge died before the meeting took place, but those who attended unanimously elected Mr. Birchall to be President and Mr. Kermode to be Hon. Secretary. In March 1880 Mr. Kermode delivered a paper entitled "A plea for the study of Natural History in the Isle of Man" in which he described the great importance of, and the good that could come from, having a wider knowledge of the various aspects of Nature, (Botany, Zoology, Geology & Mineralogy) finishing his address with these words "Who is willing to help?"

Since then many people have been willing to help and much original research has been carried out. The result of this research has been printed in the Society publication, which was at first called "Yn Lioar Manninagh" (lit. the Manx Book) covering the period 1880-1906; since then it has been known simply as "Proceedings of the Natural History & Antiquarian Society."

Philip Moore Callow Kermode was born at Ramsey in 1855, the son of the Rev. William Kermode. He received part of his education at King William's College and was admitted to the Manx Bar in 1878. In 1885 he was elected President of the Natural History & Antiquarian Society, a position he was to hold also in 1904, 1907, 1908 & 1930. He was Hon. Secretary during the years 1880-1883, 1889-1903 & 1909-1914. The work for which he is most well known is as a gifted antiquarian, and in 1907 he published a huge book about his researches into the Manx Celtic & Norse Crosses which is still referred to by students and experts alike. He was a constant advocate for a Manx National Museum and when, in 1922, he saw that dream materialise he became its first curator.

When Prof. Percy K. Kendall, F.G.S., Lecturer in Geology at the Yorkshire College, Leeds, undertook his memoirs on the Glacial Geology of the Isle of Man he had the help of Mr. Kermode. Prof. Kendall acknowledged this help by naming a sub-fossil shell Nassa kermodei with this dedication - "It affords me great pleasure to do honour to a naturalist native to the Isle of Man by naming my shell after my valued friend, Philip M. C. Kermode."

Philip M. C. Kermode died in 1932 and tributes to his life's work were received from eminent people from many countries.

Backnumbers of Newsletters are still available at £1.00 each (including postage). Remuneration must accompany all orders, which should be sent to John Martin, Leicestershire Museums, 96 New Walk, Leicester, LE1 6TD.

Submission of MSS

Three Newsletters are published annually. The last dates for submission of MSS for publication are:

November 1st for January issue
March 1st for April issue
August 1st for September issue

MSS should be sent to the editor typed and double-spaced, please.

ADVERTISEMENT CHARGES

Full A4 page	£20 per issue
Half A4 page	£10.50 per issue

Further details from the Editor.

For further details please contact either the Editor or the Secretary.

GEOLOGICAL CURATORS GROUP

(AFFILIATED TO THE GEOLOGICAL SOCIETY OF LONDON)

CHAIRMAN: Dr. Hugh S. Torrens, Geology Dept., University of Keele, Keele, Staffs., ST5 5BG. Tel: 0782-621111, Ext. 93.

GENERAL SECRETARY: Philip Doughty, Ulster Museum,Botanic Gardens, Belfast, BT9 5AB. Tel: 0232-668251:5.

TREASURER & MEMBERSHIP SECRETARY: John A. Cooper, Leicestershire Museums, Art Galleries and Record Service, New Walk, Leicester, LE1 6TD. Tel: 0533-539111, Ext. 263.

EDITOR: Brian W. Page, Geology Dept., University of Keele, Keele, Staffs., ST5 5BG. Tel: 0782-621111.

COLLECTIONS INFORMATION TO - Dr. Hugh S. Torrens. (Chairman)

CONTENTS

VOLUME 2 No 5

Actual Date of Publication 14th June 1979

AN EXPERIENCE FROM THE OTHER SIDE

(We gratefully acknowledge the author's permission to publish this article which first appeared on 22nd March 1979 under the title "Harvest of Stone" in "The Lady" magazine.)

Last week we went to London with, as we thought, an Iguanodon's tooth. It had taken us almost exactly thirty years to do this. Way back in 1947 we were engaged in a mighty battle to create a garden in heavy Sussex clay, and while digging in this clay my husband unearthed a large, curiously axe-shaped stone. It wasn't a flint, therefore we ruled out the idea of an ancient Briton axe-head. So what was it?

There was so much to do around our newly-built house and garden that we never got as far as the Archaeological Museum in Lewes. The stone was put in a place of honour on the mantelpiece, and in emergencies it served as a good paperweight, or sometimes a door-stop. Sometimes we looked at it and wondered.

It wasn't until the summer of 1977 that we found our first clue. By this time my husband had retired, and we were busy improving our minds with local history and general culture. In the Worthing Museum one day we spotted a stone rather like ours, labelled as being an Iguanodon's tooth.

This shed an entirely new light on the object. Still in the grip of inertia, however, we continued to let it sit on the mantelpiece until last week, when we set out, in our quest for culture, on a trip to the Victoria and Albert Museum. It suddenly occurred to us that the Natural History Museum was right next door, and we decided to take our stone there for inspection.

So we plodded along Cromwell Road and into the Natural History Museum, past crowds of noisy children all eating ice-cream regardless of the cold and of the notice that said fiercely NO ICE CREAM TO BE TAKEN BEYOND THIS POINT. Inside the Museum all one could see, apart from two enormous elephants, was another vast melée of children - it was, it seemed, half-term. We fought our way through them to an attendant sitting at a desk, and showed him our stone. He looked at it and, after some reflection, told us to take it to the Department of Palaeontology, which he kindly interpreted as fossils.

It was fun, this, because the way led through the Department of Dinosaurs, Brontosauri and Iguanodons, and we joined the children gaping at these monsters. One thing, though, caused us slight misgiving - a descriptive notice by the Iguanodon stated that it was vegetarian, and what's more it didn't seem to have any teeth.

The door to the Palaeontology Department was marked Private, but we rang the bell and were admitted by a girl in jeans. Again we opened our box, and she looked inside and said 'Gosh'. But she couldn't give us an answer on the spot because the expert was out, so she took our name and address and gave us a receipt, and just as we were leaving asked for our telephone number as well. This suggestion of urgency at the end excited us to wild flights of fancy. We had produced something quite phenomenal. We should probably appear on *Nationwide* - or at least in our local paper.

But no telephone call; merely, after a week of speculation, a printed card with details filled in by hand. Our Iguanodon's tooth wasn't one. It was something called a Bivalve, and would we like it posted back? This we thought a decent offer, in view of its weight and present-day postage rates, but we were going to another lunchtime lecture, and could collect it ourselves. Also we might discover what a Bivalve was.

The girl in jeans, who despite her youth seemed to know all about it, was very helpful. She led us to a room full of glass cases labelled 'Gastropods, Scaphopods and Bivalves.' There were others called Graptolites and Trilobites. They were all fossilized shells of varying shapes and sizes. The Gastropods - or was it the Graptolites? - were particularly attractive, all speckled in different shades of brown. She explained that our stone was an accumulation of tiny bits of these Bivalves and that the axe-head shape was simply coincidental and probably due to weathering.

We couldn't help a feeling of anticlimax, because it was evident that we weren't going to make headline news after all. But then came a ray of comfort. 'How old is it' we asked. 'About a hundred million years', she replied - quite casually, just like that. So our Sussex clay has yielded up something a hundred million years old. Considerably older than an iguanodon. When you think of that, our thirty years of procrastination seems almost like rushing.

Hope Cobb
Hummock Hill,
High Beech,
Haywards Heath, Sussex.

NEW'S' COLUMN

In response to several requests we are instituting a new column on notes and news in the museum world of geology. As compiler Tony Cross of Peterborough City Museum was approached and is "willing and interested to give the idea a trial run in the September issue." Any items should therefore be sent to Tony at the address below:

T. Cross,
Peterborough City Museum,
Priestgate, PE1 1LF

Telephone No. 0733 43329

COMMITTEE NOTES September 1978– April 1979

Two committee meetings were held during this period: at Derby on 25 October and at Bolton on 27 April.

The A.G.M. at Hull was attended by 23 members; the minutes of this meeting appeared in Newsletter 2.4. It was preceded by a morning session on the History and Future of the Hull Geological collections. A short discussion on the restitution of cultural property was also included.

The meeting on the Future Development of Geological Conservation in the British Isles was held at Burlington House on 19 & 20 March. It was jointly sponsored by G.C.G., N.C.C., C.G.S.D., A.T.G., and Earth Sciences Educ. Methods Group. It is hoped that the Geol. Soc. might publish the proceedings of this meeting.

The meeting on the History of Museums & Collections in Nat. Hist. was held at the B.M. (Nat. Hist.) on 4 - 6 April. It was jointly sponsored by G.C.G., B.C.G. and the Society for the Bibliography of Nat. Hist.

In addition the Chairman & Editor produced a display showing G.C.G. publications and activities for the Pal. Ass. meeting at Keele on 20 December. A display on the Nat. Site Recording Scheme was mounted at the A.T.G. meeting in September; John Cooper and Keith Duff had both spoken at this meeting.

Three further G.C.G. meetings are planned for 1979. On Wednesday 11 July a one-day meeting on 'Unwanted Collections' will be held during the Mus. Ass. Conference at Portsmouth. A programme of speakers is being organised by Hugh Torrens and Theo Getty is acting as local secretary.

On Friday 21 September, the topic for the Group's contribution to the joint meeting of the Geological Societies of the British Isles at Sheffield will be 'The Curation of University Research Collections'. Phil Doughty is organising the speakers and Tim Riley is local secretary.

The Sedgwick Museum, Cambridge is the proposed venue for the A.G.M. in December. The theme would be 'Standards of Curation' and Colin Forbes would be asked to act as local secretary.

Phil Doughty's 'Report on the State and Status of Geology in U.K. Museums' is now virtually ready for publication. The Royal Society had turned down the application for a grant to cover the publication costs and alternative sources of funds were now being actively investigated. 2,000 copies of the report (hopefully to include 5 plates) would be printed and quotations were being obtained from printers in Leicester, Stoke, Brighton and Ulster.

The Group would themselves make a contribution of £100 to the Pal. Ass. towards the costs of publishing the Cardiff Colloquium proceedings.

F. Howie had been asked to write a paper on the Conservation of Geological Material for Newsletter 2.5. He was also preparing a questionnaire for circulation to museums with large geological collections asking for details of their conservation facilities and storage conditions.

Following the publication of the Drew report, concern had been expressed that little notice seemed to have been taken of G.C.G. representations. The Secretary was asked to write to Sir Arthur Drew asking what policy the committee had adopted towards science in general and geology in particular. He would stress the Group's concern over the state of collections, the lack of qualified staff to curate them, and the inadequate facilities for training curatorial staff.

The Institute of Geologists had asked for comments on a draft entry on 'Museums and Information Retrieval' for their forthcoming booklet on guidelines for graduate training. The Committee felt that the entry was unacceptable as it stood and the Secretary was asked to draft an improved version.

The Museums Association had asked Specialist Groups for their views on the restitution of cultural property prior to holding a one-day meeting on the subject in May. This item was therefore added to the programme for the Hull meeting where the discussion was somewhat inconclusive.

The Committee for Geological Site Documentation had been closely involved in the organisation of the March meeting at Burlington House. J. Cooper, P. Phillips, K. Sedman and M. Stanley had been re-nominated as members of the C.G.S.D. executive and R. Clements re-nominated as G.C.G. representative on the committee.

Geoff Tresise

INTERNATIONAL CONFERENCE ON THE HISTORY OF MUSEUMS AND COLLECTIONS IN NATURAL HISTORY 3–6 April 1979

In recent years there seems to have been a considerable upsurge of interest in the history of the natural sciences. Byways which once experienced only the tread of an occasional passing taxonomist in search of evidence now appear to have a much wider appeal.

This was proved convincingly at the beginning of April when a conference on the History of Museums and Collections in Natural History was convened in the British Museum (Natural History). Held under the auspices of the Society for the Bibliography of Natural History with the Biology and Geological Curators Groups, the meeting attracted some 160 delegates from 15 countries.

The three working days of the conference produced a varied programme of high quality papers including accounts of pioneer collectors and institutional collections ranging from the well known to the relatively obscure. There were also sessions on zoological gardens and books in Museums. Specifically geological contributions included an account of the Bavarian State Palaeontological collections, a description of fossil collections in Poland and an account of the history of the U.S. Geological Survey fossil collection.

Papers presented at the conference are to be published by the Society for the Bibliography of Natural History early in 1980.

It seemed a pity that discussion was mainly confined to the end of the conference when the main points of concern were raised on the first day. Various speakers from the floor stressed that many historic collections are improperly stored or poorly curated in sharp contrast to the examples related in the papers delivered at the meeting. Chief offenders mentioned were the universities, where important historical or voucher material could be disposed of at the whim of a new department head.

Short of legislation to compel administrative bodies to care for their collections properly, there can only be a campaign of persuasion. The British Museum (Natural History) is to hold a conference on History in the Service of Systematics in 1980. Hopefully this will help to convince collection administrators that the responsibility for material in their charge is a serious one and not without purpose.

Alan Howell

MUSEUM SERVICES TO NATURAL SCIENCES IN SCOTLAND

Contents

INTRODUCTION

The following notes were prepared following Dr. C.D. Waterson's invitation to discuss this subject at the Royal Society of Edinburgh's symposium "The Role of Scottish Museums in Science", held on 20th February 1979.

In an attempt to assess the present state of natural science museums in Scotland a questionnaire was sent out (Appendix 3) investigating the following aspects of museum work: curatorial, public relations, exhibition, education, research and conservation.

Scope of the Enquiry

The questionnaire was sent to a sample of 43 of the better known or most representative museums, selected from the 90 "museums" with natural science collections. Of these, 31 completed the questionnaire, giving a response of 72%. The figure of 90 "museums" has been obtained from the Leet of Museums (Norgate 1977) known to have relevant collections, and represents 27% of the total of 331 museums and galleries listed there.

These figures contrast with 21 natural science museums listed by the Standing Commission (1963) out of a total of 136 museums and galleries listed in the Museums Yearbook (Maliphant 1978). The Leet contains botanic gardens, zoos and wildlife parks (both the latter omitted from this survey), castles and houses containing collections and nature reserves with site museums. Such Museums range from very small, or single-room museums - such as the Deer Museum, Torridon or the Appin Wildlife Museum, or the few natural history specimens in a museum dedicated to other subjects (e.g. three rocks at Glenesk Trust Museum), or the interpretation centres of the Forestry Commission and other bodies through the medium-sized, most usual local authority museum, to the large national, university and local authority museums. A map is given as Appendix 4. This number represents the number of administratively independent museums. Thus, a museum with several branch museums, many of which may have natural history displays (e.g. Dundee) is only counted as one museum, whereas Edinburgh University's departmental museums Zoology and Geology are counted as two museums. Site museums (e.g. Forestry Commission) and visitor centres (e.g. Nature Conservancy Council) are also counted as independent museums.

The services that these museums render to natural science can be dealt with under the several headings which follow, although this is far from an exhaustive account. Although an attempt has been made to cover all natural science (botany, zoology, geology), the author's experience inevitably biases him towards geology, although the conclusions from geology collections probably apply to the other natural sciences also.

Acknowledgements

Through the courtesy of the former Director, Martin Norgate, some of the records of the council of Museums and Galleries in Scotland were inspected. This is the most up-to-date and authoritative record of the current position of museums in Scotland. Individual accounts of such museums are kept on file by the Council, and it forms a most important archive of information accompanied by relevant publications. Some of the files are understandably confidential, and it would be helpful if the objective data containing buildings, displays, collections, etc. were filed separately (and hopefully published), so that they could be more openly accessible.

Finally, Mr. P. Doughty of the Ulster Museum kindly made available some of the results of his survey of British geological collections that apply to Scottish collections, and this is given as Appendix Table 2.

Above all, I am grateful to the many curators for completing the questionnaire, and making additional comments - particularly Ms. S. King (Dundee) for her notes on the Arran Nature Centre which she helped to found.

COLLECTIONS

The maintenance and increase of collections is one of the most basic museum functions. By this means, museums render their unique service to natural science: preserving specimens with their data throughout time. Dr. Waterston is dealing with many of the qualitative aspects of this contribution to science, and he has discussed the matter in print elsewhere (1972, 1979). The size of Scottish collections is indicated in Appendix Table 1.

Size

As expected, most collections tend to be small - 27% of this sample have less than 500 specimens, and 50% less than 5000 specimens in their care. 10% have between 200,000 and 1 million specimens (Glasgow, Perth, Hunterian Museum and the I.G.S. Collections, Edinburgh - not in sample) whilst only two exceed one million specimens: the Royal Scottish Museum - with an estimated 3 million specimens and Royal Botanic Gardens, Edinburgh, with almost 2 million herbarium specimens.

Accessions

Rate of accession to the collections (Appendix Table 1) is roughly correlated with size of collections, and with the number of established posts for curators. It ranges from 3 specimens a year (Bute) to 11,000 a year (Royal Scottish Museum). Although 24 out of 27 museums do regularly add to their collections, only 6 of them acquire specimens by purchase. This is largely because few relevant natural history specimens are available for purchase (although the Royal Scottish Museum purchases roughly 30% of its accessions).

Treasury Purchase Grants-in-aid

The figures for expenditure from this fund have been reported annually by the Director of the Royal Scottish Museum in the Museums Journal. In the five years 1973-78, £1447 is recorded as having been given in grant-aid (usually 50%) towards natural science purchases - out of a total of £82,000 available for scientific and technological material. Although this is only 1.8% of that total sum available, it is proportionately more than England & Wales spent during the same period: £2581 out of a total of £433,500 available - only 0.6%! These figures can be contrasted with expenditure of arts purchases during that same period of £2,050,000 (England & Wales) and £187,000 (Scotland). As far as can be ascertained from the published record, this sum was used to buy only five objects, or collections of objects in the natural science field in Scotland. It would be worth exploring additional, perhaps more realistic, ways of using such funds to enrich natural science collections. For example, funds might be ear-marked to support collecting expeditions (even if only for teaching - collection material), or to permit costly geological excavations, to employ temporary collectors, or to assist with overheads on relevant Manpower Services Commission projects.

Acquisition Policies

The need for clearly stated acquisition policies has been argued elsewhere (Rolfe 1979). Eleven out of the 32 museums on Appendix Table 1 (No's 1, 3-5, 8, 9, 12, 15, 17, 18, 20 and 25) claimed to have stated acquisition policies for natural history objects, which is an improvement on the overall British position of 23 museums with major geological collections, only two of which have formal, published acquisition policies. This is largely because the local collecting role of regional museums is obvious and accepted, although there is still the need for such policies to be widely published. Much local collecting remains to be done in Scotland, as Inverness points out, for example, in its policy statement: "the Highlands are particularly rich from the natural science viewpoint, but at the same time one of the areas of Britain about which least evidence has, in general, been collected".

University natural science departments often amass collections resulting from research by staff and research students. Six museums (3 university museums, 2 national and 1 local) have links with universities to ensure that such collections enter their museums, but several museums stress the informality of their links. It would guarantee the future safety of such collections if grant-awarding bodies such as the Natural Environment Research Council were to impose conditions on such grants, ensuring the deposition of such collections in a reputable museum. Universities could also make such deposition a condition for award of relevant degrees.

Storage

From Doughty's survey (Appendix Table 2), it seems that 45% of the 29 museums with geological collections surveyed in Scotland house their collections at least partly in cardboard boxes, and 24% use packing cases.

It is disturbing to learn that the first figure represents 49% of the U.K. total for such storage. As Waterston has pointed out (1972 p. 140), "adequate storage in purpose-built cabinets is essential", and it is difficult to gain ready access to material stored otherwise, nor can deterioration readily be detected.

Catalogues

Only a couple of the smallest museums (Glencoe, Culzean) claim to have their collections 100% catalogued, although one other (North East Scotland Library Service - Peterhead) is expecting to progress from its present 5% to 100% catalogued by the end of 1979. Museums with more than 10,000 specimens have an average of only 55% of their specimens catalogued, although the range of variation is total - from 0% at Greenock to 95% catalogued at the Royal Scottish Museum. The most serious position seems to exist at Perth, where only 10% of its 300,000 specimens are catalogued. Two museums could not assess how much of their collections remained to be catalogued and others clearly had similar problems. Two museums mentioned half their cataloguing was inadequate, and no doubt many other museums would feel the same about their own catalogues.

Standards of cataloguing have recently been upgraded by I.R.G.M.A. and latterly by M.D.A. (Museum Documentation Association), and the sales of their natural history cards throughout Britain totalled 133,900 in 1977-78: 34% of all cards sold during that year. This confirms that natural historians are among the most avid users of the system (IRGMA 1977 p. 13), since natural history cards form only 26% of the subjects dealt with by IRGMA. Scottish museums have played their part in this, and the Hunterian Museum has employed many job creation staff on this work. By this means, not only has the museum's backlog been reduced, but conventions of usage have been evolved, and published (McInnes 1978), so that other museums may benefit from the experience. Without the adoption of such standards it is feared that part of the value of the Museum Documentation System is lost. The initial manual record card is designed to enable computer input, so that a variety of indexes can be generated by the M.D.A. using its package of programs known as GOS (Light 1979). The plan is for each museum, once it has adequately catalogued its collections onto IRGMA cards, to obtain the indexes of its choice simply by sending those cards to the M.D.A. and paying the appropriate fee. At present, this system is undergoing pilot tests, partly on Hunterian Museum data, and the results are proving satisfactory. The Council for Museums and Galleries in Scotland is supporting the system, and in due course a great deal more should be known about what is held in Scottish museums. It is noteworthy that most of the financing of this improvement is coming from the Manpower Services Commission!

The economics of publishing the bulky catalogues and indexes that are likely to result suggest that microfiches will have to be used, since efforts to obtain funds to publish them more conventionally met with little support (Waterston 1972 p. 140). The national museums have fewer difficulties in obtaining such support, and the Royal Scottish Museum has published several valuable catalogues of its collections in its Information Series.

The problems of cataloguing and indexing collections nationally largely lie with the M.D.A., now that the Office for Scientific and Technical Information has been absorbed by the British Library. In this connection, it is a pity that the British Museum (Natural History) has no Research and Development Department analogous with that of the British Library, "to find out what service other libraries would like the British Library to offer and to provide these services as quickly and efficiently as possible" (British Library 1978 p. 8).

CONSERVATION

Museums are becoming increasingly concerned with the preservation of natural science material both in the museum and the field, and provide an active service for science in these areas.

Site recording

An essential pre-requisite of conservation is a thorough knowledge of what wild-life or geology exists in each area of Scotland, so that decisions on conservation issues can be securely based. "There is a growing demand from local authorities, the Nature Conservancy Council and Nature Conservation Trusts for detailed information, which has highlighted the problem that naturalists are not well organised to produce data on a site basis so as to enable objective comparisons between sites" (Habitat Digest 17). The Biological Recording in Scotland Committee (BRISC) has got off to a good start by publishing a manual (Sommerville 1977) listing currently active recording projects in Scotland. It also maintains a list of over 200 names of active recorders. Geological recording is less well served in Scotland (Cooper 1978, p.2). England and Wales have established many units under the National Scheme for Geological Site Documentation, which have already recorded essential data from thousands of geological sites, on the standard field record cards evolved by M.D.A. Scotland has yet to establish a unit under this scheme, although there is urgent need to do so. Eleven out of 28 museums take part in biological or geological recording of some form, however, and three others are arranging to do so, but this may mean no more than occasional wildlife counts, or beached bird surveys. This whole subject of recording is one which it is most relevant for museums to take up. It can relate closely to acquisition policies of individual museums, and it will give local museums an important research role, as research studies develop into ecosystem taxonomy (Shetler 1969 p. 729). Once again, lack of finance is the main reason preventing the development of an effective Scottish service.

Recording sites is only one aspect of conservation, and museums often get involved in action over particular local conservation issues. Eleven musuems out of the 28 surveyed are active, another two give advice, and two more are arranging so that they can activate when the need arises. Scotland is particularly vulnerable to unscrupulous collecting for private gain, and several museums (Thurso, Royal Scottish, Hunterian) have been active in calling attention and attempting to formulate solutions, with the N.C.C., to the difficult problem of pillaging of fossils from classic sites (Rolfe 1977, 1979).

Conservation sensu stricto

There is little point in accumulating and expensively restoring and documenting collections if they are not adequately conserved in an appropriate environment. "The conservation of natural history material presents special problems on which little research has been done up to now" (Wright 1973, p.46). Natural history and geology share the dubious privilege of the lowest percentage of conservators working on that category of material (10% and 11% respectively) and share with oil paintings the most unfavourable eightfold ratio between the percentage of institutions with such collections compared with the percentage of conservators for that category (Armitage 1974 p. 19).

Natural history is most in need of specialised conservation staff, since specimens are susceptible to decay if not stored and displayed in a correct environment (Armitage 1974 p. 38), and the position is known to be particularly poor in Scotland. Thus, Kilmarnock volunteers that it cannot upgrade its zoological displays until the environment can be controlled:

specimens which deteriorate (usually by fading) are removed for conservation, weakening the display, yet there is no item in the budget to improve the conditions. Brinklow (unpubl.) has observed that "tatty specimens" with good data may be scientifically valuable, yet often more natural history material has been thrown away by ignorant "curators" than has ever rotted away.

At such lowest levels of conservation, the simple survival of collections, the alarming reports about the large scale "junking" of significant geological collections (Doughty 1979a, b) are all the more disturbing since one cannot know at any time which collections are being disposed of "behind the scenes". Doughty has documented the scale of this, and it is well known from certain areas of the U.K. where the Geological Curators Group has been active. The case of Ayr, with its disintegrating insects and its crated specimens, can be mentioned*, but it is probable that other collections with significant specimens are equally poorly provided for.

More subtle problems also exist with geological conservation, since recent research (Howie 1977) ahs shown that low relative humidity is paramount in preventing pyrite disease, whereas a high R.H. is required for mammoth tusk and Recent bone. These two conditions are perhaps nowhere catered for in Scottish museums, although the Royal Scottish Museum is setting standards with its air-conditioned stores. This implies that the many Scottish collections outside the R.S.M. are at risk from pyrite disease.

STAFFING & ORGANISATION

Of the museums surveyed, fifteen have curators specifically for natural history, whilst in the other fourteen museums, the curator is responsible for a wide range of subjects, or the curator is honorary, or there is no curator at all. Only five of the museums have more than one natural history curator (see Appendix Table 1), but of the 42 curators in the sample, 30 are natural science graduates. This is a much healthier situation than prevailed some years ago, and means that museums can now offer a more professional service to the public.

A recent development has been the appointment of curators with a district or regional, rather than single museum responsibility (e.g. Moray Museums: Forres, Buckie and Burghead Angus). Whilst this has merit in ensuring some level of care for collections, it can mean that the curator, who is inevitably responsible for a wide range of subject disciplines as well as for several premises, has to spread himself too thinly to be fully effective.

The Council for Museums and Art Galleries in Scotland instituted a novel service by its provision of a travelling curator, on an agency basis. This should prove particularly appropriate for Scotland with its far-flung, disparate and often small museums. The first incumbent of this post was a natural historian who has subsequently become a private consultant in this field. The results of these arrangements have yet to be seen and there is some apprehension about the longer term fate of the improved facilities which result from such a travelling curator's efforts.

Much of this development has taken place since local government reorganisation in 1975, and some local councils have taken up with vigour the challenges posed by their inherited often near-derelict museums. Some good

---

NOTE:

Since the Geological Curators' Group report on Ayr (Howells 1975), and the post-reorganisation appointment of a curator, much improvement has resulted: some of the collections have been unpacked, sorted in suitable cabinets and have been identified. The new curator can only accomplish this slowly, since he also has to organise an active programme of temporary travelling exhbitions.

local reports have been drafted (e.g. that for North Berwick Museum, September 1978), and appointments of professional curators have been made, often for the first time (e.g. Moray). Altogether more information should eventually be forthcoming from these neglected areas, which in turn could lead to an improved service by these museums to natural science in their area.

It has been estimated (Shetler 1969, p. 711) that the worldwide average number of herbarium specimens/curator is 47,000, and therefore that an above average number of specimens/curator reflects an unfavourable staffing situation. If this ratio is applied to Scottish museums, Perth leads the way with an estimated 300,000 specimens for its one curator, followed by the Hunterian Museum with 166,000 specimens/curator. Even though large museums, like herbaria, become more efficient in terms of numbers of specimens that its curators can manage, the R.S.M. still averages 143,000 specimens/curator. "Tending to counteract this gain in efficiency, however, is the greater workload of the large herbarium, which gains in service responsibilities to the scientist and layman as it gains in size and thereby general usefulness and visibility. It is problematical, therefore, whether the large herbarium should be measured by a different specimen/curator yardstick than the small herbarium" (Shetler 1969, p. 712). The only other two museums with poor ratios are the Zoology Department of Aberdeen University (70,000 specimens/curator - although if the one zoology graduate technician is taken into account, this reduces to a favourable ratio), and the Geology Department, Edinburgh University (50,000 specimens/curator). It is presumably therefore no coincidence that both Perth and the Hunterian Museum have found it necessary to turn to the Job Creation Programme to find staff to cope with their cataloguing backlog. Three of these five museums with unfavourable curator/specimen ratios are university museums, and this is part of the universal "pressing need for extra staff" in university museums pinpointed both by the Wright Report (1973) and the Standing Commission's "Report on University Museums" (1977 pp. 2, 9). With the larger collections (say over 200,000 specimens) the job of administering the collection becomes a full-time one, and collection managers should be introduced. "Libraries are not organised on the premise that only scholars can order, purchase, catalogue, shelve and loan the books, and neither should (museums) be organised on this premise" (Shetler 1969 p. 732).

Greenock and Inverness are the only museums with medium sized collections (both c. 15,000 specimens) that lack a curator in natural history, although Inverness hopes to appoint such a curator in June 1979. A number of Scottish museums with natural history collections lack any permanent staff, let alone the "one full-time qualified curator" required by the Museum Association's Code of Practice. Included among these is Elgin Museum, with its internationally important collection of fossil reptiles. It is only a short step to the ultimate closure of such museums (e.g. Airdrie, Annan) and the storage and deterioration of natural history collections, of which Ayr's Carnegie Museum is a known example, and to which attention has been drawn by the Geological Curators' Group. The number of significant geological collections that has been lost to science in this way is mentioned elsewhere.

Honorary Curators perform sterling services to science at some museums. It is worth citing the activities of Mr. J. Saxon, until recently Hon. Curator at Thurso Museum, by way of detailed example here. Single-handed, Mr. Saxon has carried on the work of providing a museum service in that area. The collections of minerals and gemstones, and the Jurassic flora of E. Sutherland as well as most of the fossil fish in Thurso Museum were brought together by Mr. Saxon. He has published valuable local guides to the fossils of the regions; has actively tried to conserve some of the local fossil fish S.S.S.I.'s from over-collection by visiting collectors; maintains site records, and answers queries forwarded to him by the local Council. Allegedly without consultation, Highland Regional Council terminated Mr. Saxon's Honorary Curatorship, whilst attempting to recruit a curator to be

based in Inverness. These and problems elsewhere revealed by the report come back to inadequate staffing at all levels of the museum service. The fact that so many museums have availed themselves of Manpower Services Commission schemes (J.C.P., S.T.E.P., Y.O.P. - Atkinson 1977, Rolfe 1978) is a further indication. Yet such short-lived staff produce great problems of security and supervision for the already busy permanent staff. In the long term, money used for M.S.C. schemes would be better used in creating permanent posts in museums. Without proper staffing, museums cannot serve science in Scotland: "Not just a few curators are virtually enslaved by the sheer burden of the routine daily transactions and public service, when in fact they should be practising science. The quantitative growth of the world's (collections) has overwhelmed us and become an end in itself, such that we spend all of our time packing away specimens for a research day that never comes. At the same time we find ourselves incapable of retrieving the most elementary information" (Shetler 1969, pp. 730, 740).

EXHIBITION

The museum is one of many media by which science is presented to the public - but through the unique medium of the exhibition.

Permanent exhibitions

It is encouraging to note that no less than 14 out of 30 museums are new (4 museums) or have totally renewed their displays since 1968, and a further three have renewed 70-85% of them. Of the four museums that have renewed no displays during that period, two lack curators, and only Perth has a full-time curator (who is preoccupied with the cataloguing backlog there).

Probably the most ambitious project has been the Royal Scottish Museum's Evolution exhibition, opened in 1975. Occupying five floors, it is the largest single development in any Scottish museum since the War. At the other end of the scale, some exciting developments have taken place in medium and smaller museums (e.g. Anstruther, Culzean, Abriachan) which perform a valuable service to science by portraying and interpreting its different aspects to the public. The visitor centres providing "on-site" interpretation have shown much growth in recent years, and can be expected to increase. They are run by such bodies as the Nature Conservancy Council, the National Trust for Scotland, the Countryside Commission, the Scottish Wildlife Trust and the R.S.P.B. The Forestry Commission, for example, has twenty-three such centres, nine of them in Scotland and plans to provide one or two centres a year for the next few years. "The centres do not display deep scholarship based on a collection of artefacts, rather they represent a partnership between foresters, local museums and local scholars to provide stimulating introductions to themes appropriate to a forest centre. They rarely display real objects of any value. The policy for interpretation is a simple one. It is to encourage visitors to go out and visit the forest area and to give the visit enjoyment and meaning. If a centre becomes a place to be visited for its own sake, the designer has failed probably by over-endowing the place with riches. Visitor centres are the threshold to the forest and must be linked to it" (Orrom 1978). The importance of design in communicating the unfamiliar subjects of science to the public has also been accepted at such centres: "Often the whole environment of the display room is designed to introduce or recall some feature of the forest without being strictly imitative. Perhaps a third or more of the budget is allocated to this mood setting which is so vital for capturing a casual visitor's attention to what is probably an unknown subject with few obvious links to his everyday life" (Orrom 1978).

Few visitor surveys have been made to discover the effectiveness of the new diaplays. "To a great part of the European public, natural history exhibitions, even the modern ones, are still only large curio cabinets; they have never become real centres of intellectual life" (Klausewitz 1973 p. 45). In an attempt to make museum exhibitions a more effective instrument for teaching modern biology

as a science, the British Museum (Natural History) has embarked on a completely novel approach, making use of current educational psychological thinking to develop a "museum technology" which actively involves visitors with the exhibits (Miles & Tout 1978). Visitor surveys show that this new approach does effectively teach scientific concepts and principles, whereas previously "most visitors were unable to show that they had learnt anything from the exhibit they had found most interesting" (1978 Rept. B.M. (N.H.) 1975-7, p. 88). The new methods have caused much controversy, but they represent a break-through in museum communication. Museums could serve science further in Scotland by taking note of these developments and applying them to new exhibitions. It may even be possible to mount duplicates of some of the most successful new B.M. (N.H.) exhibits in Scotland, since the offer has been made to make reproducible items available for purchase. Such "Science Centre" type exhibitions need not be confined to museums: they could be mounted in schools and colleges, airports, railway and bus station concourses, shopping centres, hospitals, community centres, etc. - this is something the Council for Museum and Galleries in Scotland could be asked to facilitate. Although the B.M. (N.H.)'s exhibits were expensive to produce, the principles they embody could be applied elsewhere using "alternative technology" so that costs come within the range of smaller and medium-sized Scottish museums.

Temporary exhibitions

Temporary exhibitions can be very effective in bringing topical aspects of science before the public, and achieving wide publicity for natural science. The most spectacular recent exhibition was of Moon rock, displayed just after the lunar landings, which attracted 25,000 people in 19 hours! (Waterston 1972 p. 141). Yet almost no British museum availed itself of the publicity of the last wave of Loch Ness Monster fever, to mount an exhibition on this topic. Ideally, a central unit would rapidly prepare many copies of a travelling exhibition on such topical themes as they arose, and circulate them regionally.

There is a great lack of travelling exhibitions in natural science, and museums inevitably present an unbalanced programme of such exhibitions. The Hunterian Museum attempted to rectify this by establishing a travelling exhibition unit in the natural sciences under Job Creation. The unit produced three successful small exhibitions which are being circulated by regional councils, but these are no substitute for an established unit comparable with that at the Science Museum or the Arts Council. Proposals for such a unit are to be placed before the National Environment Research Council shortly, however, and it is hoped the situation will improve thereafter. Meanwhile, the Scottish Council for Museums fulfils this role only partically, since it too is largely dependant upon outside suppliers or travelling exhibitions.

Of the 30 museums surveyed for this report, 22 museums showed temporary exhibitions on natural history - 17 museums showed about 70 exhibitions annually from their own resources, and 15 museums import another 30 exhibitions annually from other agencies. (Some of these statistics for temporary exhibitions refer to regularly renewed plant tables - e.g. 20 annual 'exhibitions' at Glasgow).

PUBLIC RELATIONS

Museums can help the public image of science in their provision of relevant services to the public.

Enquiries. This is one area where the public can make direct contact with museums, and where museums serve science by direct public information. It is therefore worth noting that practically all museums sampled were active in this field (Appendix Table 1), with the largest load being taken mainly by the

larger museums. The Royal Scottish Museum and the Royal Botanic Garden probably take much of the load off other museums, by serving as the Scottish centres for specialist natural science identifications (and other museums in Scotland often forward requests to the R.S.M.). In this way those two institutes deal with a staggering 3300 enquiries each year - over ten times that dealt with by any other museum. Each museum has much to offer in this field, however, and Dumfries Museum's public notice to "Please disturb the curator" shows excellent public relations. It might be helpful if the Specialist Groups were to issue standard leaflets providing detail on topics of frequent enquiry or identification, to accompany letters of reply, and a survey of this topic is in preparation (by Sharpe & Rolfe).

Enquiries are very much a two-way exchange: museums gathering material and information from the public which might otherwise be lost. Probably the most spectacular recent example of this was the enquiry in 1968 by Sir John Clerk, who "sought the opinion of Charles Waterston at the Royal Scottish Museum on an old folio containing seventy drawings, mostly of geological subjects, which he had found among the extensive papers of his family at Penicuik House, Midlothian" (Craig 1978 p. 8). These drawings were recognised by Dr. Waterston as the drawings, lost to science for over 180 years, which were intended to illustrate volume 3 of James Hutton's Theory of the Earth. They reveal "that Hutton and his friends .... had an even greater understanding of the structure and evolution of the Earth than had hitherto been suspected" (Craig 1978 p. viii). Had the drawings been published with the original Theory as intended, the course of geology might have been different. These delightful and geologically accurate drawings have now been beautifully published by Scottish Academic Press, partly in association with the Royal Society of Edinburgh.

Many other, more conventional, natural science discoveries have been made, as a result of enquiries naturally directed towards museums. Of quite a different nature was the discovery of a loophole in the legislation protecting the Nature Conservancy Council's Sites of Special Scientific Interest. As the result of a fossil brought in by a schoolboy for identification to the Royal Scottish Museum, it was revealed that Strathclyde Regional Council's Water Department had made massive excavations in an S.S.S.I. Subsequently it was found that such statutory bodies had no requirement to notify such works to the N.C.C. a large loophole in the protection of such sites. As a result of action by staff of the Royal Scottish Museum and the Hunterian Museum, acting on information from an enquiry, the N.C.C. was able to take action to prevent a recurrence of this type of unwitting damage.

Loans

A total of twenty out of the thirty sampled museums lend material for teaching and/or for research (see under Education and Research sections), but no further details were requested in the questionnaire. This is yet another valuable service which museums perform, although numbers are not always recorded by museums, nor published in their reports. The Hunterian Museum has lent an average of 4,244 geological specimens in 181 loans for each of the past ten years. This is considerably more geological specimens than lent by the B.M. (N.H.), which averaged 2,794 specimens in 228 loans for each of the past nine years (the period for which these data have been published). Most of the Hunterian Museum's loans (averaging 2743 specimens in 141 loans each year) are for teaching within the university, the remainder being to research workers out with the university. The Hunterian Museum has no doubt that this number of loans could be increased if staff were available to promote such a service, and there is an even greater demand for loan collections of material for schools.

The botanic gardens offer related services in their provision of plant material for teaching and research, although such "loans" may be one-way only! Thus Glasgow Botanic Gardens supply 6,200 plant materials annually (5,000 and 500 to Glasgow and Strathclyde universities respectively, 800 to Glasgow

schools). It also participates in the Internationa Seed Exchange Scheme, exchanging with 275 similar institutions 2,000 packets of seed of c. 1,000 taxa. Similar exchanges of specimens take place on a much smaller scale, ad hoc between museums.

Publicity

About one third of the museums surveyed advertised their natural history exhibitions in the media, and a few more (13 out of 28) have articles in, or provide advice to the media. All the museums except four can provide photographs if requested - although with varying degrees of difficulty being expressed - and all museums save one (N.E.S.L.S.) permit visitors to photograph exhibits or collections.

Societies

Two thirds of the museums encourage links with natural history societies by museum staff serving as officers. The remaining museums are unable to do so since they have no staff that could so serve! Just over half the museums assist such societies by using museum premises as venues for their meetings.

Opening Hours

A quarter of the museums open some evening of the week, and others often open by special arrangement. Practically all open for Saturday afternoons (23/27), whilst half are open on Sunday afternoons.

Publications

About one third of the sample publish popular pamphlets, handbooks, guides to nature trails, etc. This is surprisingly low, although again, half of the museums that do not publish such items lack any appropriate natural history staff. The standard of production is very variable, although many of the smaller museums' publications make up in liveliness for what they lack in standards of production. Many museums, however, have thriving bookshops which bring natural science publications before the public at a time of the year and in a place where the public is predisposed to receive them: the Arran Nature Centre springs to mind here.

EDUCATION SERVICES

Only ten of the thirty museums surveyed had a school services section, although another four or five offered informal services, two of them using Job Creation staff. Many more museums (20) lend material for school or university teaching, and seven of them have special loan "kits" of such material. The schools Loan Service at Dundee is well established and well used, with about 66 kits of individual birds, mammals, etc., about the same number as in Glasgow. Dundee museum delivers and collects kits from schools weekly, whereas in Glasgow each school must make its own arrangements. New kits are being made up by Dundee for secondary schools, tailored to relevant syllabuses, and there are also school loan displays (e.g. dinosaurs). There is a great need for such loan schemes in other regions of Scotland, and the National Museum of Wales' loan scheme is available as a model. In some parts of Scotland the School Library Service visits schools regularly, and it would be worth investigating if that Service could take on the distribution of such educational kits. There is a slight danger of overlap of Museum Education Services by Teachers Resource Centres, which needs resolution. Many museums produce worksheets, but these are of very variable quality, and too often they are of the "treasure hunt" variety. Teachers' Panels can help to make educational services more relevant, the emphasis being on museum activities involving children directly with museum objects. "It is also desirable in this cooperative planning that teachers should have personal experience of museum objects" (Long et al. 1972 p. 80), and several of the larger museums are known to provide students at education colleges with brief courses on how to use museums

effectively (see below).

Natural history sections of museums are becoming increasingly involved with environmental education in the field (e.g. Collis 1978) and it becomes correspondingly difficult to recognise where a museum's role merges with that of a Country Park or even an Outdoor Centre! Most of the new Country Parks have small collections of material in their visitor centres and provide ranger and visitor services indistinguishable from those provided by many museums. Provided there is no great overlap, this is all to the good of natural science education, but closer liaison is perhaps needed. One of the best ways to introduce large numbers of people to natural science is through the large excursion, of up to several hundred people. If well organised, as in Scandinavia and in Wales (by the National Museum of Wales), these can gain adherents for existing bodies. Few of these occur regularly in Scotland, although Glasgow University Extra-mural Education Department has organised one to Loch Lomond, and the Quality of Life Experiment at Dumbarton had similar, if not sustained, success. Some museums (Royal Scottish, Dundee, Edinburgh University, Paisley, Falkirk, Torridon, Culzean) organise field activities of various kinds for the public, although these may often be under the organisational umbrella of Extra-mural Education (Glasgow) or of a learned Society (Bute).

An example of a successful Country Park service is Culzean - listed in the Leet of Museums (and sampled here), although really at the extreme limit of variation of what can usefully be considered as a museum. It offers a varied programme of environmental education through its Ranger Naturalist service, and finds that school visits are of two kinds: recreational, with little educational purpose, or teaching visits, designed to link directly with classroom work. Although both types of visit are encouraged, the pressure of visits in May and June leads to priority being given to the teaching visit. Wider education is also given through its programme of daily walks, demonstrations (e.g. of small mammal trapping), illustrated talks and film evenings.

Smaller establishments can also be very successful in education. Thus the private Arran Nature Centre has a captive audience in the many nature-lovers that visit Arran each year. Being very small, and permanently manned by staff in the "exhibition", which is more like an activity area, an immediate rapport can be established with visitors who may only wish to spend a short time in the centre. Visitors are known to return to the centre regularly, to report sightings and to ask new questions arising from what they have seen on the island (e.g. feral mink), which produces a good sense of visitor involvement. The lack of cases with "cut and dried" labels and the obvious spirit of enquiry that pervades the centre contribute to its success, as do the organisers who are very much part of the local community.

Teacher Training

If teachers are to use museums effectively, they should be instructed how to do so during their training period. The Royal Scottish, Glasgow, Hunterian and Dundee Museums regularly give such training, and the Royal Botanic Garden and N.E.S.L.S. (Peterhead) museums do so occasionally.

Higher and Further Education

Many museums lend material for university teaching purposes, but only a few museum staff take part directly in such teaching (Royal Scottish, Hunterian, Aberdeen University museums and Royal Botanic Garden). A few other museums (e.g. Glasgow, Torridon) take an active part in promoting natural science through Extra-Mural and Adult Education classes.

Student Vacation employment

Some museums - Royal Socttish, Dundee, Falkirk, Culzean, (Thurso - but unsupervised!) - regularly employ students during their vacation to work on

collections; the Hunterian did so until recent cut-backs prevented it; and job creation schemes have diminished the appeal of such schemes to museums, in general. Such schemes offer valuable pre-work experience, enabling students to decide if they would like to enter museum work as a career, and whether to follow it up by taking the post-graduate course at Leicester, or a traineeship elsewhere. The schemes do not appear to be as widely advertised in Scottish universities as they might be, or as they are by the British Museum (Natural History).

RESEARCH

The advancement of knowledge by research is another way in which museums already serve natural science in Scotland. As Cossons (1978, p. 2) has recently suggested, "Museums are primarily centres of scholarship and when they fail to perform this function they cease to be museums - these ends will never be served in three-quarters of public sector museums".

This picture is borne out by the present survey: of 28 museums, only the staff at the Royal Scottish, Aberdeen University, Glasgow, Hunterian, and Torridon museums, and the Royal Botanic Garden publish research papers. (Number of papers produced each year per curatorial staff member: Glasgow 0.25: R.S.M. 0.6: R. Bot. Garden 0.8: Torridon Deer Museum 1.2; Hunterian 1.5; Aberdeen University 2.5. Calculated from figures over past 6-10 years - except Aberdeen, based on past 2 years only. I.G.S. not sampled.) Scholars from other institutes published papers on material from 12 of the 28 Scottish museums sampled, and 16 out of 29 museums lent material for research elsewhere, indicating that the collections would repay study by their curatorial staff at more museums than the 6 listed above. It is likely that descriptive and systematic work will become increasingly concentrated in museums (Waterston 1972 pp. 141-2), and that local museums will need to become more research oriented to cope with more sophisticated demands for data about their material (see Recording schemes section). Yet the lack of manpower at museums inevitably means that research is viewed as an indulgence, and the Museums Association has understandably felt it necessary to endorse the guideline that "no curator should allow research for publication, or general research to take up so much time as to hazard proper administration or other curatorial duties" (Staniland 1978 p. 8).

Training in research

As might be expected, only the university museums or institutes formally linked with them (Royal Botanic Gardens, Glasgow Botanic Gardens), regularly have students researching for higher degrees, under the supervision of museum staff. The Royal Scottish Museum could also undertake such supervision although, unlike the British Museum (Natural History), it does not do so currently.

SUMMARY OF FINDINGS

1) Collections. Most Scottish museums with natural history collections are small, comprising less than 5,000 specimens, and accessions tend to be correspondingly few.

2) Purchase grants-in-aid are little used, and thought could be given to employing such funds to encourage acquisition in other ways.

3) Much local collecting remains to be done, within a framework of published acquisition policies.

4) Storage appears to be inadequate, Scotland having 49% of the U.K. total of geological collections stored in boxes.

5) Larger museums with over 10,000 specimens average only 55% catalogued. The use of M.D.A. cards is improving the situation, although it is not clear if standardisation is adequate! Financing publication of catalogues produced by M.D.A. will remain a problem unless assistance is forthcoming through a provincial museum council, as advocated by Wright (1973), or a national body.

6) Site recording is becoming well established and coordinated (by BRISC) for biological sciences, but Scotland has yet to establish a Record Centre under the National Scheme for Geological Site Documentation.

7) There is a great lack of qualified natural science conservators in Scotland, and humidity control is almost totally lacking.

8) Only about half the museums surveyed have curators of natural science, although three quarters of them are graduates in a natural science.

9) Many museums are understaffed, even the largest ones, for the tasks they attempt to carry out. Manpower Services Commission funds would be better used in creating permanent posts in museums.

10) Most museums have renewed most of their "permanent" displays in the last ten years, and there has been a great growth of the visitor centre type of museum. More thought is required to make modern exhibitions effective instruments for teaching natural science.

11) There is a great dearth of travelling exhibitions in the natural science.

12) Almost all museums are very active in answering enquiries, the brunt being borne by the National institutes.

13) Only one third of the museums surveyed have school services sections though some of these are very active in education, as are many of the smallest museums. Closer liaison may be needed between museums and Country Park, etc. services providing environmental education in the field.

14) A few student vacation employment schemes exist, but they could be more widely publicised.

15) Only six of the twenty-eight museums surveyed engage in research, and this should be increased (with improved staffing) so that museums can cope with the more sophisticated demands that are likely to be made upon them.

W.D.I. Rolfe
Hunterian Museum

References

ARMITAGE, D. et al. 1974. Conservation in museums and galleries - a survey of facilities in the U.K. International Institute of Conservation, London.

ATKINSON, F. 1978. A report on Job Creation in museums, 1976 to 1978. Mus. J. 77, 158-60.

BRITISH LIBRARY, 1978. Fifth Annual Report 1977-8. British Library Board, London.

COLLIS, L. 1978. Perth in its countryside setting. Mus. J. 78, 22-3.

COOPER, J.A. 1978. Annual report on the National Scheme for Geological Site Documentation 1977/78. Geol. Cur. Gp.

COSSONS, N. 1978. Discussion, in Croom, A. (ed.). Conference report: "Museum Interface". Mus. News 13, 2-9.

CRAIG, G.Y. (ed.) 1978. James Hutton's Theory of the Earth: The lost drawings, 2 vols. Scottish Academic Press, Edinburgh.

DOUGHTY, P.S. 1979a. State and status of geology in British museums. Spec. Pap. Palaeont. 22 (in press).

---------- 1979b. Survey of British geological collections. Geol. Cur. Gp. (in preparation).

ENGSTRÖM, K. and JOHNELS, A.G. 1973. Natural history museums and the community. Universitetsforlaget, Oslo, Bergen, Tromsø.

HOWELLS, Y. 1975. Alexander Sharpe Alexander and his collection. Geol. Cur. Gp. Newsl. 1(5), 231-5.

HOWIE, F.M.P. 1977. Pyrite and conservation. Geol. Cur. Gp. Newsl. 1(9,10), 457-65, 497-512.

IRGMA Standards Subcommittee. 1977. Ten years of IRGMA, 1967-77. Mus. J. 77, 11-14.

KLAUSEWITZ, W. 1973. Natural history museums and the public - a critical situation in Europe. In Engstrom, K. and Johnels, A.G. (q.v.) pp. 43-7.

LIGHT, R.B. 1979. Computer-based cataloguing in British museums. Spec. Pap. Palaeont. 22 (in press).

LONG, M. et al. 1972. Pterodactyls and old lace - museums in education. Schools Council/Evans & Methuen Educational, London.

McINNES, C. 1978. The Hunterian IRGMA geological vocabulary and grammar. M.D.A. Information 2(2), 11-17.

MALIPHANT, P. (ed.) 1978. Museums Yearbook. Mus. Ass., London.

MILES, R.S. & TOUT, A.F. 1978. Human biology and the new exhibit scheme in the British Museum (Natural History). Curator 21, 36-49.

NORGATE, M. 1977. Leet of museums, 2nd ed. Council for Museums and Galleries in Scotland, Stirling.

ORROM, M. 1978. The interpretive policy and visitor centres of the Forestry Commission. Mus. J. 77, 171-3.

ROLFE, W.D.I. 1977. Recent pillage of classic localities by foreign collectors. Information Circular, Geol. Physiogr. Sect., Nat. Cons. Council 13, 3-4.

---------- 1978. Special Temporary Employment (STEP) and Youth Opportunity Programmes (YOP) in museums. Mus. J. 78, 132-3.

---------- 1979. Acquisition policy in palaeontology. Spec. Pap. Palaeont. 22 (in press).

SHETLER, S.G. 1969. The herbarium: past, present and future. Proc. biol. Soc. Wash. 82, 687-758.

SOMMERVILLE, A. 1977. A guide to biological recording in Scotland. Scottish Wildlife Trust, Edunburgh.

STANDING COMMISSION on Museums and Galleries. 1963. Survey of Provincial museums and galleries. H.M.S.O., London.

---------- 1977. Report on University Museums. H.M.S.O., London.

STANILAND, K. 1978. Guidelines for professional conduct. In Maliphant, P. (ed.) (q.v.) pp. 7-9.

WATERSTON, C.D. 1972. Geology and the museum. Scott. J. Geol. 8, 129-44.

---------- 1979. The unique role of the curator in palaeobiology. Spec. Pap. Palaeont. 22 (in press).

WRIGHT, C.W. 1973. Provincial museums and galleries. H.M.S.O., London.

APPENDIX 1

Size and Staffing of Scottish Natural History Museums in Sample

	Estimated no. of Specimens	Accessions	Number of established natural history curators	Enquiries /Year
1 Royal Scottish Museum	3,000,000	11,000	21	2,100
2 Royal Botanic Garden	1,750,000	10,000	30	1,200
3 Institute of Geological Sciences	500,000	10,000	3	
4 Hunterian Museum	500,000	3,400	3	70
5 Perth	300,000	"varies"	1	150
6 Glasgow	200,000	2,000	4	300
7 Aberdeen University, Zoology	70,000	600	1	50
8 Dundee	50,000	2,250	3	225
9 Edinburgh University, Geology	50,000	800	1	50
10 Kilmarnock	26,000	275	1	100
11 Greenock	17,500	"minimal"	0	100
12 Inverness	15,000	450	0	250
13 Glasgow Botanic Garden	12,000		1	"numerous"
14 Paisley	10,000	360	1	100
15 Forres	6,300	0	0	
16 Thurso	5,000	12	0	50
17 Stirling	4,500	"few"	0	0
18 Kirkcaldy	2,500	50	1	50
19 Falkirk	2,000	0	0	40
20 N.E.S.L.S. (Peterhead)	2,000	10	0	250
21 Bute	653	3	0	0
22 North Berwick	450		0	
23 Wigtown	350	10	0	20
24 Torridon	218	"varies"	1	
25 Anstruther	100	20	0	50
26 Glencoe	100	"varies"	0	10
27 Culzean	40	0	3	
28 Abriachan	30	5	0	0
29 Orkney	?	"few"	1 (part-time)	10

APPENDIX 2

Survey of British Geological Collections, by P. Doughty, 1979b

Total number of Scottish museum authorities surveyed 62 = 22% of total in U.K.

	Number of Museums	% of Scottish total	Equivalent % in national total
Total number of Scottish museums with collections	29	46	51
Total number of Scottish museums without collections	33	53	49
Collections of less than:			
500 specimens	14	42	21
500 - 1000 specimens	2	6	11
1000 - 5000 specimens	6	18	22
5000 -10000 specimens	5	15	15
over 10000 specimens	4	12	17
undeclared	2	2	3
Museums with named collections	15	45	55
Collector's data on			
up to 25% of specimens	7	21	37
25 to 50% of specimens	1	3	18
50 to 75% of specimens	7	21	19
over 75% specimens	7	21	27
undeclared	11	33	18
Printed catalogue of part of the collection	4	12	6
Printed catalogue of whole of the collection	1	3	1
Collection housed in drawered cabinets	14	42	56
shelved cabinets	13	39	37
cardboard boxes	15	45	49
packing cases	8	24	19
Specimen condition - Good	26	78	79
Indifferent	19	57	56
Bad	7	21	31
Specimens stored according to a system	14	42	54
Specimens not stored according to a system	13	39	34
Undeclared	6	18	13
Museum register - whole collection	9	27	15
most of collection	7	21	31
less than half collection	3	9	23
no register	5	15	15
undeclared	9	27	16
Does collection contain - rocks	32	97	88
minerals	27	82	86
fossils	31	94	98
undeclared	1	3	
Museums with types (fossil)	8	24	22
Museums with types and staff	5	15	10
Museums with types without staff	3	9	12
Museums with geological staff	6	18	16
Museums without staff with curatorial arrangements for geol. collection	2	6	18

APPENDIX 3

THE ROLE OF SCOTTISH MUSEUMS IN SCIENCE - QUESTIONNAIRE

Note: All questions refer to natural history (botany, geology, zoology) collections only. If your answer is only a guess, please precede it by "ca".

CURATORIAL

1. Approximately how many specimens are in your natural history collections? _____

2. How many natural history curators does your museum have? _____

3. How many of your natural history curators are university graduates in a natural science subject? _____

4. Approximately how many specimens are added to your collections each year? a) by donation, collection, etc.? _____
   b) by purchase? _____

5. Does your museum have a formal link with universities, colleges, etc. to ensure that collections which result from research in those institutes enter museum collections? _____

6. Does your museum have a stated acquisition policy for objects? _____

7. Approximately what percentage of your collections is catalogued? _____

PUBLIC RELATIONS

8. Approximately how many enquiries from the public do you deal with each year? _____

9. Do you advertise your natural history exhibitions in the media? _____

10. Do you regularly have articles in the media (radio, T.V., press), or provide advice to the media? _____

11. Please state attendance figures at ten-yearly intervals over the past 30 years. _____

12. Can you provide photographs of any of your specimens, if required? _____

13. Do you permit visitors to photograph your exhibits and/or collections? _____

14. Are links with natural history societies encouraged: a) by museum staff serving as officers? _____
    b) by using museum premises as a regular society venue? _____

15. Is your museum open:
    a) Mondays - Fridays, outwith the normal hours of, say, 9-5.30 a.m.? _____
    b) Saturday afternoons? _____
    c) Sundays? _____

16. Does your museum regularly publish popular pamphlets, handbooks, etc. (NOT scholarly publications)? _____
    (Samples would be welcome!)

EXHIBITION

17. Estimate the percentage of your permanent natural history displays that has been renewed since 1968 _____

18. Approximately how many temporary exhibitions on natural history do you show each year?
    a) from your own resources? _____
    b) imported from another agency? _____

EDUCATION

19. Does your museum have a school services section? _____

20. If so, does it have a natural scientist on its staff? _____

21. Do you offer to lend material for university or school teaching? _____

22. Do you have special loan "kits" of such material? _____

23. Do you regularly train student teachers in the best ways to use museum facilities? _____

24. Does your museum regularly employ undergraduate students during vacations to work on natural history collections? _____

25. Do any of your museum staff regularly participate in teaching undergraduate courses? _____

26. Does your museum have any arrangement with your local university so that museum staff, or university research students, cna work for a higher degree in your museum on the collections under the supervision of museum staff? _____

27. Does your museum organise regular public lecture tours of the natural history displays? _____

28. Does your museum organise field activities of any kind for the public? _____

RESEARCH

29. Does your museum regularly lend material from the collections to scholars for research purposes? _____

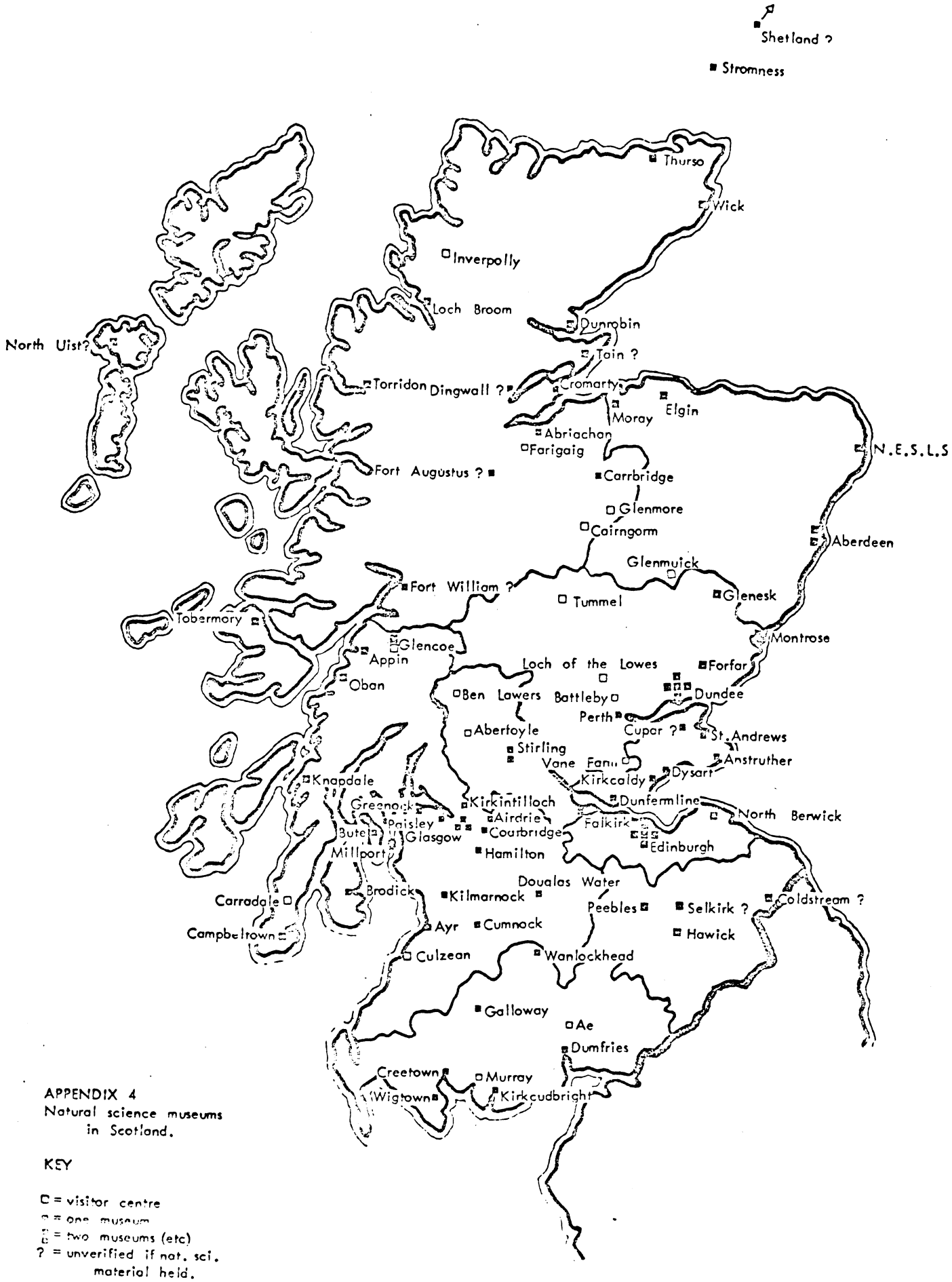
30. Approximately how many papers were published in scientific journals by museum staff in the period 1968-77? _____

31. Approximately how many papers were published in scientific journal by scholars from other institutes, utilising your museum's material? _____

CONSERVATION

32. Does your museum take part in any biological or geological recording scheme? _____

33. Do your museum staff get involved in action over particular, local conservation issues?



APPENDIX 4
Natural science museums in Scotland.

KEY

□ = visitor centre
▫ = one museum
▫▫ = two museums (etc)
? = unverified if nat. sci. material held.

COLLECTIONS AND COLLECTORS OF NOTE

16 THE MANX MUSEUM SHELLS FROM 'THE MANXLAND DRIFT'

The geological collections of the Manx Museum include a sizeable group of marine shells, collected mainly from the talus of the coastal cliffs of the north of the Island. About one third of these are well localised, since they were the results of the efforts of the Field Section (now defunct) of the Isle of Man Natural History and Antiquarian Society to obtain a collection more truly representative, both in terms of distribution of find spots and range of species. They carry registration numbers (IOMMM) with a 68 prefix and most were identified by Mrs. N.F. Macmillan of Liverpool Museums, to whom grateful thanks are due.

The remainder largely consist of collections made by the first curator (P.M.C. Kermode), the Rev. S.N. Harrison and the Rev. A.S. Newton and deposited in the Manx Museum through the Isle of Man Natural History and Antiquarian Society in 1923[1]. Some groups, not identified as to species, were accompanied by dated locality labels written by Kermode and seem to represent the fruits of a particular day's fieldwork, while others are quite evidently part of Kermode's collection from the sewer cuttings on the Ramsey Mooragh[2]. One group, (stored uniformly in glass-topped tins and bozes with data labels said - by Dr. Owen of Manchester and others - to be in the handwriting of P.F. Kendall, 'Lecturer on Geology at the Yorkshire College, Leeds'[3]) had long puzzled me, since about half carried green spots indicating they had been figured. Information from Dr. Hugh Torrens, University of Keele, enabled me to check that a few had, in fact, been figured in F.W. Harmer's The Pliocene Mollusca of Great Britain (London, Palaeontographical Society, Vol. 1, 1914-19 & II, 1920-25) and had been, therefore, in the Rev. S.N. Harrison's collection. They are all listed below.

When due allowance is made for a welter of synonyms and some rather dubious species it would appear that something between a third and a half of the species recorded from the 'Manxland Drift' are now represented in this museum's collections. When the, at present unidentified, material has been further checked this situation will probably improve. Due allowance must also be made for the difficulty of distinguishing modern tideline debris from 'fossils' from the talus. It is noteworthy that Kendall printed records for many species only from the unimpeachable context of the Ramsey sewer cuttings and inland sand cliffs ('brooghs') of the Mooragh. Other authors were more credulous. I would suspect that some readily identifiable species which have not been refound in recent collecting should be deleted from the 'fossil' list.

I would be very grateful to hear from anyone who has further material from the 'Manxland drift' and, in particular, as to the whereabouts of the balance of the Rev. S.N. Harrison's collection and those of Alfred Bell[4] and P.F. Kendall. In conclusion it is pleasant to be able to record that the Centenary of the still-active Isle of Man Natural History and Antiquarian Society, in 1979, has been marked by an issue of stamps. One of these carries a portrait of one of its founders - P.M.C. Kermode, first curator of the Manx Museum - and of the shell named in his honour by Kendall, 'Nassa kermodei'. (see front cover)

References

1. 18th Annual Report of the Trustees of the Manx Museum.
2. Yn Lioar Manninagh I, ii, pp. 96-8, 'Fossil shells from the boulder clay and sand, North Ramsey' read 28.9.1889.
3. Ibid pp. 397-437 'On the glacial geology of the Isle of Man' 1894.
4. Proceedings of the Isle of Man Natural History & Antiquarian Society n.s.I 'The cliffs of North Ramsey and their fossil contents' read 18.1.1912.

Items from the Rev. S.N. Harrison's collection now in the collections of the Manx Museum

In the following list Pl. with Roman numerals indicate plates in F.W. Harmer's The Pliocene Mollusca ... - volume as indicated - and 'Bell' refers to Reference 4. It seems that some of Harrison's material reached Harmer via Bell. The latter indicated that all the examples he illustrated in Proc. Isle Man Nat. Hist. antiq. Soc. n.s.I, had also been figured by Harmer. It would be possible that some were drawn but not used - or did Bell and Harmer produce some other publication?

Specimens in alphabetical order of label name. Brackets enclose Bell's synonyms, or apparent synonyms. The nomenclature has not otherwise been revised.

* Indicates specimen has green spot, as if figured.

	IOMMM No.
Astarte Baulesii Man. (Bell has 'A.Banksii (Warhami Hanc)'- the same?)	66-126d
A. compressa Mont.	66-126b
Balanus bisulcatus var. plicatus Dam.	66-126a
Bela turricula Mont.	66-129a
Buccinium cf groenlandicum Chemnitz	66-127
B. meridionale var elongata-undosa* 3 specimens; 1 is Bell's 21 ? NOT in Harmer although spotted	"
Cardium tuberculatum L. 'Cranstal P.C.K.' - on label	"
Corbula gibba Olivi	66-131
Cerithium tricinctum Brocchi* The shell so labelled is that figured by Bell, 2, as Turritella incrassata and would appear to be this species. Harmer cites neither as Manx, although this is spotted	66-127
Eulimene obesa A.Bell (Bell, 1, Eulimella obtusa)*	66-128
Fusus longiroster Brocchi mentioned by Harmer I, p. 174, as sent to Bell	66-127
Littorina littorea L. cited by Harmer as Manx II, i, p. 646	66-127
Murex (Ocenebra) erinaceus L.* Harmer, I, Pl. XII, 14	"
Murex harrisonii A. Bell* (Bell, 14) Harmer II, i, p.521 'Cranstal Point' NOT II,i, pl. XLVII, 2 since not holed.	"
M.monacensis A. Bell*	"
M. rudis Borson 'young' 'Point Cranstal', Harmer I, p. 122.	"
Nassa kermodei Kendall (on Isle of Man stamp! - see cover)	"
N. monensis Forbes 'Cranstal Point and elsewhere', Harmer I, p. 74	"
Natica catenaDC covered with Hydractinia 'Ramsey shore, Rev. S.N. Harrison' - on label - the fossil status of this shell is doubtful	66-152
N. sordida Philippi (=N. fusca Blain.) not listed as Manx by Harmer	66-127
Searlesia costifera var monensis 'Cranstal Point', Harmer, I, p. 140	66-129c
S. nordmanii Harmer I, mentioned p. 146 as in Harrison's collection	66-129b
S. gracilis DC	66-130/2
Sipho gracilis var convoluta Jeff.	66-130/3
S.hibernicus A. Bell* (Bell, 17)	66-130/1
S. menapiae A. Bell* 5 = Harmer I, Pl XXIII, 19 (Bell, 18)	66-130/4,5
S. tortuosa var liratus F.W. Harmer* (Bell, 23 as lineatus)	66-130a
Solen ensis L.	66-126
Tellina fabula Gm.	66-126
Trichotropis borealis Brod. & Sow.	66-129
Trophon clathratus L.* Harmer I, Pl. XII, 25	66-128
T. lamplughi F.W. Harmer	"
T. truncatus (Strom)	"

Larch S. Garrad,
Assistant Keeper,
Manx Museum

COLLECTIONS AND COLLECTORS OF NOTE

24 RAWTENSTALL MUSEUM

See G.C.G. 2 No. 3 p. 114

Happily it can now be reported that the Rawtenstall Museum geological collection is presently receiving curatorial attention.

Following the transfer from Rawtenstall to Blackburn Museum on "deposit loan" it quickly became apparent that the collection was in urgent need of care and proper examination. Many of the boxes were in a state of semi-collapse, while many of the specimens were unwrapped and very dirty. The staff at Blackburn responded favourably to an offer of help from Bolton Museum so the collection was again moved, this time to Bolton.

The collection is now on extended loan (or perhaps re-loan is more correct) to Bolton for the purposes of examination, listing and storage. It is understood that the loan will continue until Blackburn have the staff and facilities to cope with the material. The only constraints are that any locally relevant material is to be returned to Rawtenstall and Blackburn has stipulated that nothing be thrown away.

With an estimated 3000 specimens needing attention the fact that the material is on loan obviously imposes some constraints on its treatment. For instance, it was deemed impractical in terms of time spent, to physically mark each specimen with a reference number, so after cleaning each specimen is wrapped in acid-free tissue paper and assigned a number which is written on the outside of the package. Three parallel series of numbers with different letter prefixes are being built up, one each for rocks, minerals and fossils. The specimens are listed to ultimately form a catalogue and a single index card is typed for each specimen. The cards are filed alphabetically according to species in the same three series of rocks, minerals and fossils. A copy of the catalogue will be sent to Blackburn when the job is completed.

The wrapped specimens are being placed in standard heavy-duty cardboard boxes with the reference numbers of the contents marked on each. The boxes are stored on a steel mobile shelving system. Large specimens are being sealed in polythene tubing and also placed on the steel shelving. To date, some 650 minerals, 150 rocks and 150 fossils have been processed. The work has taken 26½ man days. A more complete report on the contents of the collection will appear when the work is finished. However, so far there has been a disappointing lack of data with the specimens. Most of the minerals appear to come from the West Cumbria haematite deposits and would be an excellent in-depth collection if they could be assigned to a particular locality or group of localities.

Finally, appreciation must be expressed to the staff at Blackburn Museum who have allowed the collection to be transferred and worked on in this way.

Alan Howell,
Bolton Museum

Lapmaster

LAPMASTER 15 is a new addition to the LAPMASTER range of machines, and it is not only suitable for Laboratory or Metallurgical use but is equally capable of small batch production work.

This size of machine is available fitted with various types of Lap Plates such as Copper, Brass, Ceramic, for specialised lapping and polishing operations, as well as being capable of being fitted with special Jigs and Fixtures for lapping and polishing awkward shaped components.

Lapmaster offers a complete range of Accessories i.e. Monochromatic Light, Polishing Stands, Optical Flats, Polishing Plates, Flatness Gauges, Hand Lapping Plates. In addition there is available a complete range of Abrasives in all materials including Diamond and Lapping Vehicle to suit all applications.

PAYNE PRODUCTS INTERNATIONAL LIMITED

P.O. BOX 1 PLYMOUTH
DEVON PL1 1YN
ENGLAND
Tel: Ivybridge 3191

COLLECTIONS AND COLLECTORS OF NOTE

4 THE BATH GEOLOGICAL COLLECTIONS

THE MOORE COLLECTION OF UPPER LIASSIC CROCODILES: A HISTORY

Although, perhaps, eclipsed by the beautifully preserved large vertebrate fossils of the Lower Lias, the Upper Lias (Toarcian, Lower Jurassic) is well known for its vertebrate fauna. The presence of crocodilian remains in beds of this age was known at an early stage. A skeleton of Steneosaurus bollensis (Jaeger, 1828) was found in the Upper Liassic Alum Shales Series of the Whitby succession, Yorkshire, as early as 1758 (Chapman, 1758, Wooler 1758, Young and Bird, 1828, Buckland, 1836, Owen, 1842, Browne, 1946, Westphal, 1962). Since this initial find, various steneosaur mesosuchian crocodiles have been recovered from this locality. Notably, Steneosaurus brevior Blake 1876 is recorded from the Jet Rock Series (underlying the Alum Shale Series) (Tate and Blake 1876, Westphal, 1961, 1962); Steneosaurus gracilirostris Westphal 1961 is based on several specimens from the Alum Shale Series.

Steneosaurus latifrons (Owen, 1884) (Lydekker, 1888 : 113) is recorded from the Upper Lias of Northamptonshire (see also Woodward and Sherborn 1890 : 296). This English crocodile fauna is more diverse than that so far obtained from the classic European locality of similar age, Holzmaden, in southern Germany (see Hauff, 1953 for a general account). The Holzmaden deposits yield a richer vertebrate fauna overall, as compared to that of Whitby, but they have certainly been more thoroughly worked and intensively sampled since it is actively quarried. Notably common in the crocodilian fauna of Holzmaden is Pelagosaurus typus Bronn 1841. This is an originally monotypic mesosuchian crocodile genus which has also been recorded from various other localities in southern Germany, and from Normandy (Deslongchamps, 1863). Specimens of this form have been thoroughly and competently described in the literature, but have, as yet, not been recorded with certainty from the English sequence.[1] This is surprising as beautifully preserved specimens have been present in the collection of Charles Moore for over 130 years.

---

1 Lydekker (1888: 106) mentions a partial skull of Pelagosaurus from the Upper Lias, probably of Whitby. Fox-Strangways (1892: 121) mentions 'P. typus' in a fossil list of the Yorkshire Lias. Woodward and Sherborn (1890: 262) reiterate this record as 'P. ?typus'. Arkell (1933: 182) later states that two species of Pelagosaurus have been found in the Alum Shale Series of Whitby. Finally, Steel (1973: 26) reiterates Lydekker's record.

The specimen referred to above would appear to be R 14437 in the British Museum (Natural History). The specimen is very badly preserved (Plate 1 figs. D, E). Only the dorso-medial portion of the isolated skull is available for study. The overall proportions of the skull testify that its affinities lie within P. typus. No further locality or stratigraphical information is available for this specimen.

A few other fragmentary and badly preserved remains present in the British Museum can be tentatively assigned to P. typus. R. 4, preserving the skull table (orbits 5 cm. long and 4 cm. deep, laterally placed) and 11589 (cast of a crushed cranium, Mantell Collection, purchased 1838) possibly belong to P. typus. They were referred to 'Pelagosaurus brongniarti (Kaup 1835)' by Lydekker (1888: 108). Westphal (1961, 1962: 75) established this species as a junior synonym of Steneosaurus bollensis (Jaeger 1828), but it is possible that these specimens are distinct.

Woodward (1893: 330) also mentions that Pelagosaurus is known from Gloucestershire. I can find no further mention of these specimens, although a rich vertebrate fauna was supposedly collected from the 'Fish and Saurian Bed' of the Dumbleton Upper Lias (Woodward 1893: 266).

A native of Ilminster, Somerset, Charles Moore (1815-1881) spent many of his early palaeontological collecting days on the Upper Lias in that area. He made a large collection of fossils from these rocks, and became an expert on the geology of the area. Indeed, Winwood (1892: 7), in a rather acrimonious turn of phrase, remarks on the fact that Moore looked upon professional geologists with "jealous suspicion" after "the magnates" of the Geological Survey drew upon his detailed knowledge of local geology without acknowledgement. Fortunately for Moore, and for geology in general, he married well and was able to spend much time in geological fieldwork throughout his life. Thus, his magnificent collection of Upper Liassic fossils formed the basis of a small museum which eventually grew into a vast personal museum, later to be housed in Bath, Avon. Prominent amongst this collection is a series of specimens of Pelagosaurus typus from the Toarcian of Ilminster.

In spite of, or perhaps as a result of, his unfortunate experience with professional geologists previously, Moore emerged as a much respected geologist of the nineteenth century. Probably his greatest talent lay in collecting palaeontological specimens. Indeed, he was once jokingly accused of exercising geological clairvoyance when he correctly predicted the precise contents of a nodule from the 'Saurian and Fish Bed' (Ilminster Upper Lias) on the occasion of his leading a party of members of the British Association for the Advancement of Science around his Upper Lias localities. The collections he made are vast, highly important, and remarkably rich in original species. Furthermore his examination of them was exceedingly thorough.

Moore first identified the crocodile from the Ilminster Upper Lias as 'Teleosaurus'. Bearing in mind that he was an active collector during his early years as a geologist, it is quite possible that Moore might have found some of his Pelagosaurus specimens before Bronn named the genus in 1841. Certainly, the earliest known record of this material is in a letter to Richard Owen dated July 5th 1848, requesting that he examine and describe the specimens. Owen was the expert on fossil reptiles, having published a classic work which proved to be a turning point in vertebrate palaeontology, at least as far as the public was concerned, in 1842. The letter (in the Owen Correspondence, 9, British Museum (Natural History) Library) is reproduced below:

"

Ilminster July 5 1848

Dear Sir,

I did not have the pleasure of seeing you again before I left town and therefore took the liberty of leaving my Teleosauri with you intending to write directly I returned. Since then I have been so much a truant I have had very little opportunity of doing so. If you would like to undertake their description I shall be pleased by your doing so as they cannot possibly get into better hands. In this case I should wish you to describe and publish them when and where you liked. I should like to be allowed to have the drawings on the stone if this is usual. I have two ichthyosauri from the same beds. Any information you should desire respecting the locality etc. I shall be happy to furnish.

I remain

Yours very truly

I found an Ichthyosaur in the Lower Lias last week.

No such paper by Owen appeared (but see Appendix p 253). Instead, Moore began to advertise the specimens himself. He was a founder member of the Somerset Archaeological and Natural History Society and exhibited "a rich collection of fossil fish and insects from the Lias near Ilminster" at their inaugural meeting in 1849. Perhaps his 'Teleosauri' were exhibited at the same meeting. Moore then published an early review of Upper Liassic palaeontology in the proceedings of that Society, briefly describing three specimens found at Strawberry Bank, north of Ilminster (ST 361148) He specially mentions a very small specimen, reportedly some 33 cm. (13 inches) in length. This he called a "baby saurian". In a later paper (Moore 1866: 181) he mentions several specimens of 'Teleosaurus temporalis Blainville 1835' from the same locality (see also Moore 1864: 5), again giving particular reference to the specimen of a juvenile form, preserving the skull and the greater part of the post-cranial skeleton. The skull and skeleton were recovered separately, with an intervening period of 'several months'. The skull was found first and the skeleton only after considerable searching. Moore (1866: 182) relates the painstaking work involved:

"On carelessly striking a piece of yellow limestone of the saurian bed, which was lying on a heap of the marlstone, with the hammer, a small portion flew off exposing a fragment of bone, which on examination proved to be part of the jaw of a little saurian, the continuation of which, after a lengthened search, was found in another block. Several months was occupied with its development, and when finally cleared the cervical vertebrae leading to the edge of the stone indicated that its body might have been found in another block, and the quarry was again repaired to with the hope of finding it, but without success. Some months again elapsed when, as a last hope, it was considered possible the body might still be lying in its original bed in the section.

With the block containing the head the quarry was again sought and it was fitted to the exposed edges of the saurian and fish bed until a piece was found which joined on somewhat roughly, but which, notwithstanding, was supposed to contain the body of the little specimen. On working down below the point where the skeleton should have shown itself no part was visible, and it was thought after all the labour had been lost. Turning the block on edge and endeavouring to split it, a bit of bone not larger than a pin, belonging to one of the lower limbs was exposed, and working away from this indication we were led on to the body, which, with its vertebral column, is still covered up by its undisturbed bony scutes, with which, like the gavial of the present day, to which it is closely allied, this little crocodile is furnished, and by these fortunate incidents we were enabled to complete one of the most beautiful little specimens ever discovered."

Moore (1852, 1864, 1866) further mentions the presence of a Leptolepis in the stomach region of this specimen - "the last meal it had eaten, countless ages ago" (Moore, 1866: 183).

In a fourth paper (Moore, 1870: 97) he reported on and exhibited a specimen of 'Teleosaurus temporalis' from Ilminster to the meeting of the British Association for the Advancement of Science at Exeter. It appears that Moore became aware of the true affinities of the specimens found at Ilminster after this. Reporting a later excursion of the Geologist's Association around Bath, he (1879: 200) mentions that two species of pelagosaur, 'P. moorei' and 'P. typhus' (sic), come from the Upper Lias at Ilminster.

A clue to this realisation that these crocodile specimens belonged to the genus Pelagosaurus lies in the fact that Wilson (1893), in a report on the type material housed in the Bath Museum, mentions a crocodile specimen

from Ilminster described in manuscript (1876) by Eugene Eudes-Deslongchamps, under the name Pelagosaurus moorei Deslongchamps, sp. nov. (see also Winwood 1892). Eugene was the son of Jacques-Amand Eudes-Deslongchamps (1794-1867). Jacques Deslongchamps was an acknowledged authority on fossil crocodiles, particularly teleosaurs. He left many manuscript notes at his death on January 18th 1867. Eugene revised and edited these notes, publishing several articles in his own right. He is particularly noted as having redescribed some of the fossil crocodile species established by his father, and occasionally synonymising them with previously established genera.

Moore could well have been introduced to the younger Deslongchamps by his old friend Thomas Davidson. Davidson worked extensively on the fossil brachiopods collected by Moore, and was a great encouragement to him. The reason for this possibility is that Davidson obviously had a high regard and personal friendship with the Deslongchamps family. He mentions their work in several letters to Owen (22nd November 1852, 6th July 1867 - see Owen Correspondence 9 : 227, 233).

Deslongchamps' manuscript describing the crocodiles of the Ilminster Upper Lias has not yet been traced but may not have survived the bombing of Caen in World War II. Eugene Deslongchamps died in 1889 (Mook and Borker 1934) and so outlived Moore by some 8 years. That Deslongchamps must have met or corresponded with Moore is reasonably certain since mesosuchian material from Normandy is now in the Moore Collection at Bath (M 1698). It is possible that Moore exchanged some specimens with Deslongchamps perhaps after his visit to France in 1872.

After Moore's death in 1881, the then 'Bath Institution" bought his entire geological collection by public appeal. Updated versions by Winwood of Moore's (1864) catalogue to the collection form the next mention of the crocodile specimens (Winwood 1888 : 6, 1900 : 9 see Anon. The Bath Chronicle Sep. 23rd 1864). Bearing in mind Winwood's close knowledge of Charles Moore's work (they organised the British Association for the Advancement of Science meeting at Bath together in 1864), and of his collection, it is incredible that Winwood should record 'Pelagosaurus temporalis' as present in the Moore collection in the latter paper. Similarly, it is interesting to note that Wilson, referring to Deslongchamps' monograph, records 'Pelagosaurus moorei' amongst the Type material in Bath Museum, but 'Teleosaurus temporalis' amongst the described and figured material from the Ilminster Upper Lias.

No further detailed examination of this crocodilian material has been undertaken. Woodward (1893 : 256) merely mentions the juvenile specimen named 'P. moorei' by Deslongchamps and the further specimens in the Bath Museum. Arkell (1933 : 170) later recorded both P. typus and P. moorei from the Ilminster Upper Lias.

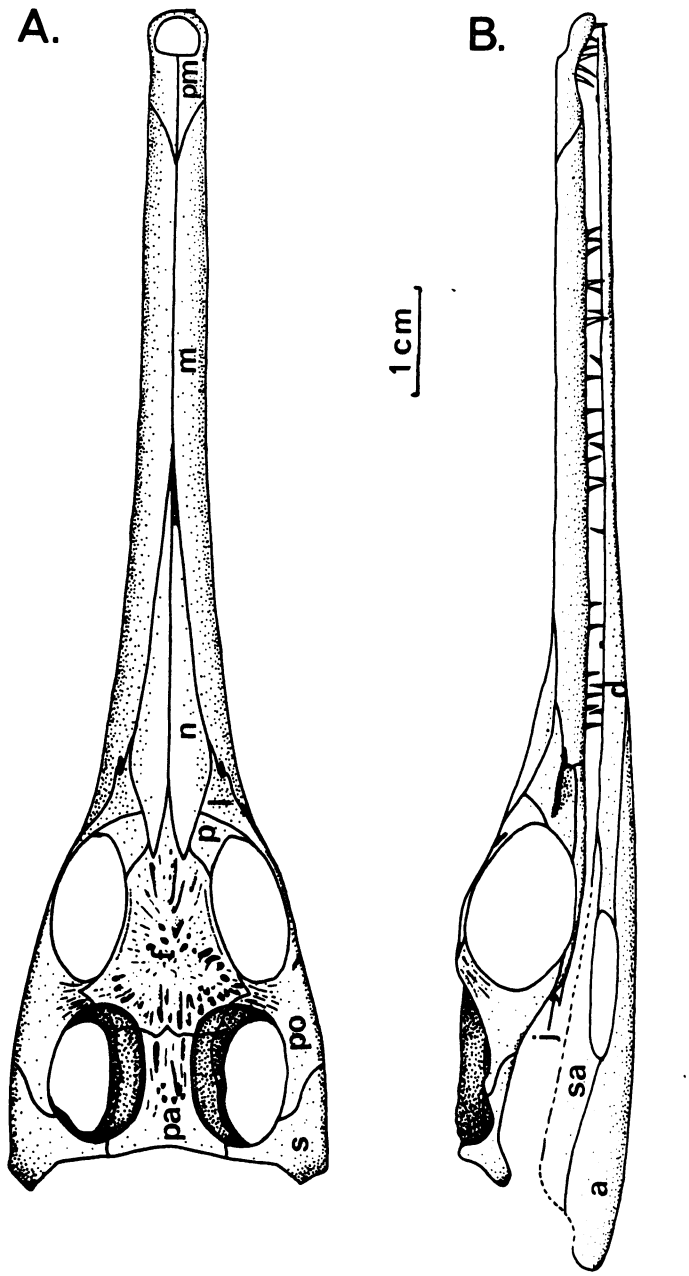
Duffin (1978) in a general account of the vertebrate faunas collected by Charles Moore, briefly mentions the history and importance of the specimens held in the Bath Geology Museum, noting that reviews of fossil Crocodilia have previously failed to mention even the existence of these specimens (see Woodward 1885, Westphal 1961, 1962, Steel, 1973).

Some comments on the Ilminster specimens

Twenty-two specimens referable to Pelagosaurus typus are present in the Moore Collection of fossil vertebrates from the Ilminster Toarcian (Bath Geology Museum catalogue numbers M 1410 to M 1431 inclusive). Three specimens (M 1412, M 1416, M1422) are currently on display in the Moore Room of the museum.

From the above review of the history of the specimens, it is obvious that

M 1418 (Plate 1 figs. A - C Text Fig. 1A, B) is the 'baby saurian' of Moore, and the intended Type specimen of P. moorei Deslongchamps MS. The specimen comprises two parts. M 1418a preserves the skull and anterior cervical vertebrae in lateral and dorso-lateral views. The skull is complete



Text fig. 1. Partial reconstruction of M 1418a, the skull of a juvenile specimen of Pelagosaurus typus from the Ilminster Toarcian.
A. Dorsal view, B. Lateral view. Abbreviations: pm - premaxilla; m - maxilla; n - nasal; l - lachrymal; p - prefrontal; f - frontal; po - postorbital; s - squamosal; pa - parietal; d - dentary; a - angular; sa - surangular; j - jugal.

Plate 1. Pelagosaurus typus from various localities. Fig. A. M 1418a, juvenile skull from Ilminster in oblique dorsal view (1 cm. bar). Fig. B. same specimen in lateral view. Fig. C. Counterpart (M 1418b) in dorsal view. Fig. D. B.M.(N.H.) 14437 from Whitby in dorsal view. Fig. E. Same specimen in lateral view.

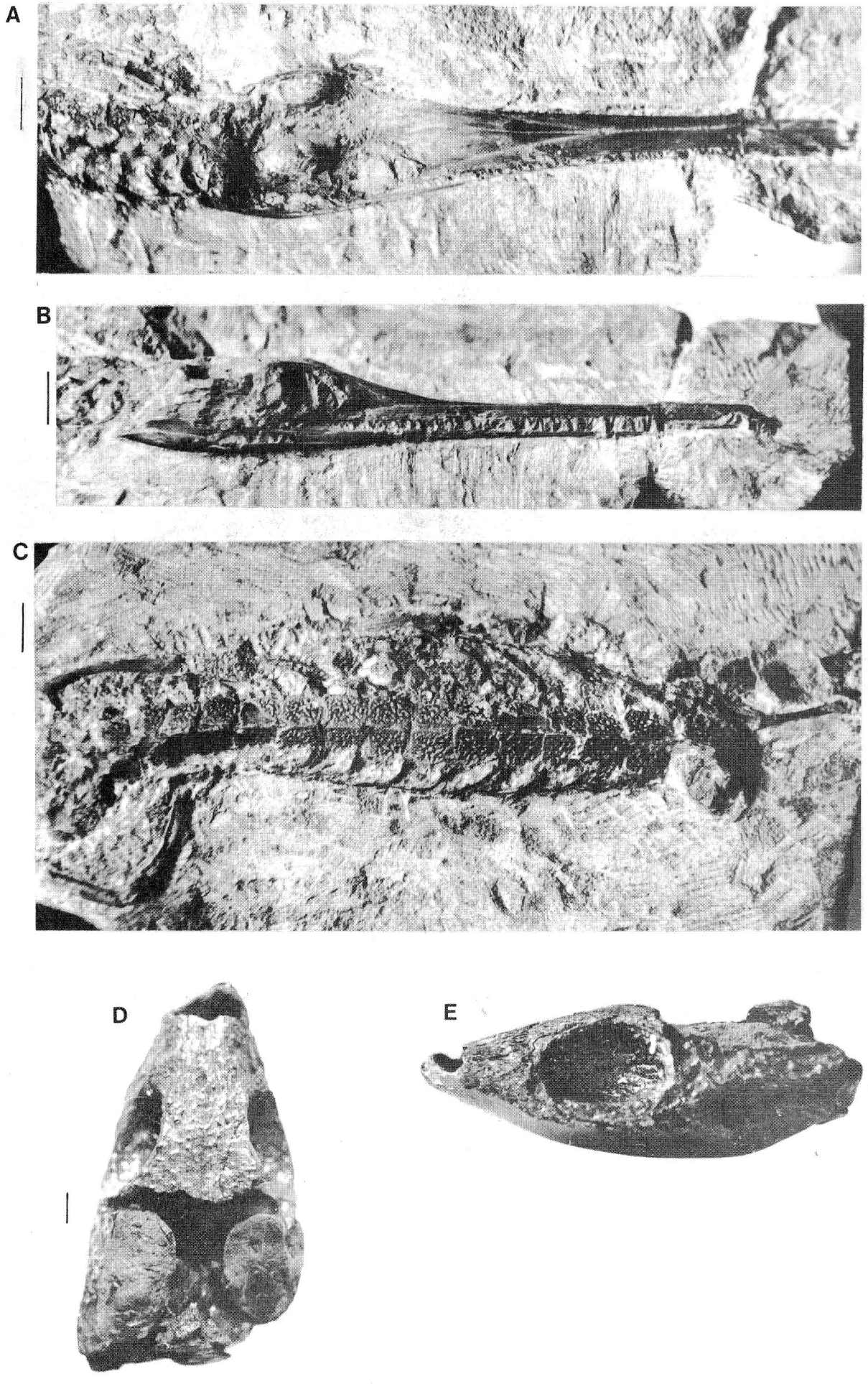


Plate 1. *Pelagosaurus typus* from various localities (see text).

Plate 2. Specimens of Pelagosaurus typus from the Ilminster Toarcian. A, M 1428 in oblique dorsal view. B, M 1422 in lateral view. C, M 1416 E, D, M 1426 B. 1 cm bar.

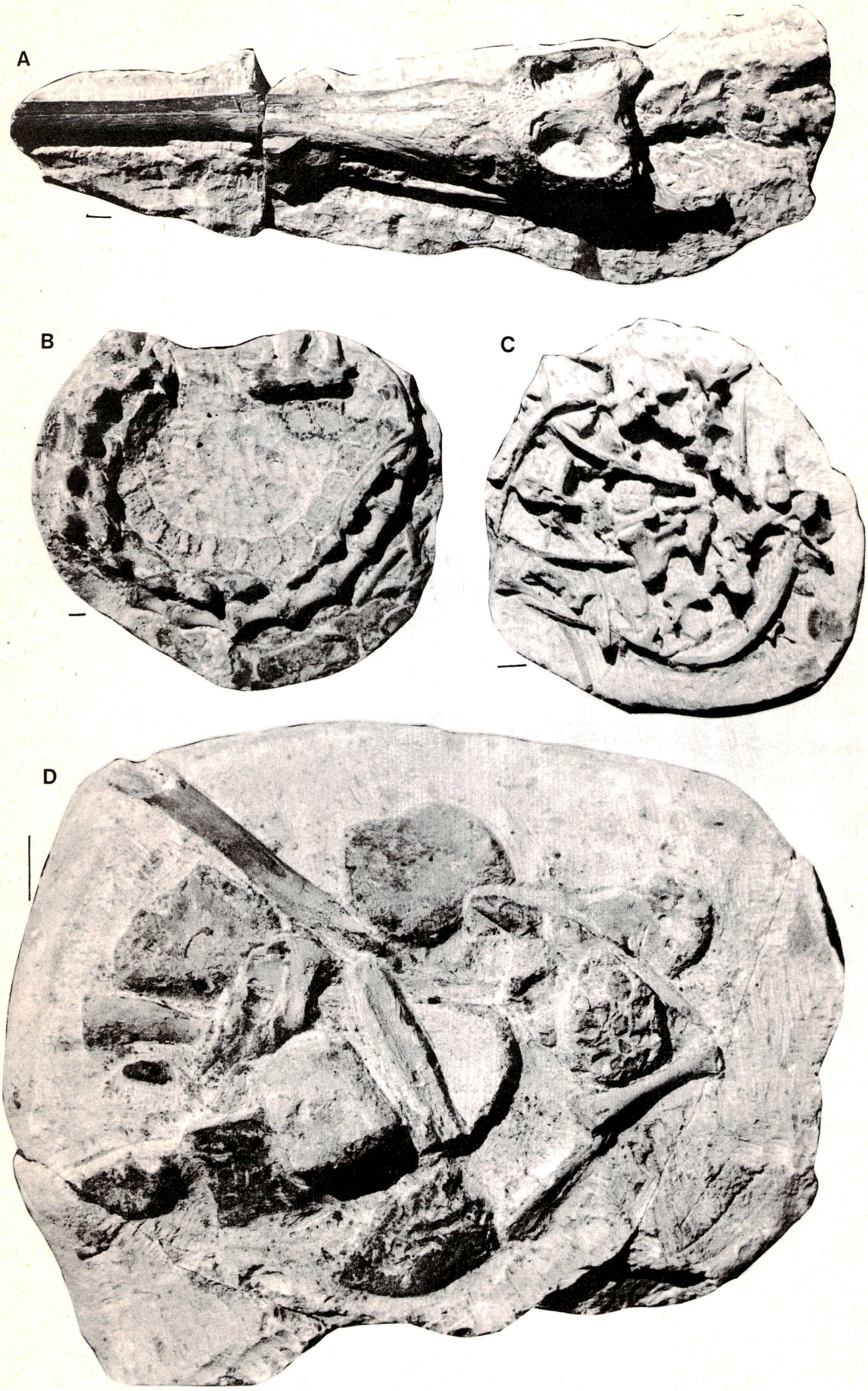


Plate 2. *P. typus* from Ilminster.

Plate 3. Lithograph featuring *P. typus*.

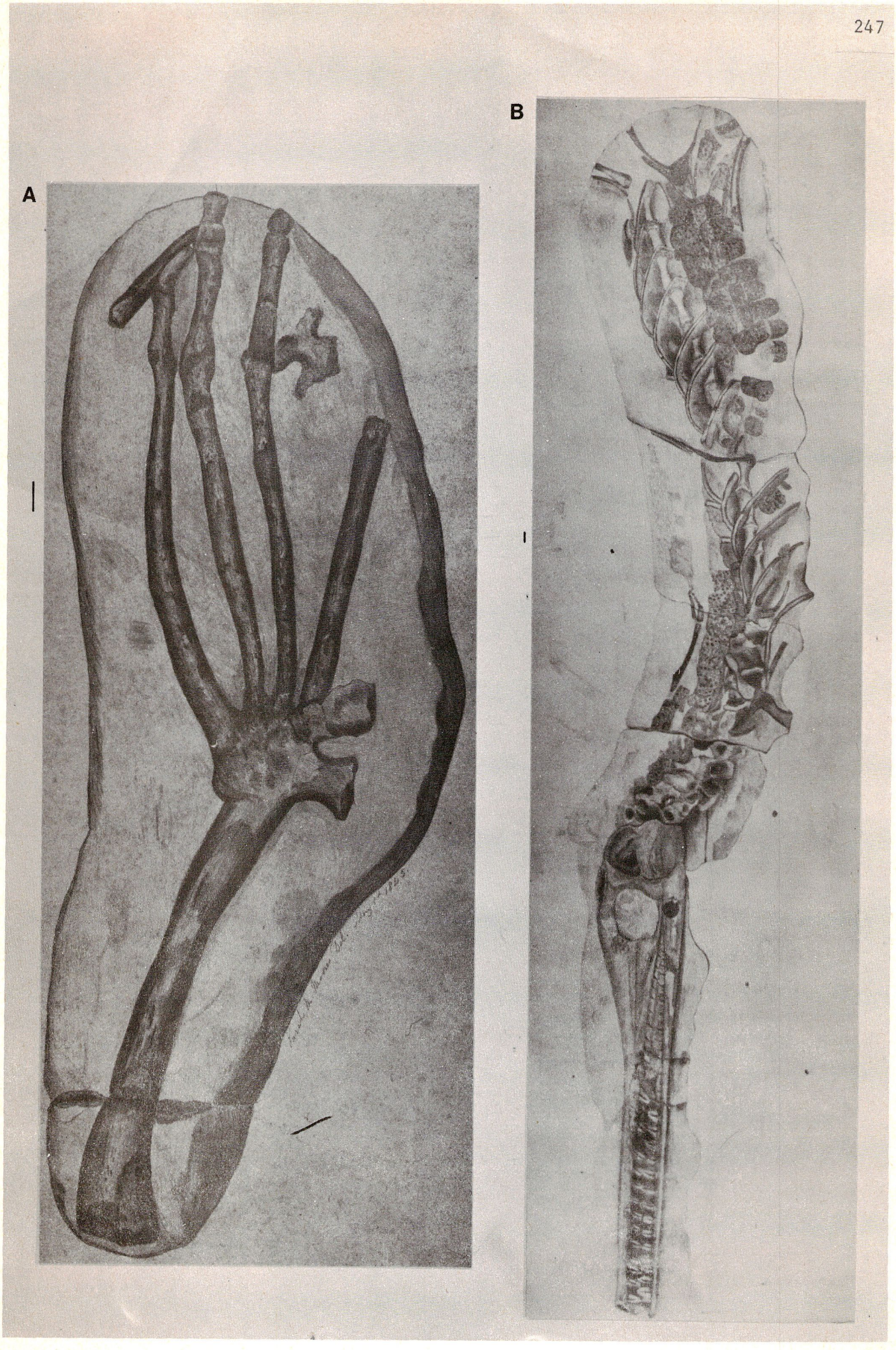


Plate 4. Pencil illustrations by Sarah Moore.

and beautifully preserved in three dimensions, with the sutures between adjacent bones well defined. The occiput is obscured by the matrix, a well indurated creamy limestone with calcite cement. M 1418b (Plate 1 fig. C) preserves the greater part of the postcranial skeleton in dorsal view. Skeletal elements present include the double row of sculptured dorsal scutes, ribs, proximal elements of both hindlimbs and elements of the pectoral girdle. The dorsal vertebrae are obscured by the dermal scutes, and the articulated vertebral column and occasional fin dermotrichia of a leptolepid fish (total visible length 22 mm.) are present on the left side of the body, beneath the ribs, 45 mm. anterior to the proximal end of the left femur. This is further evidence that this is the 'baby saurian' of Moore (1852, 1864, 1866). The matrix beneath the ribs is darker in colour than that in the remainder of the nodule. This colour difference is due to the organic matter of the skin and viscera. Since the leptolepid remains are enclosed in this darker matrix, it is reasonable to assume that they lie within the body cavity of this specimen of Pelagosaurus, and thus constitute prey, as previously suggested by Moore (1852 etc.). The alternative explanation, that the carcass of this juvenile pelagosaur came to rest directly over that of the leptolepid prior to eventual lithification and preservation, is unlikely.

Both specimens show signs of preparation, presumably by Moore himself. This preparation has, unfortunately, resulted in damage to certain parts of the specimens, notably the lower temporal arcade and postero-lateral cranial elements in M 1418a.

Duffin (1979), in a companion paper to the present one, describes the juvenile skull in detail, concluding that it should be ascribed to Pelagosaurus typus Bronn, 1841. It does not deserve taxonomic distinction at a specific level, contrary to the opinion of Deslongchamps. Briefly, those features distinguishing P. typus from contemporaneous steneosaur material are the large, laterally placed orbits, overall skull proportions and nature and distribution of the bone sculpture.

The remainder of the specimens collected by Moore from Ilminster are consistently preserved in the creamy limestone nodules which appear to characterise the 'Fish and Saurian Bed' at that locality. Not all of the specimens are articulated. Plate 2 demonstrates the range of articulation found within the collection. Some specimens, like M 1418 considered above, show good articulation (Plate 2 fig. A). Others show varying degrees of disarticulation (Plate 2 figs. C and D), but good association of the skeletal elements. Further specimens still are of particular taphonomic interest (Plate 2 fig. B). All of the crocodile specimens from this locality are referable to P. typus.

Illustrations of the specimens

We must also note the recent discovery of a series of illustrations of the Moore collection of Upper Lias vertebrates. Amongst this collection of pencil drawings in the Bath Museum is a lithographic place which features M 1418a and b, the juvenile specimen. The lithograph (see Plate 3) (CD.MD.3, Bath Geology Museum) is entitled 'Crocodilia' and is numbered 'Pl.25'. 'Day & Son Lithographers to the Queen' reproduced it, and the original block was cut

'From Nature on Stone by J. Erxleben'. The overall caption to the plate is 'Teleosaurus'. M 1418 comprises Fig. 2 of the lithograph, and is reproduced as a mirror image at natural size on the original. The composite bones are numbered and would presumably have been referred to in the text. A concentrated search through the available literature on fossil crocodiles, and vertebrates in general has so far failed to reveal the publication of this illustration or any accompanying text. I have been unable to gain any information on the engraver, Erxleben, and the name of the publisher serves only to date the plate to within the confines of Moore's own lifetime. The plate may well have been one of a series commissioned for engraving to which the text was never added, perhaps due to lack of funds.

Accompanying M 1418 on the plate is another specimen of P. typus (fig. 1, 1a, 1b on the original), presumably also drawn at natural size. The specimen may well have once belonged to the Moore Collection from Ilminster, but it cannot be traced in the collections of the Bath Geology Museum. Also present on the lithograph are the reconstructions of two mesosuchian skulls (figs. 3 and 4). One of these (fig. 3) is confidently referable to Teleosaurus cadomensis Geoffroy St.-Hilaire, while the other is possibly steneosaur in affinity.

It is unlikely that this lithograph formed part of a projected paper by Owen, since his publications were written and printed at a tremendous pace. Similarly, it is unlikely that Deslongchamps was the author, otherwise the plate caption would assuredly contain mention of Pelagosaurus moorei, his new species. The source of the plate remains obscure for the present time (see Appendix).

Amongst the pencil drawings by Sarah M. Moore, Charles' sister, are two which are ascribed to 'Teleosaurus' (Plate 4, figs. A and B). Both were presumably executed at natural size, as are all the other illustrations in the collection. Plate 4 fig. A shows a very strange specimen, the drawing of which (CD.MD.4) is dated May 1st 1845. The specimen is not in the material housed by the Bath Geology Museum, and is presumed lost. The affinities of the specimen are debatable.

The second illustration, completed on March 27th 1849 is of an articulated specimen of P. typus preserving the skull and greater part of the vertebrae, dorsal scutes and ribs. Assuming the drawing to be made at natural size, the skull of the specimen would have measured 255 mm. long. Like the others in the collection, this drawing (CD.MD.5) is made with great attention to detail. The specimen is not present in the Moore Collection at Bath, and is also presumed to be lost.

Referring to the discussion above, it may be that these two missing specimens, perhaps accompanied by others from the Moore Collection, were exchanged for other specimens with Deslongchamps.

Conclusion

It is remarkable that P. typus was not confidently recorded from the English Toarcian at an earlier date. This extended geographical range of the genus may prove important in faunal comparisons of the English and continental

European Toarcian. It is to be greatly regretted, however, that the Moore collection of Upper Liaasic crocodiles was not more thoroughly studied at an earlier date, that the manuscript description of the material by Deslongchamps has not been found, and that there is every likelihood that a number of the crocodile specimens collected by Moore have disappeared from the Bath Geology Museum collections.

Acknowledgements

I would like to thank Mr. Ron Pickford for access to the specimens. Mr. C. Copp, Dr. H. Torrens, Mr. K. Rodgers and Mr. B. Page read the manuscript in various stages of its development.

References

Anonymous. 1864. Mr. C. Moore's Geological Museum. The Bath Chronicle, September 23rd.

Arkell, W. J. 1933. The Jurassic System in Great Britain. 681 pp., 97 figs., 41 pls., Oxford.

Blainville, H. de. 1835. Osteographie, Atlas du Genre Crocodilus. Paris.

Bronn, H. G. 1841. in Bronn and Kaup, J. J. 1843. Uber die fossilen Gaviale der Lias-Formation und der Oolithe. Arch. Naturgesch., (8), 1, 77-82, Berlin.

Browne, H. B. 1946. Chapters of Whitby History 1823-1946. 332 pp., 99 figs., Hull and London.

Buckland, W. 1836. Geology and Mineralogy. 2 vols. London.

Chapman, W. 1758. An account of the fossile Bones of an Allegator, found on the Sea-Shore near Whitby in Yorkshire. Phil. Trans. R. Soc., 50 B, 688-691, London.

Deslongchamps, E. E. 1863. Memoires sur les Teleosauriens de l'Epoque Jurassique du Departement de Calvados. Mem. Soc. linn. Normandie., 13, 1-138, 9 pls., Caen.

Duffin, C. J. 1978. The Bath Geological Collections. f. The importance of certain vertebrate fossils collected by Charles Moore : an attempt at scientific perspective. G.C.G. Newsletter., 2, (2), 59-67.

_____ 1979 (in preparation). Pelagosaurus (Mesosuchia, Crocodilia) from the English Toarcian (Lower Jurassic). Submitted to N. Jb. Geol. Palaont.

Fox-Strangways, C. E. 1892. Yorkshire. Gen. Mem. Geol. Surv. U.K. Jurassic rocks of Britain I, 570 pp., 28 figs., 6 pls.

Hauff, B. 1953. Das Holzmadenbuch. 80 pp. illus.

Jaeger, G. F. 1828. Uber die fossile Reptilien, welche in Wurttemberg aufgefunden worden sind. 48 pp., 6 pls., Stuttgart.

Lydekker, R. 1888. Catalogue of the Fossil Reptilia and Amphibia in the British Museum (Natural History), 1, 309 pp., 69 figs.

Mook, C. C. and Borker, L. R. 1934. The Deslongchamps publications on fossil crocodiles. Am. Mus. Novit. No. 701, 1-7. New York.

Moore, C. 1852. On the Palaeontology of the Middle and Upper Lias. Proc. Somerset archaeol. nat. Hist. Soc., 3, 61-76.

_____ 1864. Handbook to the Geological Collection of Charles Moore, Esq., F.G.S., deposited at the Royal Literary and Scientific Institution, Bath. British Association Meeting, 1864, 1-13, Bath.

Moore, C. 1866. On the Middle and Upper Lias of the South West of England. Proc. Somerset. archaeol. nat. Hist. Soc., 13, 119-244.

_____ 1870. On a specimen of Teleosaurus from the Upper Lias. Rep. Br. Ass. Advmt. Sci. Exeter, pt. 2., 97.

_____ 1879. Excursion to Bath, Whit Monday, June 2nd and the following day. Proc. Geol. Ass., 6, 196-201.

Owen, R. 1842. Report of British Fossil Reptiles. pt. 2. Rep. Br. Ass. Advmt. Sci. Plymouth, 60-204.

Steel, R. 1973. Crocodylia. in Kuhn, O. (ed.). Handbuch der Palaoherpetologie, 116 pp., Stuttgart and Portland, U.S.A.

Tate, R. and Blake, J. F. 1876. The Yorkshire Lias. 475 pp., 9 figs., 23 pls., London.

Westphal, F. 1961. Zur. Systematik der deutschen und englischen Lias-Krokodilier. N. Jb. Geol. Palaeont. Abh., 113, 207-217.

_____ 1962. Die Krokodilier der deutschen und englischen Oberen Lias. Palaeontogr., A, 118, 23-118, Stuttgart.

Wilson, E. 1893. Fossil Types in the Bath Museum. Proc. Bath. nat. Hist. antiq. Fld. Club., 7, 270-292, Bath.

Winwood, H. H. 1888. Handbook to the Geological Collection in the Literary and Scientific Institution, Bath. 13 pp., Bath.

_____ 1892. Charles Moore, F.G.S. and his work. Proc. Bath. nat. Hist. antiq. Fld. Club., 7, 220-269, Bath.

_____ 1900. Handbook to the Geological Museum, Bath. 15 pp., Bath.

Woodward, A. S. 1885. On the literature and nomenclature of British fossil Crocodilia. Geol. Mag., 3 (2), 496-510.

_____ and Sherborn, C. D. 1890. A Catalogue of British fossil Vertebrata. 396 pp., London.

Woodward, H. B. 1893. The Lias of England and Wales (Yorkshire excepted). Gen. Mem. geol. Surv. U.K. Jurassic rocks of Britain III, 399 pp., 89 figs.

Wooller, 1758. A description of the fossil skeleton of an animal found in the alum rock near Whitby. Phil. Trans. R. Soc., 50, 786-790, pl. 30.

Young, G. and Bird, J. 1828. A Geological Survey of the Yorkshire Coast. 323 pp., 18 pls., Whitby.

Christopher J. Duffin,
126 Central Road,
Morden,
Surrey, SM4 5RL

APPENDIX: THE SOURCE OF THE LOST LITHOGRAPH

Chris Duffin's interesting exposé of the crocodilian treasures of the Moore collection is very welcome. It set me thinking about the "lost lithograph" marked plate 25 (see pl. 3,p.245) and what its history might have been.

Finding that the lithographer named on the plate,J. Erxleben,was one much employed by Richard Owen from at least 1840 (Owen 1895 1 173) was the first clue. From this it is now possible to identify the work for which plate 25 was intended but in which it was never published.

In 1847 Owen became a founder member of the Palaeontographical Society - formed to illustrate and describe British Fossils. In July 1849 Owen and T. Bell were the authors of the second publication of this Society, the first part of their joint work on the 'Reptilia of the London Clay'. After this Owen continued publishing a series of fine monographs through this Society until 1881. These are listed in the Bibliography of Owen's works by C.D. Sherborn (Owen 1895 2 333-382).

The same Bibliography also lists two larger scale companion works by Owen as follows:

1846 A History of British Fossil Mammals and Birds.London [Issued in 12 parts between 1844 and 1846].

1884 History of British Fossil Reptiles. 4to, London, [This book consists of a reprint of the papers which appeared between 1849 and 1884 [recte 1881] in the publications of the Palaeontographical and other societies; it was issued from time to time, as a separate work to subscribers, and was finally bound and published as complete. Beyond a few notes, here and there, the 'British Fossil Reptiles' is identical with the papers in the Monographs of the Palaeontographical Society, and these papers should always be referred to.]

One would expect Sherborn's opinion - as an expert bibliographer - that the second work was a mere reprint of Owen's Pal. Soc. and other monographs to be correct. However the differences extend well beyond "a few notes here and there". Introductory matter is added to the History, many if not all the differently numbered plates are given a quite different style in the History and some plates are quite different. Some of these differences are significant.

Compare for example plate 10 of Owen's 1851 Pal. Soc. Mon. "Reptiles of the Cretaceous Formations" reproduced here (p. 255) with the relevant plates 8 and 9 of Lacertians in Owen's History of British Fossil Reptiles part 4 1851 also reproduced here (p 257-9). Apart from differences in caption it is clear that the contents of these plates are quite different and that the Pal. Soc. plate is an amalga of the two History plates. There are some curatorial problems as a result. What is the specimen figured in Lacertians pl. 9, fig. 12 and nowhere else, which does not figure in the plate explanation? In whose collection is the jaw figured in Lacertians plate 8, fig. 2; Mrs. Smith's of Tonbridge Wells, as this plate explanation claims, or that of Sir Philip de Malpas Grey Egerton Bart FRS MP as the explanation to Pal Soc. plate 10 states?

The "History of British Fossil Reptiles" was issued, in a number of parts; 'Printed for the Author' as the Front Covers state.

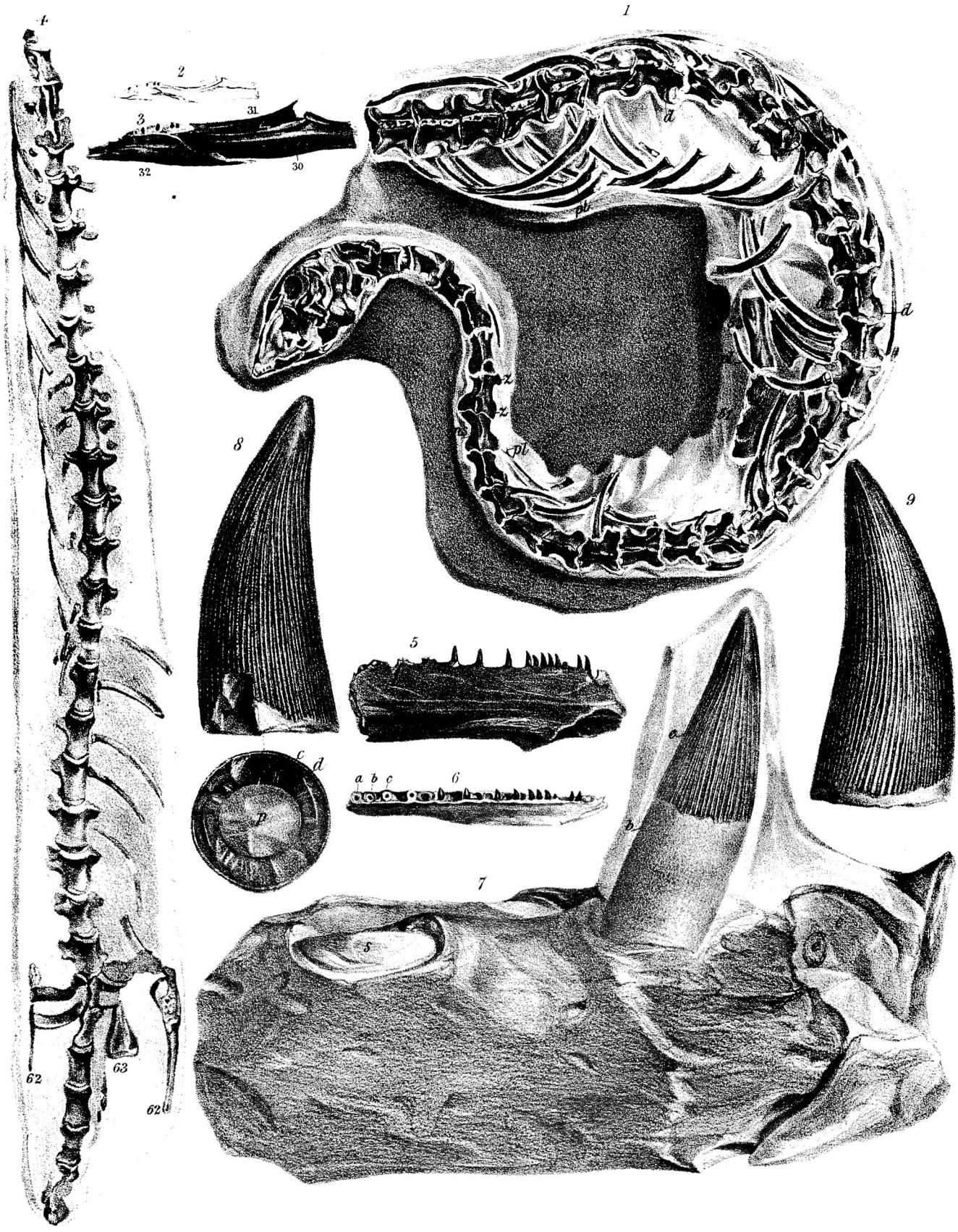
The author's intentions with this work can be seen from the rear cover:-

TAB. X.

Fig.

1. Mutilated head and vertebræ of the fore-part of the trunk of *Dolichosaurus longicollis*.
2. Outline of part of the lower jaw.
3. The same, magnified.
4. Vertebræ of the hind part of the trunk and pelvis of *Dolichosaurus longicollis*.
   From the Middle Chalk, Kent. Fig. 1, in the Collection of Mrs. Smith, of Tonbridge Wells. Fig. 2, in that of Sir Philip de Malpas Grey Egerton, Bart., F.R.S., M.P.
5. Portion of the lower jaw of *Raphiosaurus subulidens*.
6. Upper or alveolar surface of ditto.
   From the Lower Chalk of Cambridgeshire. In the Collection of James Carter, Esq., of Cambridge.
7. Portion of the lower jaw, with a tooth in situ, of *Polyptychodon interruptus*.
   From the Chalk of Kent. In the Collection of Mrs. Smith, of Tonbridge Wells.
8. Crown of the tooth of *Polyptychodon interruptus*.
9. Crown of the tooth of ditto.
   From the Green-sand of Cambridgeshire. In the Collection of James Carter, Esq.

All the figures, save fig. 3, are of the natural size.



From Nature on Stone by J. Erxleben.

Day & Son, lith.rs to the Queen.

Lacertians.

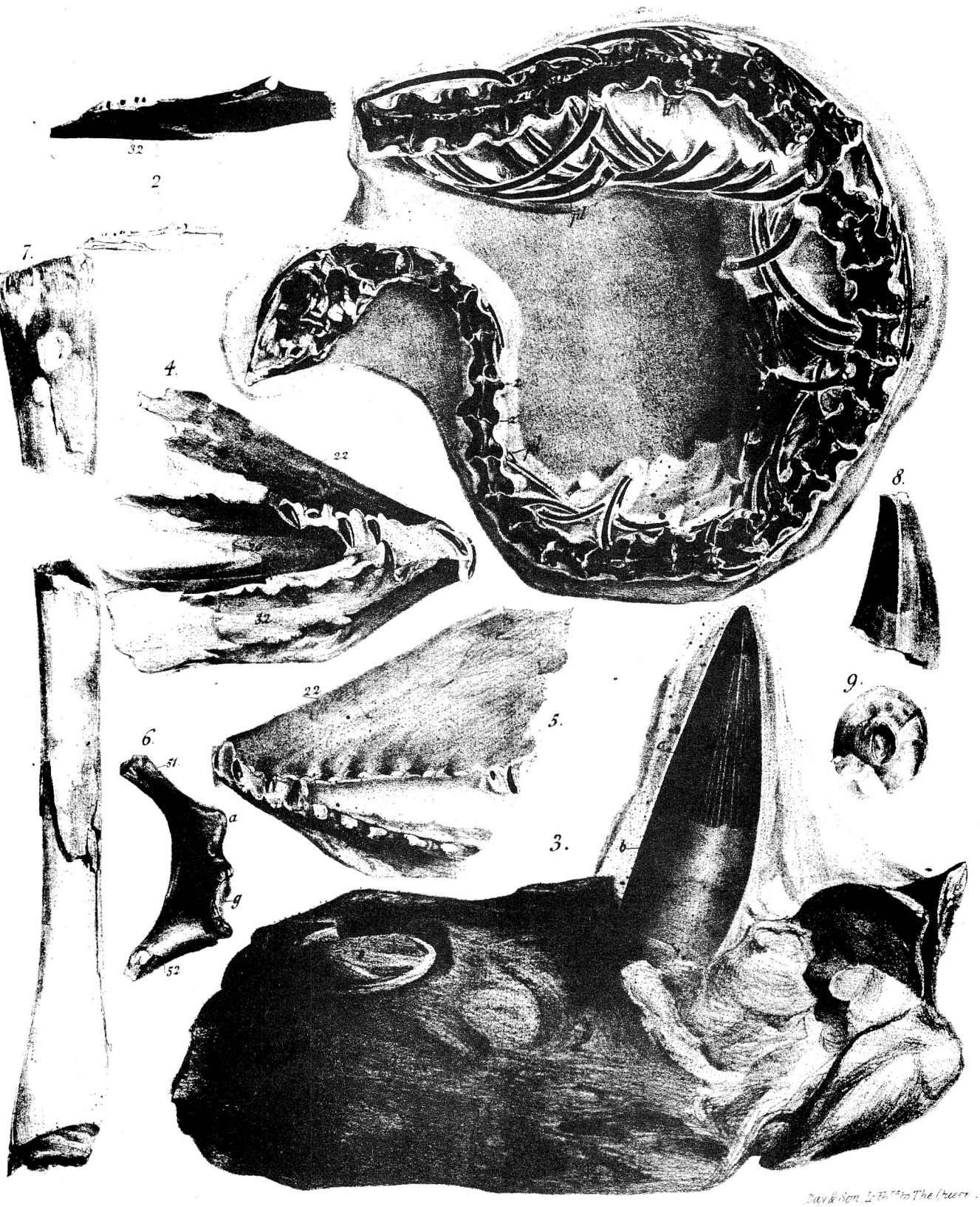
PLATE 8.

Fig.

1. Mutilated head and vertebræ of the fore-part of the trunk of *Dolichosaurus longicollis.*
2. Outline of part of the lower jaw, and the same magnified.
   From the Middle Chalk, Kent. In the Collection of Mrs. Smith, of Tonbridge Wells.
3. Portion of the lower jaw, with a tooth in situ, of *Polyptychodon interruptus.*
   From the Chalk of Kent. In the Collection of Mrs. Smith, of Tonbridge Wells.
4. Anterior part of jaws of *Pterodactylus conirostris.*
5. Left side of ditto.
6. Conjoined portions of scapula, 51, and coracoid, 52, of ditto.
7. Portions of one of the wing-bones of ditto.
   From the Barham Chalk-pit, Kent.
8. Crown of the tooth of the *Leiodon anceps.*
9. Base of the same tooth.

All the figures, save fig. 2, 32, are of the natural size.

Lacertians *Pl. 8.*



On Zinc by J. Erxleben

Davidson, Lith. to The Queen

Fossil Reptili from the Chalk.

Lacertians.

PLATE 9.

Fig.

1 and 2. Portion of the lower jaw of *Raphiosaurus subulidens.*

3. Two views of part of the alveolar border of ditto.

From the Lower Chalk of Cambridgeshire, in the Collection of James Carter, Esq., of Cambridge.

4. Vertebræ of the hind part of the trunk and pelvis of *Dolichosaurus longicollis.*

From the Middle Chalk of Kent. In the Collection of Sir Philip de Malpas Grey Egerton, Bart., M. P., F. R. S.

5. Four marginal plates of a large *Chelone,* showing the cavities for the ends of the ribs.

6. Outside view of the same marginal plates.

From the Middle Chalk of Kent. In the Collection of Mrs. Smith, of Tonbridge Wells.

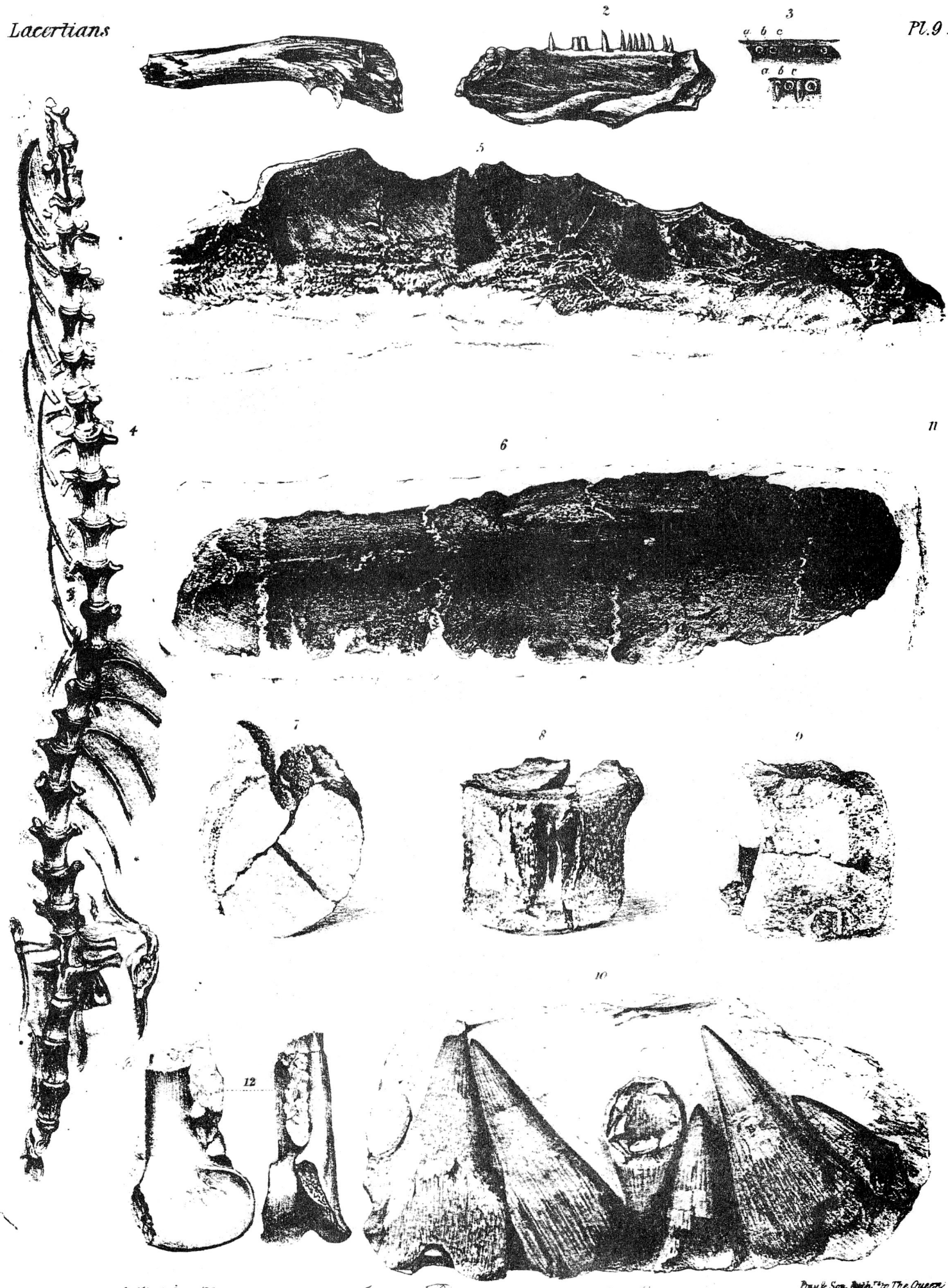
7, 8, and 9. Three views of a fractured centrum of the *Mosasaurus gracilis.*

From the Sotheram Chalk-pit, near Lewes. In the Collection of the Rev. H. Hooper, M.A.

10. A group of teeth of the *Ichthyosaurus campylodon.*

From the Lower Chalk of Kent. In the Collection of William Harris, Esq., F.G.S.

Lacertians *Pl.9.*

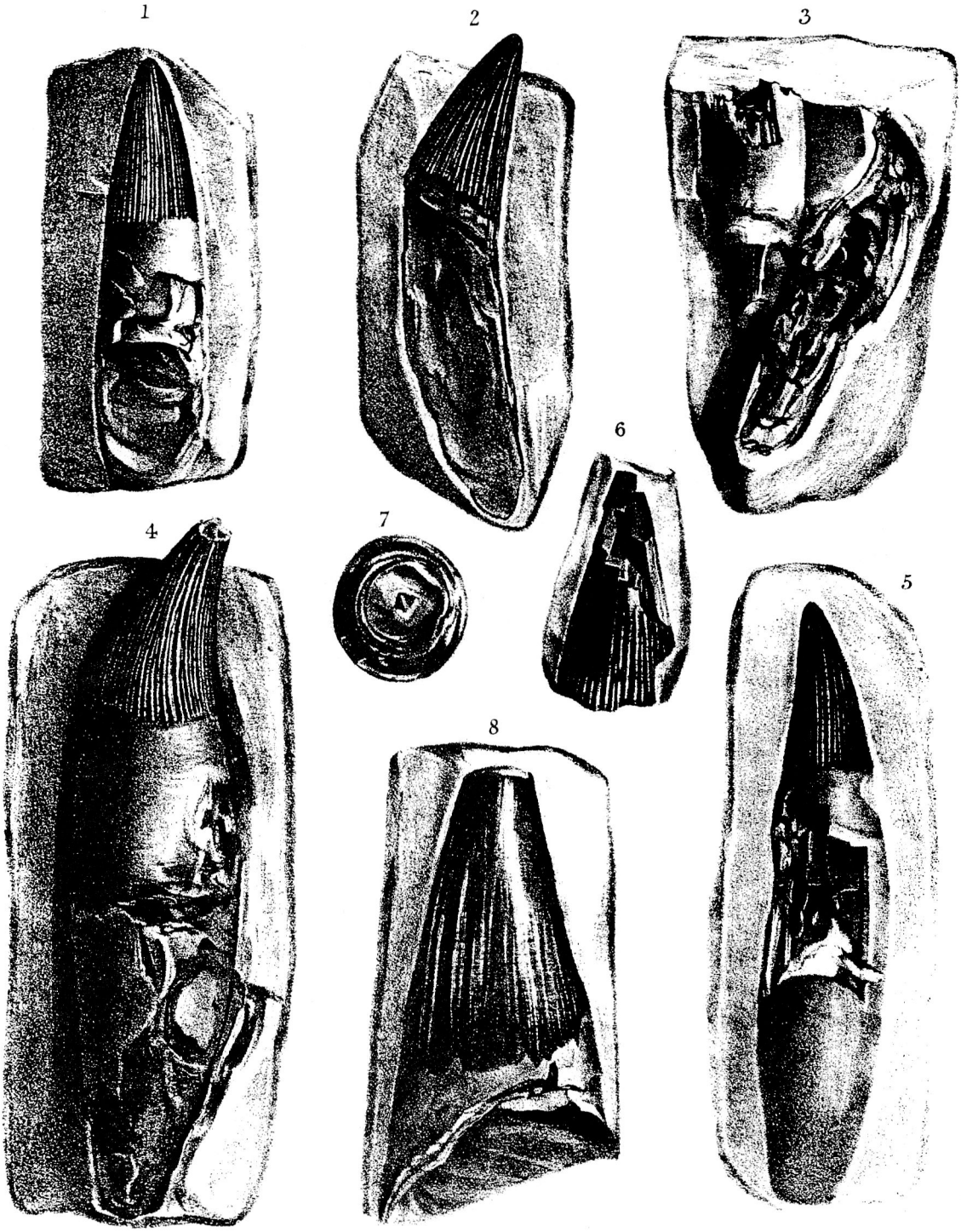


On Zinc by Lens Aldous.

Day & Son, Lith.rs to The Queen

Fossil Reptilia from the Chalk.

Crocodilia. *Pl. 26.*



Polyptychodon.

From Nature on Stone by J. Erxleben. *Day & Son. lith.rs to the Queen*

In the forthcoming Work I propose to describe and figure the extinct animals of the class Reptilia, the fossil remains of which have been discovered in Great Britain, where they occur in every stratum down to the Coal. The extensive engineering works carried on of late years in various parts of the island have brought to light an unexampled abundance of these evidences, which are usually kept in some private or local collection. No available time nor expense has been spared in journeying, with an Artist, to study, describe and depict the specimens which could not be transmitted to the Metropolis.

. . . . . .

A large portion of it is now completed: upwards of one hundred of the illustrations are already engraved; so that I commence its publication with a confident prospect of its completion, if it should be found to merit and receive the requisite measure of support.

The Work will be published in about Twelve Parts, in quarto, with plates of the same size, except a few folding ones of folio dimensions.

The price of each Part, with from six to eight sheets of letter-press and with twenty plates, will be £1.

The first will be issued on the 1st of July, 1849, and the rest will follow at intervals of six months.

Some of these parts in my own copy (parts I-IV only) have lists of subscribers, ranging from 74 to 88 (in part 4) showing it was a very limited edition.

Most important for our purposes is the fact that both part 3 (1850) and part 4 (1851) have plates of exactly the same style as Chris Duffin's lost lithograph and headed Crocodilia; plates 1-4 and 1A, 1B, 1C, 1D, 1E, A2, 2A, 2B, 3A, 3B (in part III) and Crocodilia plates 26-30 (in part IV).

Crocodilia plate 26 is reproduced here. It is identical apart from the captions at the head to Pal Soc. plate 11.

In the only adequate collation I have seen of Owen's "History of British Fossil Reptiles" (Junk 1900-13 p. 79) it is stated to have appeared in 4 volumes in an edition of only 170 copies and to comprise 286 lithographic plates. Of the plates of Crocodiles it records the following were issued - 1-14, 19-21, 23, 24, 26-45, 1A, 1B, 1C, 1D, 1E, 2A, 2A recte A2 and more significantly that "Crococile plates 22 and 25 were cancelled." This is the solution to the lost lithograph mystery. The lithograph headed "Crocodilia plate 25" and located and illustrated by Chris Duffin must have been prepared by Owen using in part some of the material lent to him by Moore in 1848 which also in part still survives in Bath. Why this plate was cancelled and never published remains a mystery and will only be solved if a full bibliographic study of Owen's "History of British Fossil Reptiles" 1849-1884, and how exactly it compares with Owen's many Palaeographical Society Monographs 1849-1881, is made.

Hugh Torrens

REFERENCES

JUNK, W. 1900-1913. Rara Historico - Naturalia et Mathematica. Vol. 1, 122p. BERLIN.

OWEN, Rev. Richard. 1895. The Life of Richard Owen. Vols. 1-2. Second edition. LONDON.

WHEN DID THE BATH GEOLOGICAL COLLECTIONS START TO DETERIORATE?

In H.H. Winwood's article on Charles Moore quoted in the previous article (1892) we can find the following (p. 39). "Let us hope that the hands of the unsympathetic temporisers for the hour may not banish Moore's unique and precious collection, so widely known and preserved with so much loving care, to the dark and dusty depths of the [Bath] Institution cellars, where they have already stowed away in drawers the historical collection of his distinguished predecessor and former Curator of the Institution, William Lonsdale".

In view of Christopher Duffin's suggestion that a number of unique crocodilian fossils have disappeared from the Bath collections it is worth examining when the decline of the Bath collections first started. In our previous article GCG 1 (3) p. 112-113 we noted that Winwood was Honorary Curator from 1883-1920 and that the major phase of neglect for the Moore collection was from 1920 onwards.

However thanks to Geoff Hancock of the Natural History Dept., Bolton Museum, Le Mans Crescent, BOLTON, BL1 1SA we know the situation during Winwood's curatorship was also difficult. Geoff has sent us the following 'new' information about the Bath Geological situation as far back as 1895.

"We could mention many lamentable instances in which a controlling organisation [such as a State Commission working in conjunction with the National Museums to maintain a general oversight over all local collections and bequests entrusted to their care] might operate with advantage to the devotees of natural science. It would be difficult, however, to find a more striking illustration than that afforded by the Moore Collection of Fossils at Bath. No geologist can visit the Bath Literary and Philosophical Institution without feeling deep and just indignation. The specimens are nominally under the care of an accomplished honorary curator of wide experience, universally respected by his fellow geologists; practically, his advice is set aside by a preponderance of conflicting interests, and the result is a disgrace to any body of educated men at the end of the nineteenth century. Beautiful slabs of rock with delicate projecting skeletons of reptiles are left to the tender mercies of the audiences who crowd into the quondam museum, attending lectures and entertainments. Ugly pieces of wood are nailed across the frames, and occasional pieces of coarse netting testify to at least some qualms of conscience on the part of the Bath Committee. If these precious specimens are to be kept apart from the remainder of the collection and to decorate a lecture hall, they ought to be covered by secure glass cases, which would preserve them from accident and mischievous fingers. Better still if the subscribers who purchased the Moore Collection for the native town of the geologist who amassed it, had the opportunity of making some competent State Commission its permanent trustee, and rescuing it from the vagaries of a mixed local committee."

Quoted from Natural Science, Vol. 7 (part 46) pages 370-371, December 1895.

In view of these comments one can only wish with much fervour that something had been done along the lines suggested. Instead we find comments written in 1895 applying with considerable force to the situation in 1979 (over 80 years later) except that the collections have deteriorated from their condition in 1895 and the "beautiful slabs of rock" are now in Cardiff rather than Bath.

Hugh Torrens

COLLECTIONS AND INFORMATION LOST AND FOUND

COLLECTIONS AND INFORMATION SOUGHT

64. BATES, H———, C———

Dr. Isles Strachan of the Department of Geological Sciences, University of Birmingham B15 2TT is gathering information about the fine collections preserved in his Department which are especially strong in Silurian invertebrates.

One of their collections for which they have no accession data or documentation at all has a series of printed labels reading "H.C. Bates Colln." Any information about this collector, his dates and his fate would be welcome.

65. LONGMIRE, John Bateman (1784-1858)

In 1824 Longmire a Cumbrian mining geologist and engineer of much interest willed that his "cabinet of minerals shall be presented to the corporation of Kendal as soon as conveniently may be after my decease". He did not die until February 1858 and the will was proved in April 1858.

Kendal Museum in 1858 was owned and run by the Kendal Literary and Philosophical Society and the present Museum dates only from 1909 (information from the present curator Bill Grange acknowledged with thanks). The collections there have suffered as usual and there is no trace of any of his important collection (see also GCG 1 (5) p. 264 about transfer of Kendal fossil collection to Liverpool Museum in 1960). Any information about Longmire's material will be gratefully received.

Hugh Torrens,
Keele University

66. HARRISON, James (1819-1864) of Charmouth

In 1937 his younger daughter presented some of his fossil collection, some books on geology, his correspondence with pioneer palaeontologists about his collection and a sum of money to Lyme Regis Museum. His work and collections were described by W. D. Lang in 1947 in Proc. Dorset nat. hist. arch. Soc. vol. 68.

Unfortunately the rarest of the fossils then donated a fragment of the armoured dinosaur named Scelidosaurus harrisoni after him by Richard Owen and all the letters summarised by Lang have since disappeared from the Museum. John Fowles, curator of the Philpot Museum, Lyme Regis, Dorset and the Newsletter would be grateful for any information leading to their rediscovery.

67. RAWLINS, Rev. Francis John (1827-1896)

In 1833 Rawlins visited Lyme Regis for a family seaside holiday and met - as a six year old - Mary Anning, the famous dealer in the fossils of Lyme Regis. This visit was the inspiration for a collection of fossils which Francis Rawlins made. It included fossils collected and labelled for him by Mary Anning of considerable historical importance.

In 1896 he died and on 1 June 1913 his wife Jane Harriet née Hooper also died. W. D. Lang (1963 Proc. Dorset nat. hist. Arch. Soc. 84 pp. 181-182) records that the Rawlins fossil collection then passed to Weston-Super-Mare Museum. Lang's enquiries in 1962 and John Fowles' more recent enquiries have all failed to shed any light on the fate or resting place of the collection in Weston-Super-Mare. Any information will be gratefully received.

John Fowles,
Philpot Museum, Lyme Regis.

68. FOX, Rev. William (1813-1881)

William Fox was mentioned in our first volume GCG 1 (4) pp. 172-173 in connection with the work of R. W. Hooley. He was born at Millom,Cumberland on August 9 1813 and died October 15 1881 and was buried at Brighstone in the Isle of Wight. His collections passed to the British Museum (Natural History) in 1882 who have confused him completely with the unrelated William Darwin Fox (Woodward 1964, Swinton 1936a - refs in GCG 1 (4) p. 179).

W. T. Blows of 20A Brent Road, Woolwich, London SE18 is writing a book about Fox and his dinosaur collections. He writes:

"I need to know if he gained an M.A. degree as some sources suggest, and if so, what year and university? Also, I can find no trace of his activities during the years 1841-1853 and 1859-1862. Finally, if anyone should know of any photographs or portraits of this man, I should be very glad to see them.

William Fox found, in 1865, the only known skeleton of the armoured dinosaur Polacanthus foxi, the type, now in the British Museum. I find it a strange and remarkable twist of fate that only two weeks ago, 114 years later, I found traces of a second skeleton of this armoured rarity, at the very time I am writing about Fox's original discovery."

69. MR. PAYTON of DUDLEY (fl. 1825-1827).

During my search for separately published prints of fossils (see GCG, 2, (3) p. 145) I have come across copies of two lithographs showing trilobites from Dudley from Mr. Payton's collection. Both were drawn by Scharf, printed by Hullmandell and published by W. Phillipps (sic) in 1827. In his bibliography of Warwickshire geology, W. Whitaker records the following item for the year 1827: 'Payton, - . On the trilobites of Dudley. 4to.' I suspect that this work contains the two plates, and maybe others as well. Can anybody tell me of a copy? A somewhat earlier print showing 'Actinocrinites monileformis found in the limestone at Dudley by Mr. Payton in 1825' was published by John Murray. This specimen was in Dudley Museum in 1844, perhaps it is still there.

John Thackray
Geological Museum
Exhibition Road
London, SW7 2DE

See also FOUND section no. 70 (p. 267).

71. BLACKWOOD, James (1823-1893)

72. DUNLOP, Robert (? -1921)

73. HUNTER, Dr. J.R.S.(1835-1898) - BRAIDWOOD COLLECTION

74. KILMARNOCK PHILOSOPHICAL INSTITUTION (1823-1957)

75. LANDSBOROUGH, David (1826-1912)

76. THOMSON, James (1823-1900)

I am currently writing a history of the geological collections at the Dick Institute, Kilmarnock, and am anxious to trace any information on the above, especially correspondence, collections, and photographs.

The collections of Hunter, Landsborough, Thomson, and the Philosophical Institution noted above, were largely destroyed by a fire in the Dick Institute in 1909, though portions of these collections such as those of Hunter and Thomson are known to have gone elsewhere, such as Kelvingrove Museum, Glasgow (GCG, 1 (7), p. 341-344) and I recently discovered some of Hunter's minerals, antiquities and his herbarium at Ayr in the Alexander Collection (GCG, 1 (5), p. 231-235).

The following brief notes may provide help in locating or identifying relevant material:-

J. BLACKWOOD resided Gillsburn, Kilmarnock, was manager of a wool spinners and foundry and was also a magistrate and Town Councillor. Prime interest was mineralogy and he prepared rock sections for his own study and other scientists such as Thomson and Forster Heddle. He was active in the 1840's and 1850's in making daguerreotype photographs. Leading figure in Kilmarnock Philosophical Institution.

R. DUNLOP resided at Woodmill Villas, Dunfermline. Made very large collections of Scottish fossils, zoological specimens and antiquities. Majority of fossils now in Royal Scottish Museum. Dunlop took a keen interest in the Dick Institute collection and is known to have taken photographs of specimens before the 1909 fire.

J.R.S. HUNTER (later known as HUNTER-SELKIRK) resided at Daleville House, Braidwood, Carluke. Made large collection of Scottish carboniferous and silurian fossils, minerals, antiquities, and books, all of which he named the Braidwood Collection. Much of his collection perished in the 1909 fire. (See notice in GCG, 1 (7) p. 341-342.

KILMARNOCK PHILOSOPHICAL INSTITUTION - a body promoting science through lectures, etc. Minute books covering 1875-1957 recently discovered, so any 1823-1875 material much sought after. In 1847, the K.P.I. arranged a museum-type exhibition which included collections of minerals, rock and fossils.

D. LANDSBOROUGH, Minister of Henderson Free Church, Kilmarnock. Collections included Scottish geology and zoology, possible including some of his father's specimens (David Landsborough, 1774-1845). Most of his collection perished in the 1909 fire but he is known to have given other workers important finds (e.g. Peach & Kidston).

J. THOMSON resided at 3 Abbotsford Place, Glasgow. Was a traveller for a tea merchant. The majority of his huge collection of carboniferous corals, fish and amphibia, perished in the 1909 fire. Only 19 of over two hundred type corals survived. Thomson cut most of his own thin sections and prepared figures of the specimens himself for publication. (See notice and references in GCG 1 (7) p. 343-344.)

Michael J. Bishop,
Keeper of Geology,
Dick Institute,
14 Elmbank Avenue,
KILMARNOCK, KA1 3BU.

COLLECTIONS AND INFORMATION FOUND

29. ANDREWS Rev. William Ryton (1834-1922)

The valuable notes by Justin Delair and R.S. Barron on the manuscript collections of this geologist at Devizes Museum show him as a man of some significance in the realms of Wiltshire geology. These biographical notes are given to add some information to what is known and to correct one or two minor errors in our previous accounts.

In 1890 Andrews was certainly still living at Teffont Evias (Woodward, A.S. and Sherborn, C.D. (1890) A Catalogue of British Fossil Vertebrata p. xv). Delair and Barron (GCG 2 (4) p. 190) suggest his retirement to Eastbourne was after 1903 as he was leading an excursion of the Geologists Association in Wiltshire in that year. However it is clear that Andrews co-led this excursion having come from Eastbourne. The report (op cit p. 194, item 2) refers to his having brought fossils with him to Teffont for distribution to the party. He would hardly have done this if he was then living there. Clement Reid, who knew him personally, spoke of him in the same year (op cit p. 194 item 3, p. 8) as formerly of Teffont. H.B. Woodward (Jurassic Rocks of Great Britain, vol. 5, 1895), who also knew him personally, records that his collection was then in Eastbourne, Sussex and that Andrews himself was by then also formerly of Teffont (p. 203, 208, 272, 349).

Andrews was in fact the eldest son of Thomas Randle Andrews of Graisley, near Wolverhampton and was born apparently on 29 June 1834 (the only date consistent with published information). He entered Rugby School in 1850 and Wadham College, Oxford three years later in 1853. In 1857 he graduated BA with a second class degree in Natural Sciences. His M.A. degree followed in 1860. He was Rector of Teffont Evias for 19 years from 1873-1892. In 1893 he moved to Eastbourne and in the following year published a paper on "The making of the South Downs" published in the Transactions of the Eastbourne Natural History Society vol. 2, pages 420-432, 1894, showing his interest in geology continued in Sussex. He lived at 27 [not 25] Etys Road where he died on 14 March 1922 after a short illness (The Times 15 and 16 March 1922).

There is a second paper to be added to his bibliography (see GCG 2 p. 194):-

Outline of the geology of the Vale of Waldour.

Proc. Dorset Antiq. Fld. Club 5, 57-68, 1884.

H. S. Torrens

60. SOPWITH Thomas (1803-1879)

Working through the Donations book of the Shropshire and North Wales Natural History Society (established June 26 1835) recently, thanks to the kindness of E.J. Priestley Curator of Shrewsbury Museums, we noticed the following donation:-

June 21 1841
Donated by Viscount Dungannon M.P. President [of the Shropshire and North Wales Nat. Hist. Soc.]

"Sopwith's Geological Models illustrating the nature of stratification, Valleys of Denudation, Coal Seams in the Newcastle Coal Field, Faults or Dislocations of the Strata, Intersection of Mineral Veins, etc. with 12mo [printed] Description".

B. Page
H.S. Torrens.

70. HINTON Mr. (fl 1827) (see Information Sought no. 69)

John Thackray's query (p. 264) about the lithographs of fossil specimens taken from Mr. Payton of Dudley's collection and published in 1827 may be answered by an item in the British Museum (Nat. Hist.) Library.

The very useful library catalogue of this institution includes the following entry, but under HINTON.

> **HINTON** ( ) Trilobites.—Fossils found in the neighbourhood of Dudley . . . in the collection of Mr. Payton, Dudley. *pp. 4: 2 pls.* fol. *Dudley*, 1827.

This seems certain to be the work John is seeking and one can only presume that Whitaker was wrong to credit authorship of it to Payton. Any information about the otherwise obscure Messrs. Payton and Hilton would be of interest.

Hugh Torrens
Keele University

U.C.450 rock cutting machine

FOR

rock sectioning

slabbing

core slitting

SUITABLE FOR OPERATION WITH WATER OR OIL COOLANT

FULLY INTERLOCKED AND PROTECTED TO MEET SAFETY REQUIREMENTS

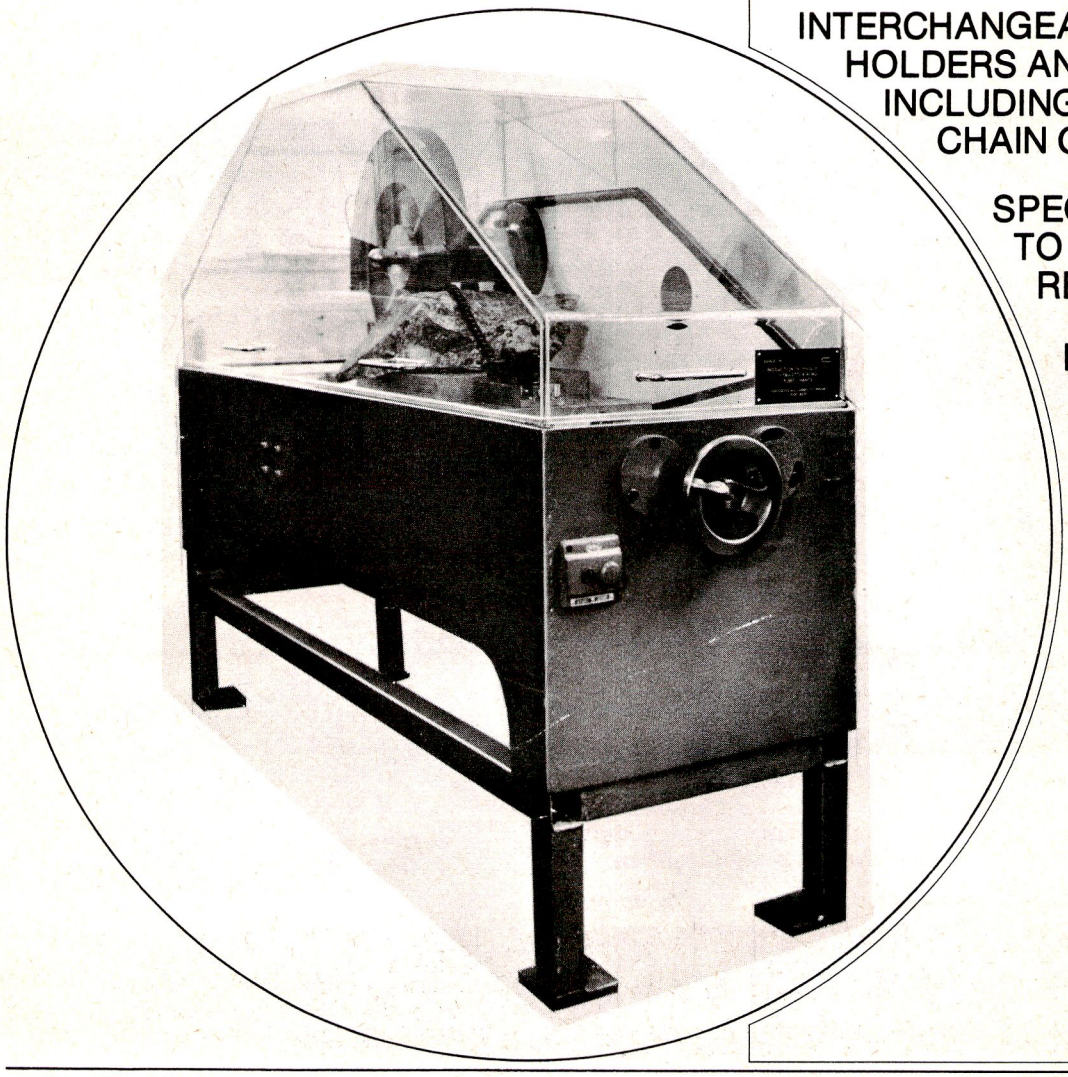
MANUAL OR AUTOMATIC FEED

COOLANT TO DRAIN OR WITH RECIRCULATOR

INTERCHANGEABLE WORK HOLDERS AND CHUCKS INCLUDING A STANDARD CHAIN CLAMP

SPECIAL FEATURES TO CUSTOMERS REQUIREMENTS

MAXIMUM 450mm CUTTING WHEEL DIAMETER



PRODUCTION TECHNIQUES LIMITED

11 TAVISTOCK ROAD, FLEET, HAMPSHIRE.
FLEET (02514) 6575

TECHNICAL

PHYSICAL CONSERVATION OF FOSSILS IN EXISTING COLLECTIONS

Introduction

As more geological collections are brought to light in U.K. museums and, hopefully, staff and resources become increasingly available, the ability of those concerned to recognise problem areas and to take positive steps to treat cases of deterioration and rectify potentially hazardous situations becomes important. This last applies just as much to the care of existing curated collections in many large and small museums as it does to the rescue of neglected collections.

In this article I attempt to set out some of the problems experienced in the care of palaeontological collections from the conservator's point of view, describing various symptoms of deterioration and their interpretation, and briefly outline appropriate conservational treatments.

Before embarking upon a scheme of salvage it is important to realise that the conservation of individual specimens, if carried out in a sensible manner, can only enhance their value and, as such, is a fundamental contribution to the curation of the collection as a whole. For this reason conservation extends to the care of all labelling associated with material, whether it be loose, attached to, or written on specimens. Such documentation must be preserved physically, and any association between this information and the specimen must be maintained throughout the conservation process. Wherever possible consult with curators or specialists in the particular groups of fossils involved as to the extent to which specimens should be treated.

1. Rescue and Cleaning

One of the first decisions to make after discovering a long lost collection is whether or not to move the material before un-packing, cleaning and examination. Sometimes there may be no choice, but if the area is damp then the specimens should be transported as soon as possible to a dry treatment area. It is probably better to wait until such an area becomes available than to attempt to process material in damp surroundings. There are however certain types of material which will suffer if moved from a humid to a dry environment too quickly (see sections 5 and 6).

The transport of sound specimens in undamaged packing and boxes presents few problems, so long as care is taken to prevent unnecessary jarring. The use of trolleys with pneumatic rather than solid tyres greatly reduces the risk of damage. Before attempting to move disintergrating slabs or bones some type of support must be provided. The use of splints and plaster may be necessary and the method of application is similar to that described in Rixon (1976) for field collecting. Firstly, always protect the areas requiring plastering with layers of damp tissue or newspaper, next apply scrim and plaster with wooden splints where necessary. Remember that plaster will both increase the weight of the specimen considerably and is not all that easy to remove later, so use as little as possible - two or three layers only of set plaster/scrim jacket are immensely strong. The use of other supporting media such as polyurethane foam or glass reinforced polyester may produce toxic and flammable fumes during curing and therefore should not be attempted in areas without forced ventilation.

After setting aside an area suitable for unpacking and further treatment the next stage will involve cleaning. Dirt, although disfiguring, does not harm the majority of fossil specimens but its' hasty and ill-considered removal often does! A very important consideration at this stage is ... - are there

any labels on the specimen, or, as is often forgotten, is there anything written on it? If you throw the material in a bowl of soapy water or wash under the tap you will probably never know! Dirt takes a number of forms, all of which will almost certainly be present on salvaged material. Loose dirt presents little difficulty but packed dust and grime require careful removal. Stains caused by the decay of packing materials, soot, and iron rusting are usually extremely difficult to remove but the use of a sepiolite mudpack, mentioned later, may be successful in some cases. The safest initial approach is dry cleaning either by blowing the loose dust off, or preferably, the careful use of a soft brush and vacuum cleaner. This should enable one to establish the nature of the specimen and whether or not locality information, etc., is present.

Depending upon the nature of the material, further cleaning using tissue swabs (not cotton-wool or other fibrous materials), moistened with water and detergent (e.g. weak solutions of Teepol or Lissapol) to remove more resistant grime will do no harm. In any type of cleaning operation proceed cautiously, tackling small areas only at a time. However never use water to clean clay or shale specimens, pyritic material, friable calcareous specimens, or sub-fossil bone and enamel. As well as risking damage to the specimens it is often these types of material which have been consolidated or repaired using water-soluble glues.

With robust material the removal of ingrained grime and some stains can often be accomplished by the selective use of organic solvents or the use of an airbrasive charged with sodium bicarbonate (SS White Airbrasive Powder No. 4). When employing airbrasive cleaning techniques it is essential to proceed with great care. Even with apparently robust specimens there is some risk of damaging surface detail, or worse, destroying weak and friable areas. This risk is however minimised by lowering the supply gas pressure and/or the vibrator voltage (powder flow rate) as required. Only when you are sure that damage is virtually impossible should devices such as ultrasonic tanks or probes be used.

A method employed with great success at the B.M.(N.H.) to clean large specimens not likely to be damaged by exposure to moisture or solvents is the use of Sepiolite. A mudpack composed of Sepiolite and water, isopropanol or acetone is applied to the area requiring cleaning and left to slowly dry out; covering the specimen with a polythene sheet prolongs the solvent action on the grime. After removing the polythene allow the pack to dry out completely, any miscible or soluble impurities will have migrated into the Sepiolite layer which can then be removed by brushing or vacuum. The use of paper tissue between the specimen and Sepiolite pack eases its removal when dry. Paper pulp or tissue pads, although not as efficient, may be substituted for Sepiolite. The process can be repeated as required, changing solvents if need be (Hempel, 1968).

The cleaning and treatment of moisture sensitive specimens is discussed in later sections.

2. Consolidation and Repair

Any major breaks and markedly friable parts of specimens will usually become obvious during unpacking. Care is required when handling material which is packed in cotton wool to prevent detachment and loss of fragile pieces. It is generally not advisable to attempt consolidation and repair before cleaning. This is mainly because resin penetration and adhesion is impaired by dust, which also hides other faults such as cracks and deteriorating glued joints.

In general only employ consolidants and adhesives when absolutely necessary. Always record any treatment carried out on a specimen on a slip kept with it, or,

preferably in an indexed laboratory treatment file. It is of the greatest importance for your successor to be able to judge the value of a particular material or treatment and, if necessary, to be able to remove or reverse it without risk to the specimen. Record the date of treatment and the trade name and, where known, the components of the materials employed.

Specimens should be repaired only when no ambiguity exists as to the correct way of reassembling the broken parts; when in doubt leave alone or obtain help from a specialist in the particular group of fossils involved. The ethics of restoring missing parts of museum specimens have been and still are the subject of considerable debate. The restoration of fossil material is normally only undertaken when necessary to support the specimen or for the purposes of exhibition. The material used (fillers) should be of a reversible nature and no obvious attempt made to fake the missing portions.

To obtain good results with modern adhesives and consolidants stick to a few simple rules.

a) Wherever possible use materials which are known to be easily removable. Consult manufacturers technical information leaflets (see also Shields, 1970).

b) Use thin solutions of consolidants for hardening; dilute from a concentrated stock as required. Where possible use a grade of resin which will, for given proportions, produce the lowest viscosity but highest solids content when in solution (see also Torraca, 1975).

c) Use brush, spray or dropper to apply consolidant in preference to total immersion unless the specimen is known to be robust.

d) Do not flood porous material with consolidant. Allow partial drying between applications.

e) Ensure that material is thoroughly dry before applying organic solvent based consolidants. Apply in a dry environment. These two measures should prevent surface tackiness and subsequent formation of bloom.

f) Support material to be treated clear of work surface using e.g. wire mesh or metal zig-zags (see Rixon, 1976).

g) Before repairing old breaks ensure that old glues are removed. Wax based adhesives, favourites with early workers, totally inhibit the setting of most modern glues. To remove wax, press a methylene dichloride soaked tissue pad or Sepiolite pack tightly against the old break after mechanically removing as much wax as possible. Enclose pad and the part of specimen affected in a polythene bag and tape down tightly. Leave for an hour or two, remove bag and allow solvent to evaporate. Repeat until all the wax has migrated into the pad.

h) Use adequate support for parts of specimen undergoing repair, e.g. sand tray, clamps, masking tape etc.

3. Efflorescent Salts

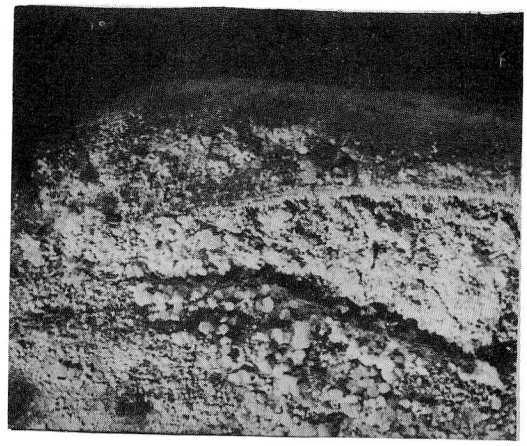
The formation of efflorescent growths, often of essentially similar appearance, on fossil material is generally the result of one of a number of totally unrelated processes. The three commonest causes are:-

1. Pyrite breakdown.
2. Surface re-crystallisation of mainly water soluble inorganic impurities.
3. Surface formation of organo-calcium compounds.

Since these processes require different conservational treatments it is

important to be able to distinguish between them. Pyrite breakdown, once experienced, is not easily forgotten (see Section 4). The distinction between 2. and 3. above is more difficult and often requires knowledge of the specimen's field locality, subsequent treatment and storage history.

The white encrustations commonly found on, for example, invertebrate and sub-fossil vertebrate material from coastal exposures are generally cited as being the result of inadequate washing after field collection. The result of subjecting salt impregnated porous material to cycles of high and low relative humidity is gradual migration, by capillary action, of salt solutions to the surface where re-crystallisation occurs, usually accompanied by the breakdown of surface details. Close inspection of the surface of specimens affected by salt re-crystallisation will often reveal small clusters of cubic crystals. Figure 1 illustrates this in the outer lip and matrix of an Eocene gastropod.



× 3

Figure 1 (Mitra deluciformis Oppenh. B.M.(N.H.) 27231 U. Eocene, Neresinje, Herzeogouina.)

Where specimens have been coated with a lacquer the salt can be seen as small cysts, usually rupturing the coating.

The normal treatment consists of thoroughly washing specimens in several changes of clean, preferably deionized water, until chloride free (i.e. no precipitate when tested with 0.01 M silver nitrate solution acidified with dilute nitric acid). With fragile Tertiary shells and friable chalk great care is required during washing. It is advisable to pre-treat such material using a few coats of dilute polyvinyl acetate (PVA) emulsion, allowing the consolidant to dry completely, preferably in an oven at c. 90°C, before immersing the specimens in water. The PVA will act as a permeable outer support which, after salt removal, can be further strengthened by application of more consolidant. The repeated use of the Sepiolite cleaning technique (see Section 1) with deionized water as solvent, can with advantage be employed to draw salt out of, for example, large vertebrate specimens.

My experiences at the B.M.(N.H.) and elsewhere lead me to the conclusion that the formation of white crystalline growths on calcareous material is more often the result of storage in 'polluted' environments than due to salt re-crystallisation (Howie, 1978). Several timbers, especially oak, used in cabinet and exhibition case construction liberate small quantities of mainly acetic acid into the relatively unventilated interior. This acid reacts with minute quantities of impurities (e.g. chlorides and nitrates) on the surface of calcareous specimens producing, in time, rosettes of radiating white crystals. Fig. 2 shows a Jurassic ammonite covered with a growth of snowy white calcium chloride-nitrate-acetate (related to calclacite, see Fitzhugh and Gettens, 1971) after storage in the proximity of oak. Close inspection reveals the silky

X 0·25

Figure 2 (Renickiid ammonite. B.M.(N.H.) M. Jurassic, Iquique, Chile)

thread-like crystal habit of a calclacite-type mineral, quite different to that of most crystalline inorganic impurities.

Heating a dry sample in a small tube or on a nickel spatula causes the crystals to partially melt, lose water and liberate a faint odour of burning plastic. The growth of calclacite-type minerals usually also results in extensive surface pitting due to etching by acetic acid.

Treatment consists of mechanical removal of the efflorescence by brushing, or the use of an airbrasive (with No. 4 abrasive powder, or an uncharged air/CO_2 jet), followed by impregnation with a dilute consolidant such as Butvar B98 in isopropanol. Treated material should of course be subsequently stored away from acid-emitting timber.

4. Pyrite Breakdown and its Treatment

The presence of white and yellowish-green efflorescences and patches on specimens in, or likely to have originally been extracted from clay or shale matrices, usually indicates that pyrite oxidation has occurred. A sulphurous odour, and acid reaction (pH 3 or less) of the efflorescence to moistened Universal Indicator paper, confirms the initial diagnosis. If doubtful, dissolve a sample of the efflorescence in deionized water, acidify with dilute hydrochloric acid and add a few drops of potassium ferrocyanide solution. A pale blue precipitate denotes the presence of ferrous iron and a dark blue coloration the presence of ferric iron. Both ferrous and ferric iron sulphates are present in pyrite oxidation products (see Howie, 1977).

Examination of the breakdown products using a hand lens or binocular microscope will often provide useful information. Fresh glistening colourless white and green crystalline masses indicate that breakdown is active and that the storage environment relative humidity (r.h.) is too high; a greyish-blue and/or white 'cigarette ash' type of efflorescence suggests that oxidation has ceased; brown iron oxide stains or deposits show that oxidation has been chemically arrested either by some past conservational treatment or naturally by, for example, reaction of acid iron sulphates with closely associated calcareous material. With some specimens, notably pyrite infilled molluscs shells and pyritic plant material, some of the oxidation products diffuse through to the surface and crystallise as distinctive yellow products. Pyrite oxidation within fossil bone occasionally produces blue crystals or masses of vivianite, a hydrated iron phosphate. Where deterioration has occurred underneath lacquer or resin coatings blistering normally takes place revealing cheesey looking

breakdown products. Figure 3 illustrates an example of this in a pyritic ammonite.

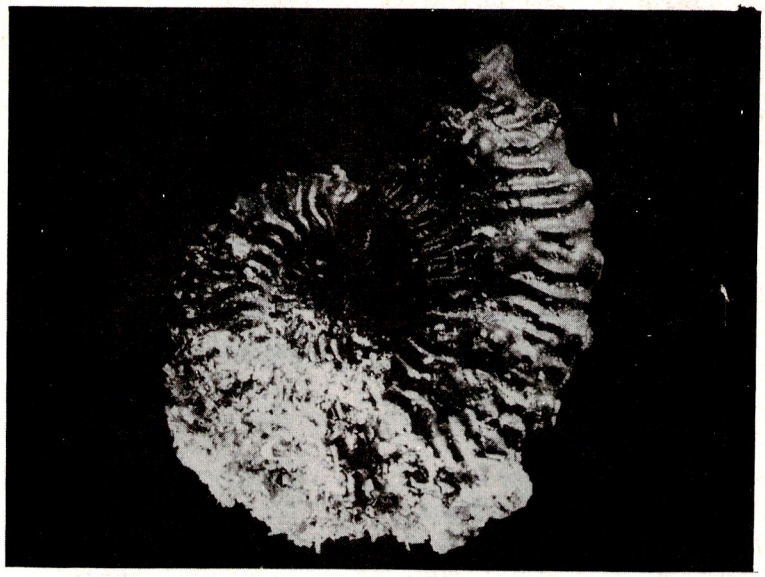


Figure 3

Polygonal or irregular cracking of the outerlayers of shale slabs, large fossil vertebrates and wood, although often cited as evidence of pyrite breakdown deep within such specimens, can have a variety of other causes. For example, the distortion of bone and shrinkage of shale caused by rapid changes in r.h., strain release - sometimes occurring years after collection, poor handling during transportation, vibration in storage or the breakdown of old glues and consolidants. In difficult cases often the only way of determining whether or not pyrite oxidation is actually responsible is to remove a loose section and examine for acidic oxidation products. Just because pyrite is visible in the matrix does not necessarily indicate that it is the only cause of deterioration.

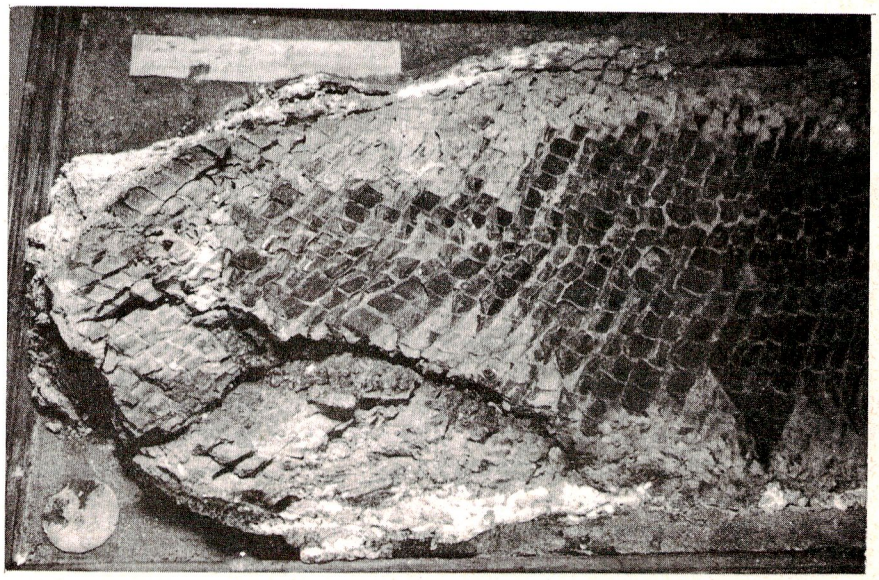


Figure 4 (Lower Liassic), Charmouth, Dorset)

Figure 4 illustrates an example of a specimen of a Liassic fish in shale where

exposure to alternating damp and dry environments has brought about both pyrite breakdown and shale distortion.

Where deterioration is active or extensive neutralisation of free sulphuric acid is necessary before any consolidation or restoration is attempted. Still the most convenient and effective method for neutralising small specimens is enclosure with ammonia gas. The use of alcoholic solutions of amines, e.g. morpholine, is neither as efficient (liquids do not penetrate porous solids as well as vapours) nor as safe (to the operator) as the ammonia treatment, and should be restricted to treating large specimens (see later).

The first stage in treating small specimens is transfer to a relatively dry environment, ideally, about 40% - 50% r.h. Specimens free of clay or shale can usually be safely and quickly dried by desiccation over silica gel, or alternatively, by immersion in dry isopropanol or acetone. Drying should be continued until visible oxidation products become chalky, often resulting in the specimens appearing worse than before. There is no reason for alarm - the change in appearance is caused by partial de-hydration of some of the iron sulphates present. Loose breakdown products may then be removed, where possible, by gentle brushing or scraping; with more robust specimens decayed areas can be mechanically removed using a vibro-pen, airbrasive or dental tools.

The second stage; place specimens in a gas-tight chamber or polythene bag containing a dish of 0.880 ammonia solution. Remember that any associated labels will be contaminated with acid and should be included in the neutralisation process. Delicate specimens should be left in their original trays, but specimens pretreated as above can be placed in new plastic or plastic coated card trays (not plain card or wood). Neutralisation using 0.880 ammonia solution vapour is generally very slow, sometimes requiring days or weeks for even superficial reaction, and there is always some danger of oxidation continuing under moist alkaline conditions. The major advantage is that the apparatus is simple and can be set up almost anywhere, taking care to avoid breathing the fumes when introducing the ammonia solution or after opening the enclosure to remove specimens.

A more effective and faster process, in use at the B.M.(N.H.), employs dry ammonia gas. The apparatus is relatively simple and comparatively inexpensive but, because of its dangers, the use of dry ammonia gas must be confined to a fume cupboard.

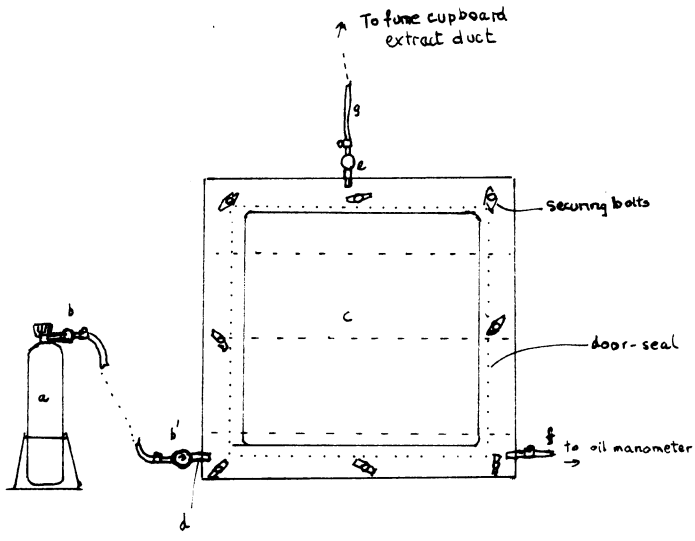


Figure 5

Ammonia is introduced from a small cylinder (a) via stainless steel needle valves (b), (b'), into a rigid perspex chamber (c) through port (d). A modified Gallenkamp perspex desiccator cabinet, with the door made gas tight by using an extra gasket around the existing door seal and addition of securing bolts, was suitable. Two further ports were required, one at the top (e), with stainless steel needle valve, to allow removal of ammonia gas, and one at the side (f) to take an oil manometer. All tubing was reinforced PVC (not rubber), all gas connections were made tight using threaded connectors or jubilee clips, and tube (g), used to duct ammonia gas away, opened directly into the extract duct of the fume cupboard.

After placing specimens on perspex shelves in the cabinet it is filled with ammonia gas, first ensuring the door is tightly sealed, by opening valves (b), (b') and (e) and turning on the cylinder key. After a few seconds valve (e) is closed and ammonia allowed to flow until the manometer indicates a slightly positive pressure within the cabinet. The ammonia cylinder key is turned off and valves (b) and (b') closed. During the neutralisation process extra ammonia gas can be added, if required, to maintain initial pressure. Neutralisation of even fairly large specimens will generally be complete within 24 to 48 hours. The next stage is to flush out residual ammonia using dry compressed air, fed into the cabinet via valved port (b'), allowing waste to escape via valve (e) and tube (g). The flushing process normally takes a further 24 hours.

Using this system both specimen pre-drying, i.e. before neutralisation, and maintaining dry conditions after ammonia treatment can be accomplished by inserting trays of silica gel into the cabinet when required. Silica gel must not however, be left in the cabinet during ammonia treatment. The removal of the reddish-brown iron compounds on specimens, produced during ammonia neutralisation, is not necessary as these deposits are inert.

The removal of pyrite oxidation products from specimens too large to undergo ammonia treatment is normally best carried out by mechanical removal of badly decayed areas, followed by partial neutralisation by repeated application of dilute (5%) alcoholic morpholine solution. Morpholine is extremely toxic and its use requires the operator to wear gloves, a respirator and eye protection.

The third stage is repair, consolidation and restoration. Extensively decayed areas should be removed mechanically using a vibro-pen, airbrasive or dental tools. Consolidation, where necessary, may be carried out using dilute solutions of polyvinyl acetate in methy ethyl ketone or Bedacryl 122X (a mixture of polybutyl-methacrylic esters) in ethyl acetate. Butvar B98 is not recommended for consolidating pyritic material. Restoration and filling, where necessary, should be carried out using non-aqueous fillers such as AJK dough.* Where specimens are fairly robust no treatment after neutralisation is necessary, provided they are subsequently stored in a dry environment i.e. at less than 50% - 55% r.h.. The same goes for repaired and coated specimens; consolidants do not act as sealants for pyritic material and do not confer long term protection in humid environments (Howie, in press).

The conservation of carbonaceous pyritic material presents various problems. Such material is extremely sensitive to moist air and a few days exposure to air at 60% r.h. or above is often enough to cause deterioration. The use of a desiccator or storage in an inert fluid is generally required. A common practice for the preservation of Tertiary endocarps, etc., has been storage in glycerol. This practice has usually led to decomposition; specimens stored in glycerol have generally lost their outer carbonaceous layers and some have completely disintegrated. The removal of glycerol using Soxhlet extraction

*See appendix: Materials (p. 280)

(Rixon, 1976) can cause further deterioration. A method employed relatively successfully by the author is repeated washing in a mixture of 9 parts of methyl ethyl ketone to 1 part of isopropanol; normally four of five immersions are necessary. After thorough drying over silica gel specimens are vacuum immersed in a silicone fluid. It is extremely important to ensure that all traces of water are removed before immersion, because deterioration of damp specimens in silicone fluids can occur.

5. Shales and Clays

Fossil remains from clay and shale deposits are often, of necessity, left with a backing of matrix for support. Large shale slabs containing, e.g. Jurassic marine reptiles, as well as presenting problems for transport and storage, can undergo deterioration through distortion. Many dark-coloured shales contain pyrite, usually both as nodules and as finely disseminated particles throughout the matrix. When exposed to moist air the pyrite oxidises, causing local swelling and discoloration around the nodules, and delamination and cracking where migrating oxidation products crystallise in cleavages and bedding planes. Many shales will also split when exposed to very dry conditions. This probably occurs through dehydration and shrinkage of clay minerals; Wealden, Liassic and Carboniferous 'paper shales' are especially prone to this type of deterioration. Most clays and many shales will swell when exposed to very damp air due to moisture absorption by clay minerals.

Where specimens in shale or clay have been stored in damp areas rapid transfer to a dry environment will undoubtedly cause shrinkage and further deterioration. Prolonged drying is essential and where pyrite oxidation is not a problem it is possible to stabilize damp shale or clay using dilute aqueous solutions of polyvinyl acetate emulsion. Oddy (1976) describes the stabilisation of antiquities made of Kimmeridge Shale using aqueous solutions of polyethylene glycol 4000 and 6000.

Perhaps the most satisfactory way of dealing with specimens in unstable shales is to remove as much of the matrix as possible. Small blocks, e.g. Gault Clay contianing fragile compressed ammonites, can generally be relatively easily reduced by carefully using a scalpel to split or cut away matrix from the back of the specimen. It may be possible to reduce the thickness of a small block to about 10 mm. without the use of consolidants.

For larger specimens, i.e. up to about 1 sq. metre surface area, the removal of shale or clay backing necessitates reinforcement using a rigid jacket. A method developed at the B.M.(N.H.) for treating deteriorating shaley-coal blocks (up to 15 cms. in thickness) containing Devonian amphibian remains will serve as an example. The surface containing the specimen was first thoroughly consolidated using a dilute solution of polyvinyl acetate and cracks filled, where necessary, using AJK dough or N.H.P. Model Plastic. After drying, the top surface was coated with a thin layer of silicone grease and tissue paper. A thin layer (approx. 3-5 mm.) of latex and jute floc mixture was applied to the whole top surface and over the edges to a depth of about a cm., and allowed to air cure (Figure 6). The entire top surface was then jacketed using plaster/scrim and when dry, the block turned over. The plaster jacket and latex/jute protected the surface containing the specimen. The shale backing was then reduced by splitting along lamination using small chisels and knives until the thickness remaining was 10-20 mm. The plaster and latex edging was cut away and the back of the block consolidated using thinned down Bedacryl 122X. A GRP jacket was then built up over the back surface (Figure 7) on top of a polyvinyl alcohol/glass fibre mat as a potential separator, and overlapped until just short of the plaster jacket. Finally the specimen was turned right side up, the plaster jacket removed, latex peeled away and the silicone grease removed using dry tissues.

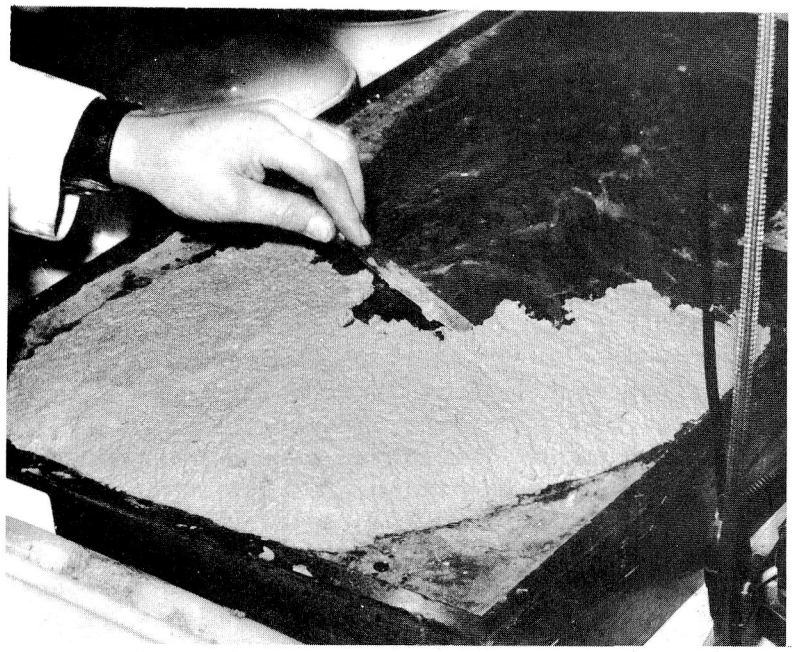


Figure 6

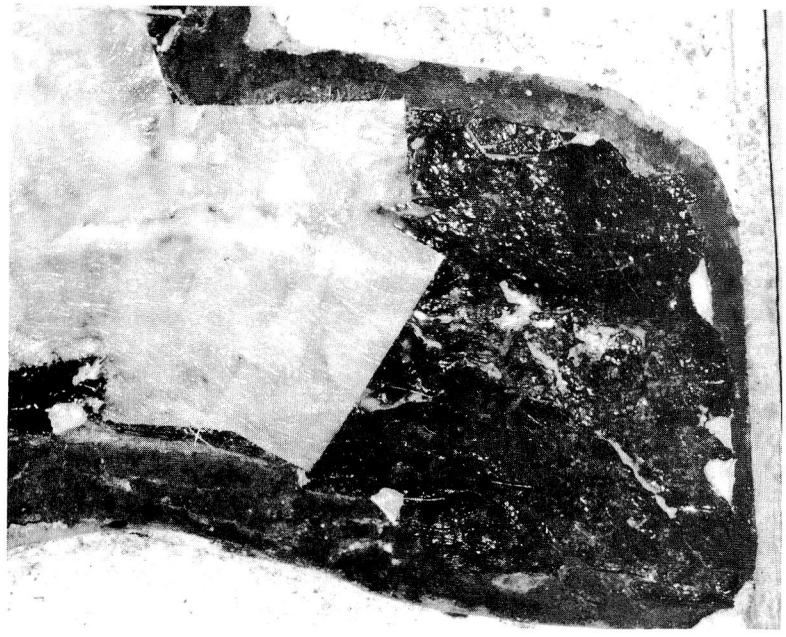


Figure 7

The conservation of very large unstable shale slabs has to be approached environmentally. Such specimens should be effectively sealed off from variations in relative humidity in gallery or storeroom by enclosure in large glazed boxes or cases. There should be adequate ventilation gaps between the wall and case back to prevent both moisture transfer to the case contents and condensation within the case.

6. Fossil Bone

Sub-fossil bone that contains organic material (probably collagen or its breakdown products) can be damaged when exposed to rapid relative humidity (r.h.) changes. Rapid decreases in r.h. will cause warping and splitting and

this behaviour appears to be more marked for variations in the low r.h. range (20%-50%) than in the mid-range (50%-70%). Tusks and antlers sometimes behave similarly. The cause of distortion is not known but may be due to loss of bound water from deep within the cell structure of the material. Bone stored in damp surroundings should not be dried but transferred, sealed in polythene, and treated as soon as possible using dilute polyvinyl acetate (PVA) emulsion solution as a consolidant and thick PVA as adhesive and crack filler. Subsequent drying must be slow and is effectively carried out in a polythene tent containing bowls of water (and a fungicide, e.g. Thymol). The humidity is gradually lowered until ambient laboratory or storeroom r.h. is reached - which should ideally be 45%-55%!

Where the bone is very dry a double impregnation process (Rixon, 1976), briefly described later, can be used. Another approach is to slowly increase the moisture content of the bone by exposure to increasingly higher relative humidity. This will help to relax distortion and eventually it is possible to impregnate using PVA emulsion as described above.

The treatment of solid mineralised bone presents few problems, consolidation is generally unnecessary and repair, if required, can be carried out using a variety of adhesives, e.g. concentrated solutions of polyvinyl acetate or Butvar B98 in organic solvents, AJK dough, and many proprietory glues. Rubber based cements and PVA emulsions are not recommended, the latter are however useful for the repair of small breaks, as are cyanoacrylates.

The consolidation of demineralised bone (e.g. material concentrated by dilute acetic acid maceration, bone where natural pyrite weathering has destroyed texture, and bones from certain cave deposits and peat) can be carried out using either dilute aqueous polyvinyl acetate or organic solvent based resins. Rixon (1976) describes a double impregnation technique for consolidating especially fragile bone. Initial consolidation is carried out by brush or dropper application of 5% Butvar B98 in isopropanol, followed, after the consolidant has dried, by coating using thin aqueous solutions of PVA emulsion.

References

Fitzhugh, E. W. and R. J. Gettens (1971) Calclacite and other efflorescent salts on objects stored in wooden museum cases. In Science and Archaeology, ed. R. Brill, pp. 91-102, Cambridge, Mass.

Hempel, K. (1979) Notes on the conservation of sculpture, stone marble and terracotta. Stud. Conserv., 13, pp. 34-44.

Howie, F. M. P. (1977) Pyrite and Conservation. Part 2. Newsl. Geol. Curators Grp., 1, pp. 497-512.

Howie, F. M. P. (1978) Storage environment and the conservation of geological material. Conservator 2, pp. 12-19.

Oddy, W. A. and H. Lane (1976) The conservation of waterlogged shale. Stud. Conserv., 21, pp. 63-66.

Rixon, A. E. (1976) Fossil Animal Remains: their preparation and conservation. Athlone Ress, London.

Shields, J. (1970) Adhesives Handbook. Butterworths, London.

Torraca, G. (1975) Solubility and Solvents for Conservation Problems. I.C.C.Rom. (available from F. W. Joel Ltd.)

Materials

AJK dough: Ingredients (parts by weight)

	Butvar B98	100
A.	Acetone	120
B.	Industrial Methylated Spirits	50
C.	Butyl Acetate	40
	Xylene/Toluene Mixture (1:1)	100
	Water	65
	Jute Floc	150
	Kaolin	75

The Butvar is dissolved in a mixture of solvents A, B and C, by leaving it to soak for 24 hours. After stirring well add the Xylene/Toluene mixture. Next produce an emulsion by rapidly stirring in the water, small quantities at a time. Then add, with kneading, small amounts of the jute and kaolin until the dough separates cleanly from the sides of the mixing vessel. Store in an air tight glass or polythene container.

Ammonia gas: BOC Ltd., Special Gases, Deer Park Road, London, SW19.

Bedacryl 122X, Morpholine, Thymol, Polyethylene Glycol, Polyvinyl acetate (solid), solvents, Teepol: BDH Chemicals Ltd., Poole, Dorset.

Butvar B98, PVA (emulsion and solid):

F. W. Joel Ltd., (Museum, Laboratory and Archaeological Supplies), P.O.Box No. 6, Downham Market, Norfolk.

Jute floc (as Jute dust):

W. Cleghorn, Clepington Works, Dundee.

Latex (as Revultex L.R.):

Bellman, Ivey and Carter, 358A Grand Drive, London, SW20.

N.H.P. Model Plastic:

North Hill Plastics Ltd., 49 Grayling Road, London, N16.

Silicone Fluids, Silicone grease, Lissapol NDB:

Hopkin and Williams, P.O.Box 1, Romford, Essex.

Sepiolite, 100 Mesh:

Steetley Minerals Ltd., P.O.Box 2, Hemingfield, Carlton Road, Worksop, Notts.

GRP (Polyester Resins and glass fibre mat, etc.):

Alec Tiranti Ltd., 21 Goodge Place, London, W1.

Airbrasive equipment and abrasive powders:

GEC Elliot, Birch Walk, Erith, Kent.

Perspex desiccator Cabinet, reinforced PVC tubing:

A. Gallenkamp & Co. Ltd., P.O.Box 290, Technico House, Christopher Street, London, EC2.

F. M. P. Howie,
Palaeontology Laboratory,
British Museum (Nat. Hist.)
London, SW7 5BD

IRISH CULTURAL NEWS

HEAD OF DEPARTMENT
James C. Brindley, D.Sc., M.R.I.A.
Professor of Geology
Phone 693244

DEPARTMENT OF GEOLOGY,
UNIVERSITY COLLEGE,
BELFIELD,
DUBLIN 4.

1st March, 1979

Mr. M.D. Jones,
Secretary,
Geological Curators Group,
Geological Society of London,
Burlington House,
Piccadilly,
London W1V OJU,
ENGLAND.

Dear Mr. Jones,

I am anxious to be enrolled as a member of the Group, if this is in order. I am not a Museum curator but have been a member of the Board of Visitors of the National Museum of Ireland since 1960 and am, at the moment, its President. As you may know, the National Geological Collection here is in a deplorable state. It has not been on display since the twenties and is now stored, without any adequate supervision, in circumstances which have allowed it to deteriorate. There is now the danger that it may become a total, or almost total, loss. The Collection is a major one and has many outstanding features, e.g. Irish meteorites, Irish type fossils, etc., and also British Liassic vertebrates, Siwalik mammals of great importance. It is based on famous 18th-19th century collections - the Leskean collection and that of Giesecke from Greenland and was initiated by the Royal Dublin Society who handed it over to the State around 1890.

I would hope that contact with other Museum institutions, and the encouragement of their authorities, would be a considerable help in the present difficult circumstances.

Yours sincerely,

James Brindley

P.T.O.

James C. Brindley.

Early in 1792 a committee was appointed to treat for the purchase of a celebrated cabinet of mineralogy called the Leskean cabinet, then for sale, and a sum of £1200 was voted for it, but in all it cost the Society about £1350.[1] On the 8th of November, Dr. Richard Kirwan, who had negotiated in the matter of this cabinet, reported that it was then lodged in the Hawkins street house, with a collection of shells which he had procured. There were also lodged there an herbarium, and a botanical collection. Nathaniel Gottfried Leske, professor of natural history at Marburg, one of Werner's most distinguished pupils, had arranged this cabinet museum, 1782–7, and on his death it was enlarged, revised, and described by Karsten,[2] who ranked next to him among German mineralogists. On the Society's behalf, Dr. Kirwan subjected it to a rigorous examination, when he rectified any errors. The cabinet contributed greatly to the diffusion of more exact knowledge on the subject of mineralogy in Ireland, and Dr. Kirwan refers to it in his work, *Elements of Mineralogy*.

The collection was divided into five separate parts :—

1. External character of minerals.
2. Classification of minerals.
3. Earth's internal structure (or geological).
4. Mineralogical geography.
5. Economical mineralogy.

The Leskean cabinet consisted in all of 7331 specimens, and was pronounced one of the most perfect monuments of mineralogical ability extant. William Higgins was appointed professor of chemistry and mineralogy to the Dublin Society in June 1795, when the cabinet was placed under his care. It was deposited in a spacious apartment, open to students, and special rules regulating admission were printed. The chemical laboratory was established, and Higgins was instructed to make experiments.

In 1815, on the report of Giesecke, professor of mineralogy, and Thomas Weaver, an authority on the same science, German manuscripts and drawings, concerning mineralogy, geology, and mining, the property of the late Dr. Mitchell, were purchased for £100. They had originally been collected with a view to the formation of a mining board, long a project of Dr. Richard Kirwan.

During the next year it was considered important to establish communication between the Society's museum and the Imperial museum, Vienna, and Giesecke was directed to send Baron Schreiber, the director, in accordance with his expressed desire, specimens of the meteoric stone which fell in Tipperary (see p. 228), and to thank him for specimens of some that fell in Moravia and Bohemia. In 1829, the committee of chemistry recommended that the Leskean cabinet should be restored and completed in all its parts, and a more suitable apartment provided for it, where the whole cabinet might be open for inspection by the public.

Extract from: "A History of the Royal Dublin Society" by Henry F. Berry, Longmans Green & Co., 1915, pp. 156-7.

ROCK BANDS

The appeal for information about the fate of Richardson's Rock Harmonicon (G.C.G. 2 No. 4) has brought a ready response from our readers.

1. Tim Riley of the Museums Department, Weston Park, Sheffield S10 2TP writes, "I remember seeing a similar instrument on display in the Keswick Museum, probably during the period 1955-60. My recollection is that it had been constructed from local slates."

2. Allan Winrow, Chairman of the Northern Federation of Lapidary and Geological Societies, 111 Holly Dene, Armthorpe, Doncaster, S. Yorks. DN3 2EZ writes, "On the subject of stone xylophones perhaps you may be interested to know that a real xylophone similar to the one illustrated is on display in the Fitz Park Museum in Keswick.

The stone for such xylophones originates from the Glenderaterra Valley, near Keswick. The rock, spotted schist, is exposed at the crossing of the second stream with the footpath, O.S. ref. NY 298276.

In his book, Mines and Mining in the English Lake District[1] the author, John Postlethwaite, makes mention of such 'musical stones' with the addition of the following footnote:

'One of these (musical instruments) was made by the inventor of Musical Stones, Peter Crosthwaite, of Monks Hall, Keswick, in the year 1785. It consists of 16 stones that have been split and hammered into shape and tune. The other one is made up of 19 smaller stones and is quite modern, having been made by William Greenip, of Keswick, probably in the 1870's.

'About the year 1840, Mr. Joseph Richardson, a builder, of Applethwaite, near Keswick, who possessed musical ability of a high order, was impressed by the musical sounds emitted by some of the stone amongst which he worked, and, having, in all probability, seen and heard Peter Crosthwaite's instrument, which was always on exhibition in Crosthwaite's Museum, set to work and constructed an elaborate instrument consisting of upwards of 70 musical stones, varying from six inches to four feet in length, the compass being nearly six octaves. But in order to produce a fuller and deeper volume of sound he added to his musical stones about 40 Swiss bells, hung upon steel bars, and tuned to the notes of the stones, and to these he added drums; the stones, bells and drums being struck by wooden mallets, by three performers, Messrs. Joseph Richardson & Sons. These men travelled with this remarkable instrument through Britain and had the honour of performing three times before Queen Victoria at Buckingham Palace.

'About the year 1875, Mr. Daniel Till, a resident of Keswick, and his son William, turned their attention to music in stone, and after devoting to it nearly the whole of their available leisure time for about ten years, produced a fine instrument formed entirely of stone, the compass being between five and six octaves. With this instrument, Mr. Till, his two sons and two daughters travelled, giving concerts of instrumental and vocal music in many of the large towns in Britain, and, afterwards for some years, in the United States of America, where I believe the stones still remain in the possession of Mr. William Till.

'After the departure of the Till family to America, Mr. G. P. Abraham, of Keswick, and his two sons, following their example, formed an excellent instrument of the same kind, wholly of stone, with a compass of 5¾ octaves. Messrs. Abraham & Sons occasionally gave concerts in various large towns in Britain, in winter, but their instrument is always in evidence in Keswick during the latter part of the Tourist Season. All visitors to Keswick in the month of August

Musical Stones made on the premises of Mr. George Fisher of Keswick

should avail themselves of the opportunity of hearing the delightful music produced by Messrs. Abraham & Sons, from what I believe is the only set of Musical Stones now in use in Great Britain.'

It is possible the specimen in the Keswick museum is based on (or is) the one built by Joseph Richardson, as it also includes a row of bells - bicycle-type shaped rather than Swiss.

3. From Blue Peter of BBC television came information that a xylophone had been featured on that programme: 'This was in November 1974 when it was played by none other than Roy Castle!

The owner was Mr. George Fisher of Borrowdale Road, Keswick, Cumberland.'

4. A letter to George Fisher brought a rapid reply.

'With reference to the Musical Stones that I have in my possession, these stones are apparently the best tuned ones that are in existence.

There are three sets in the Keswick district, one is in the possession of a Mrs. Byers of Applethwaite, Keswick, a small one in the Keswick Museum and the one in my possession.

These stones were actually chipped and tuned on my premises and came from a place called Routen Ghyll on the north side of Skiddaw mountain and I enclose a photograph of our set and hope that this will be of some assistance.' (opposite)

5. The existence of other 'Rock Bands' is brought to our notice by Andrew White of Lincolnshire Museums, Broadgate, Lincoln LN2 1EZ.

'Richardson's was not the only Rock Band in existence; in fact the idea of using musical stones seems to have been fairly widespread in Cumberland the Westmorland, perhaps encouraged by the wide choice of rocks available.

In the collections of the City Museum, Lancaster, are two photographs of the Till Family Rock Band and also an octave set of musical stones presented by a member of the same family. The Till Family Rock Band was based in Keswick. The surviving stones do not seem to represent their stage equipment, which had a much greater range.

Sets of musical stones can be traced back much further in Cumbrian collections. In Todhunter's Museum in Kendal (sold up 15/7/1832) was a set of 'Musical Stones from Kendal Fell'[2]. Possibly these are the ones referred to as coming from 'Scort' (recte Scout) Scar' in 1924, but as Todhunter's Museum was established c. 1796 we may be considering two different sets from the same geological formation.

William Gell, in his tour to the Lakes in 1797[3] refers to a visit to Peter Crosthwaite's Museum in Keswick. Among other things he saw 'an instrument of the staccato kind, made of stone of which he pretends to have found six notes in the proper musical succession'.

There are a number of other minor references of this sort, sufficient to show that Cumbrians of the late 18th and early 19th century were quite well aware of the tourist potential of the unusual instruments.

I am most grateful to Mrs. E. Tyson, Curator of the City Museum, Lancaster, for permission to refer to the various items in her care.'

REFERENCES

1. Mines & Mining in the English Lake District by John Postlethwaite. Third edition published 1913, republished 1975 by Michael Moon at the Beckermet Bookshop, Beckermet, Cumbria.

2. Curwen Records of Kirbie-Kendall p. 121.

3. W. Rollinson (ed) A Tour to the Lakes made in 1797 by William Gell (1968) p. 13.

An article covering further aspects of the Rock Bands will appear in our September issue.

LETTERS

Mrs. Irene King, Etymological Research (Palaeontology Unit), 1 Laines Head, Chippenham, Wilts., SN15 1PH, sent the following extract from the Chippenham News of 16 February 1979.

Chippenham News 16.Fe 79

COUNTY MUSEUMS OFFICER

MR Martin Norgate, 36, has been appointed to a new Wiltshire County Council post — county museums officer.

Until recently he was director and secretary of the council for museums and galleries in Scotland, based at Stirling. Before that he taught mathematics in Zambia.

Married with three young children, he is keen on Scottish country dancing — he has already joined a demonstration team in Bath — music and photography.

His appointment complements the archaeological, conservation and other services offered by the county council to the county's museums.

Mr Norgate says he is particularly interested in helping smaller museums with the care and documentation of their collections.

His appointment means a return to the West Country. He graduated in mathematics and physics at Bristol University.

She writes: "The enclosed caught my eye in the local paper and I wondered if "the shambles" of the geological collections formerly in Trowbridge, will at last find a saviour. Perhaps you might put in a strong plea for them, before the archaeologists - with whom this county abounds, claim all Mr. Norgate's time and attention."

Croydon Natural History and Scientific Society Museum

I would like to draw your attention to the minutes of the 5th Geological Curators Group A.G.M. Item 4 e). This states that 'The Group's advice and help by or through the group had been provided for collections at .... Croydon .....'

As far as I am aware this Society holds the only geological collection of relevance within the Croydon area and I would respectfully point out that no such help has been forthcoming to this material which has been in my care since we took possession of it.

I have attempted on two or three occasions to involve members of the G.C.G. and, indeed, I did write an article outlining the material of importance held by us, but that article was not published because, I understand, it did not include sufficient biographical information on the contributing collectors to our holdings.

Representatives of two internationally known geological institutions did visit the collections (one of them pronouncing the geological material as probably the greatest collection of its type in private hands), but unfortunately they were prepared to have offered help to us only on the basis of our parting with significant portions of these collections into their care in return for this help. (We have perhaps some 1200 cabinet drawers of geological material, both U.K. and foreign, some of it being of international importance.)

We have, therefore, with regret had to make our own arrangements for help with the curation of this collection, but after seven years there is, of course, much work still to be done and specialist advice is still required with many sections of this important geological material.

Any help in this direction would be most gratefully received.

J. A. Keefe
Honorary Curator
Museum Building,
Chipstead Valley Road,
Coulsdon, Surrey.

German Fashion

I wonder whether you can give me some assistance about what is meant when a geological specimen is described as being "wrapped up German fashion". I have been doing some work into Darwin's voyage in H.M.S. "Beagle" and in the letter which Professor Henslow sent to Charles Darwin on the 15th January, 1833 he said: "Darwin overpacks, the latter is a fault on the right side. You need not make quite so great a parade of tow and paper for the geological specimens as they travel very well provided they be each wrapped up German fashion and closely stowed but above all things don't put tow around anything before you have first wrapped it in a piece of thin paper." I wonder whether it is possible for you to explain or to find out for me what is meant by this phrase "German fashion". In Darwin's own manual produced later on for the benefit of geologists on expeditions with the Admiralty, he does not go into any details about specimens except that they should be wrapped in paper and be of a particular size.

Any help which you could give me would be greatly appreciated.

David Stanbury,
16 Ian Court,
2 Dacres Road,
London, SE23.

The 'Great Debate"

14th March 1979

May I join the "great debate" in response to Dr. Abell Seddon's letter published in your January issue.

I do not regard "consternation" as the most appropriate response to recent changes in the exhibition galleries of the Natural History Museum and would prefer "optimism"! The changes have certainly been drastic but I believe very much for the better. They have served, and no doubt will continue to serve, as a great stimulus to the museum profession, pointing us to the direction in which we should be looking.

The methods adopted to effect the transformation of the concepts involved, namely Human Biology and Ecology, into attractive, inspirational and educational displays are excellent and well thought out. Certainly with such a topic as human biology the exhibit is bound to be conceptual rather than specimen-based. Would anyone be "turned on" by a row of pickled spleens or kidneys? Not all the new exhibitions will necessarily be purely conceptual but should be specimen-based while at the same time adopting a modern educational approach (Miles and Alt 1979).

Some of the arguments against the new exhibition philosophy rather miss the point. Surely the Hall of Human Biology is not telling us that specimens are unnecessary in exhibits but that people wish to learn something in museums rather than just to gawp at specimens, no matter how magnificent. Only a limited number of specimens have sufficient attraction to stand alone.

The attraction of the Hall of Human Biology relative to the older systematic displays was really brought home to me during a recent visit to the B.M.(N.H.) when the Hall of Human Biology was thronged with visitors. Indeed, one could say that it was thereby packed with specimens - "an exhibition of ourselves"! In marked contrast to this one only had to look in the older galleries where systematic displays march in serried ranks away from the entrance, to see how unattractive they were proving to most visitors.

If I could perhaps mention the mineral display here, in my own particular field of interest. The first three or four cases had a reasonable number of visitors around them, marvelling at some of the most beautiful mineral specimens in the world. Only the more intrepid visitors progressed much further down the gallery, unless it was to make a bee-line for the meteorite display. As a mineralogist I personally am content and fascinated to browse through the vast number of cases. The average museum visitor is not. I do not doubt the inspirational value of some of these specimens, but at present one could spend a whole day in the exhibition and come out having learned nothing. What a tremendous opportunity there now exists to incorporate the new approach into a display which could include many, but not all, of the existing specimens. I would love to see the mineral hall thronging with people, as is the Hall of Human Biology, with visitors leaving the gallery knowing for example just why certain minerals are important or how they form.

I have probably been unfair in singling out mineralogy. What I have said could justly be applied to any of the older systematic displays : at the same time, only one visitor was in the gallery of fossil invertebrates for example!

Think what the powerful combination of specimens plus involvement with educational aids could do to transform our galleries. I eagerly await the other new displays at the B.M.(N.H.) which we have been told will be more specimen based.

Each of us as curators should be considering how any new exhibition should be structured, and how the new educational technology (Miles and Tout, 1978) can be applied in a display of the strength s of any particular museum. After all it is these relative strengths which make museums different. Such displays would not only serve as showcases for the specimens in question but also as methods of imparting more general knowledge in that subject area. Of course it is obvious that the level at which this new approach can be adopted must vary from museum to museum.

Highly structured exhibits need not be followed in sequence for one to extract enjoyment and information. Indeed I suspect that only a small minority of people can actually follow prescribed routes through the Hall of Human Biology. This does not stop one picking up information as one goes, although not necessarily the complete message. Indeed, this probably provides an incentive to return sadly lacking from many exhibits.

On the question of such displays leading to the neglect of the collections I think Dr. Abell Seddons is being unduly pessimistic. The terrible neglect of scientific collections during the era of systematic displays is hardly a creditable point on which to base an argument.

I believe that any forward looking curator must be excited by the new possibilities for exhibitions which now exist. We have been shown the way forward. It is now up to us as professional museum staff to show just how successfully educational technology can be applied to specimen-based exhibits in smaller museums. An exciting prospect!

References

MILES, R. S. and TOUT, A. F. 1978. Human biology and the new exhibition scheme in the British Museum (Natural History). Curator 21:1, 36-50.

MILES, R. S. and ALT, M. B. 1979. British Museum (Natural History): an new approach to the visiting public. Museums Journal 78:4, 158-162.

Graham Durant (Dr.)
Assistant Keeper in Mineralogy
and Petrology,
Hunterian Museum.

BOOK REVIEWS

The Geology of Snowdonia and Llyn: An outline and field guide
Brinley Roberts

Adam Hilger Ltd., Bristol 1978, Price £15

The book is essentially divided into two parts, one being a brief introduction to the geology of the Snowdonia and Llyn districts, the other a list of field itineraries where the major elements of that geology may be viewed.

The introduction, which comprises some 44 pages of text, outlines the geological history of the area, by presenting details of the stratigraphical succession of the area in question, along with information relating to intrusive igneous rocks. In addition a structural synthesis is attempted, which includes a discussion of the supposed Mid-Ordovician volcanic ring structure. A 1:70,000, uncoloured, folded geological map is provided in a detachable plastic wallet for use in conjunction with this part of the book.

The second part of the book is composed of 31 field excursions which are subdivided on the basis of five regions. The itineraries are of variable length, with approximately one half being composed of a series of separate localities (ranging from three to nine localities for an individual excursion), whilst the other half is subdivided into parts which are generally continuous walking traverses (for example the Snowdon Horseshoe is divided into Part 1: Pen-y-Pass to Crib Goch summit; Part 2: Crib Goch to Yr Wyddfa; and Part 3: Yr Wyddfa to Pen-y-Pass). For each itinerary, the principal aim of the excursion is outlined in a brief introduction, which also sometimes includes information relating to duration of the excursion and also details relating to the nature of the route taken. In addition, relevant references to literature sources and the necessary maps are also included here. For each locality, or at the beginning of a traverse excursion, invaluable information regarding parking facilities is usually given, followed by detailed descriptions of access and finally by details of the geology itself. Geological sketch-maps are provided for most excursions, along with photographic illustrations of a number of important features. It is staged that the guide has been written with the undergraduate in mind, whilst the author also suggests that it may be of interest to naturalists, amateur geologists and sixth-formers.

The book is presented with a flexicover for durability and the somewhat unusual format has been chosen in order that the field maps be kept as large as possible.

Certainly, it is considered that the book reaches the level it was intended for, and should also be of considerable use to field party organisers, although Dr. Roberts does state that it is not written with these groups in mind. The excursions are clearly described, although perhaps a few more grid references might have been quoted and used in conjunction with the descriptions of site locations given by Dr. Roberts. Most of the excursions possess a geological sketch-map, which is generally very useful. Although it is intended by the author that they be used in association with the relevant O.S. topographic maps, a few more details relating to access (i.e. paths, tracks and roads) would have been advantageous. The large, folding, uncoloured, 1:70,000 geological map is somewhat disappointing. The only area where substantial detail is presented is central Snowdonia, which only duplicates the already published IGS 1:25,000 Geological Special Sheet of that region. Other areas, such as Llyn, are necessarily subject to a great amount of inference, and the geological information on this part of the map is therefore scant. In addition, it is not clear for what purpose this map is intended. It is not mentioned in the

preface to the book, whilst in Part 1 it is suggested that it be used whilst reading the summary account. In that case, the purpose of the detachable plastic wallet in which the map is housed is not clear; surely the map is not for field use? Perhaps a better combination of map and its presentation might have helped to reduce the price somewhat, as £15 seems a somewhat expensive field guide to 'roll up and carry in the rucksack', as suggested by the author.

The format itself is somewhat peculiar and indeed a little cumbersome. I can see the need to retain the largest possible map size, but one must really consider that is likely to happen on a very wet, windy, Welsh, winter's day. Indeed, the suggestion made by the author of detachable, loose-leaf itineraries would seem an ideal combination, although it is agreed that cost may have been prohibitive. However, not all workers will willingly take this book into the field with them, both in view of the cost and the fact that for each one itinerary one must take 30 others, plus a summary of North Wales geology. It is also slightly disappointing that the aims of each of the excursions are not outlined in the list of contents, for although they are mentioned at the beginning of each excursion description, one cannot readily locate, for example, an excursion to see the welded subaqueous ash-flow tuffs exposed around Llynnau Mymbyr without either prior knowledge of their existence or by reading every excursion description. A further slight criticism is that an estimate of duration of a particular excursion is not always given, a point which is of paramount importance to any geologist or field party organiser in planning his activities.

However, one must not lose sight of the principal object of the exercise, that of describing the geology of given areas of Snowdonia and Llyn and to this end the book is to be strongly recommended. It will doubtless solve many a problem for geologists interested in this part of the country.

Dr. Richard Bevins
National Museum of Wales

The Geological Field Notebook
P. C. Ensom, 1979

Dorset County Museum, Dorchester, 6 pp. 15p per copy plus 10p postage; ten copies 12p each plus 10p postage for every £5.00 or part pound.

This leaflet explains the need for keeping a field notebook and gives introductory advice on how best to do it. There is no indication of the ability level for which the advice is intended, but one would guess that it would be for the amateur or the beginner at school rather than an honours undergraduate at the beginning of training.

The introduction sets the tone of the article quite well: a facsimile of one of the pages of John Woodward's celebrated book of 1728, a reminder of the need for discipline in going about the day's work, and a succinct explanation of the value of the field notebook: "that it should enable others to find the exact spot where an observation was made and a specimen collected, or at worst to make a reasoned guess when a site has been backfilled or altered".

The advice which follows is standard, and is generally well and simply explained. It might have helped, however, if a numbering system for specimens had been recommended and exemplified which would serve equally well for the field and laboratory. Later on it would have been useful if reference was made to the place of the standard rock description chart, the graphic logging sheet, and a simple palaeontological or palaeoecological questionnaire for use in the field,

for it is debateable whether all the information gained in the field should be recorded, even at the beginner's stage, in a field notebook alone. The reviewer has always found that the charts, logging sheets and questionnaires help the beginner to ask the right questions at outcrop and provide a most convenient organised record of the subsequent observations and measurements. A major improvement to the leaflet could be made if examples of pages of good field note-books were included - preferably those compiled in areas of signally different terrain.

The leaflet could provide an interesting focus for a university seminar or two on the virtues of different systems of recording data in the field, and on what part a field note-book could or should play in that overall system.

The section at the end concerning the keeping of field note-books for use by other persons in later years is very sensible. "Remember that the family inheriting your handiwork may not appreciate how valuable it is. Museums and Environmental Records Centres will often welcome this type of documentary material". (Give your note-books a future; act in good time. The reviewer).

As a final thought I am reminded of the student who lost 3 years field notes on a plateau basalt outcrop halfway across the Central Ring Complex of Arran. He discovered this whilst in cloud and rain at the summit of Ard Bheinn and was refused permission to leave the party to go back and down to search. His note-book contained only his name: no addresses, telephone numbers, no indication of the indispensable nature of the note-book, or an explanation of its purpose which would encourage a finder to return it as a matter of urgency. There is no advice in this pamphlet regarding this eventuality.

David Thompson,
Education Department
Keele University

PUBLICATIONS

British Society for the History of Science Monographs

IMAGES OF THE EARTH: ESSAYS IN THE HISTORY OF THE ENVIRONMENTAL SCIENCES
L. J. Jordanova and Roy Porter, Editors

xx + 282 pages; 10 black and white illustrations; direct edition; paper covers

A new and innovative collection of essays by a wide range of scholars: G. Cantor on John Hutchinson's cosmology; R. Grant on James Hutton; J. H. Brooke on geology and natural theology; M. J. S. Rudwick on Charles Lyell and the human sciences; M. Pointon on geology and landscape painting; L. J. Jordanova on environmental medicine; W. H. Brock on chemical geology in the nineteenth century; P. J. Boylan on the Noulin-Quignon human jaw; D. E. Allen on geology and the split from natural history; H. Torrens on local eighteenth century geology in Bath; P. J. Weindling on the prehistory of the Geological Society of London.

Available from The Administrator, BSHS, Halfpenny Furze, Mill Lane, Chalfont St. Giles, Bucks., HP8 4NR, England. Price (including postage) is £5.95 (£6.95 outside U.K. to cover bank charges) or £4.40 to BSHS members (£5.00 outside U.K.), cash with order. Also available from bookshops.

NOTICES

ALEXAPACK CONTAINERS

(see advertisement inside back cover)

In the paragraph relating to the Alexapack Containers in our advertisement we mention that we can supply self-adhesive labels but it may be that your readers do not appreciate that we can supply these labels as a completely separate item, i.e. not just for use with our Alexapacks.

We are able to supply many different sizes of labels, in varying colours, and wonder whether this information could be included within the advertisement. Although most of our business is with hospitals within the U.K., we do of course supply many Universities, Museums, etc. and feel that many of your readers may be interested in our range.

L. A. Hadleigh (Mrs)
Director,
HENLEYS MEDICAL SUPPLIES LTD.

GEOLOGICAL CONSERVATION EXHIBIT

This exhibit, details of which appeared in Earth Science Conservation 15, (p. 19), is now on show to the public and is at present booked until the end of February 1980. A detailed prospectus is available from Dr. K.L. Duff at Foxhold House and student worksheets at three separate levels, to enable teachers to make full use of the exhibit as an educational facility, can be provided. The worksheets are designed for non-specialist geologists, 'O' level students, and 'A' level students. Specimens copies will be sent to inquirers on request.

The exhibit will visit the following museums; further bookings can still be accepted:-

1979	March 5 - March 23	Imperial College , London
	April 2 - May 25	Yorkshire Museum, York
	May 28 - June 29	Stockport Museum
	July 2 - July 7	Dudley Museum
	July 30 - September 28	Warrington Museum
	October 1 - November 9	Kelvingrove Museum, Glasgow
	November 12 - November 30	Hawick Museum
	December 3 - December 28	Dumfries Museum
1980	January 3 - February 1	Stoke-on-Trent Museum
	February 4 - February 29	Swindon Museum

"THE LAST GLACIATION" - LEAFLET AND WALLCHART

This leaflet and wallchart, described in Earth Science Conservation 15, p. 28, can be obtained from Interpretative Branch, Nature Conservancy Council, Attingham Park, Shrewsbury, SY4 4TW.

THE MINERAL KINGDOM

Passmore Edwards Museum,
Romford Road, Stratford, London E15 4LZ.

In 1974 the Museum displayed in a comprehensive manner, for the first time in many years, its Collection of Minerals. Over the past five years additions have been made to the Collection and this new Exhibition has been prepared by the Museum staff. The minerals, which come from all over the World, are arranged according to chemical composition and structure.

Various modes of occurrence of the minerals and properties of special interest will be highlighted. It is intended that a booklet to assist the public in discovering the fascinating world of the Mineral Kingdom will be available.

19 MAY - 14 JULY 1979

Geological Collections in Staffordshire

The complete geological collections and data previously housed at Shugborough (Staffordshire County Museum) have now been permanently transferred to the new museum at Stoke-on-Trent. With the departure of Frank Beasley, who has started a career as a nurse to mentally handicapped people, the policy at Shugborough is now to concentrate on Staffordshire life and agriculture. The moved collections, along with those already at Stoke, are now contained in a storage area at the new museum which is totally devoted to geology.

The most important collection rehoused is that of Prof. W. A. S. Sarjeant who assembled over 1000 mineral specimens from sites in the North Midlands.

Stoke City Museum is now the principal centre for Staffordshire geological collections. Any enquiries about the collections should be addressed to

Don Steward,
Assistant Keeper of Nat. Hist.,
City Museum,
Broad Street,
Hanley,
Stoke-on-Trent, ST1 4HS

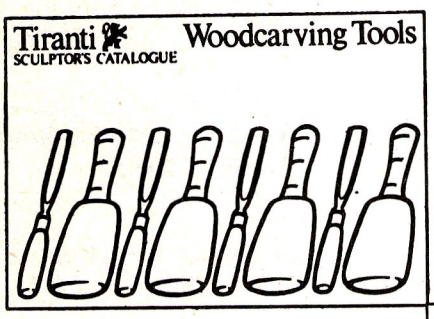
Association of Teachers of Geology

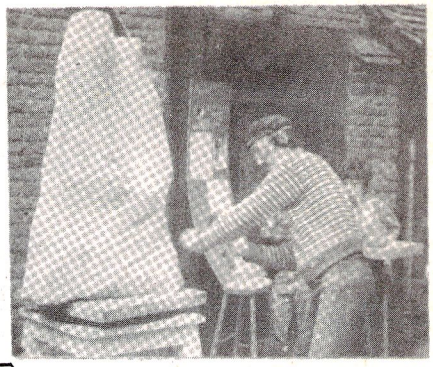
The enclosed insert gives some details of the Association which will no doubt be of interest to GCG members. The quarterly journal "GEOLOGY teaching" and the annual conference provide museum staff with a very useful picture of the activities of geology teachers at all levels and in a wide variety of institutions. ATG members range from primary school teachers to extra-mural tutors, at schools, colleges, universities, museums and field-centres.

I would recommend ATG membership to GCG members since this would provide an understanding of geology teaching in general and so help with the planning and operation of museum displays, publications and educational services. On the other hand "GEOLOGY teaching" is available to carry information from museums to geology teachers. Notes on displays, publications, lectures, fieldwork information, etc. would be welcome. Please send any such notes to me and I would be pleased to pass them on for publication.

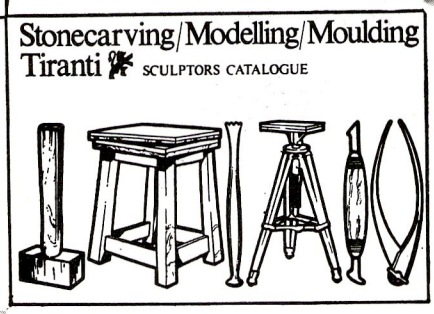
Andrew Mathieson,
Assistant Schools Organizer (Geology),
City Museum,
Bristol, BS8 1RL

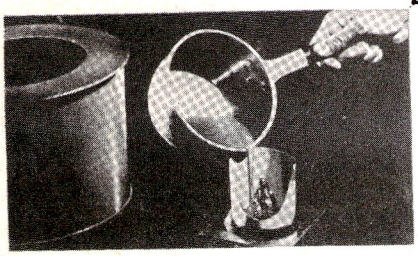
for the artist craftsman





Laurence Broderick carving
Adam & Eve





SILICONE RUBBER
RTV-700 + Beta 2

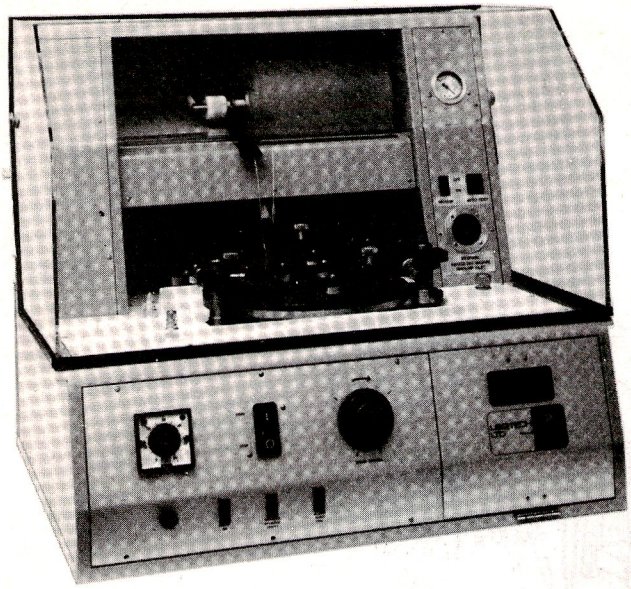
A HIGH STRENGTH, VERSATILE, COLD-CURE SILICONE RUBBER, EASY TO USE, AND GIVES FAITHFUL REPRODUCTION OF THE MOST MINUTE DETAIL.

Alec Tiranti Ltd

21 Goodge Place London W1
& 70 High St, Theale Berks

LOGITECH

Automated Thin Sectioning Systems



LP30 automated lapping system

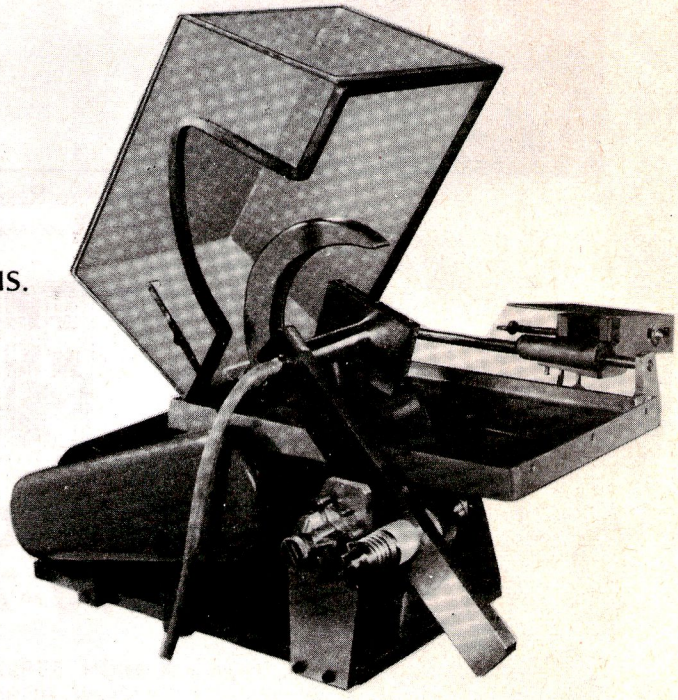
The most comprehensive fully integrated machine systems for the production of FINISHED THIN SECTIONS

Systems for production of . . . . .
- standard petrographic sections
- polished thin sections
- polished bulk sections

UNIQUE FEATURES OF LOGITECH SYSTEMS.

Elimination of hand lapping
Automatic stop at finished thickness
Different samples processed simultaneously
Processes the most friable materials
Simultaneous multi-section production.

All systems feature FREE operator training.



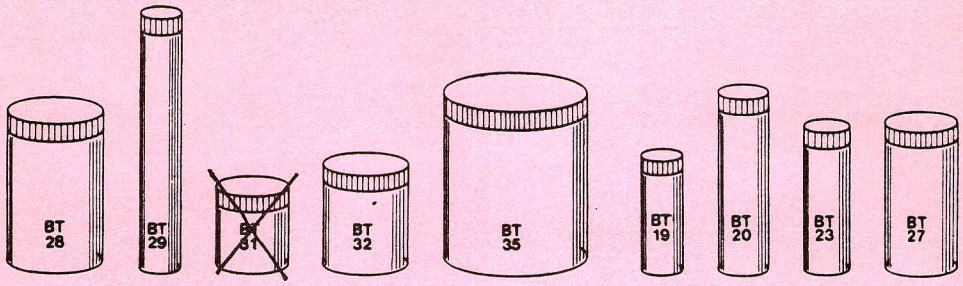
CS10 thin section cut-off saw

efficiency quality versatility

send for further information to . . .

LOGITECH LTD
Lomond Estate, Alexandria,
Dunbartonshire G83 0TL, Scotland
Tel. Alexandria (0389) 53764 Telex 777673 LOGTEC G

'Alexapack' Specimen Containers

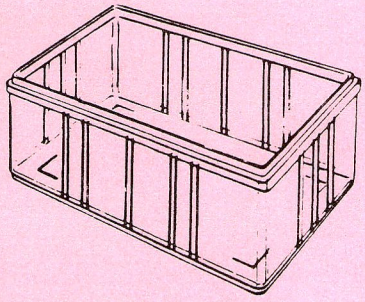


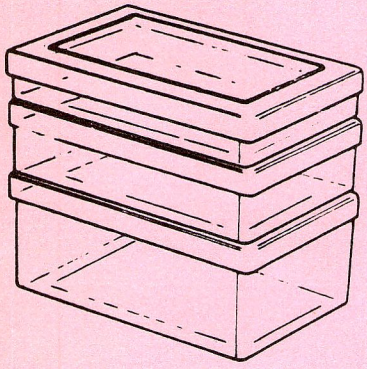
Cat. No.	Approximate Diameter	Height	Capacity
BT-19	15 mm	40 mm	5 ml
BT-20	18 mm	62 mm	13 ml
BT-23	16 mm	50 mm	7 ml
BT-27	26 mm	50 mm	20 ml
BT-28	34 mm	52 mm	40 ml
BT-29	15 mm	89 mm	10 ml
~~BT-31~~	~~20 mm~~	~~26 mm~~	~~11 ml~~
BT-32	30 mm	34 mm	15 ml
BT-35	51 mm	57 mm	100 ml

The ALEXAPACK range of containers are produced from inert, virgin, crystal clear polystyrene and are supplied with secure fitting polythene stoppers. Ideal for all types of specimens. They can be supplied with plain white self-adhesive labels applied or, for a minimum quantity of 5,000 they may be supplied with labels printed to your specifications. Also, if required, we are able to supply these containers without the stoppers and will be pleased to quote for your requirements.

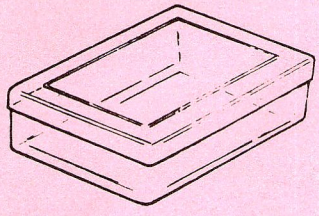
'Dines' Rectangular Boxes

Cat.No. A6-60





Cat.No. 128



Dines Rectangular Boxes are made from clear polystyrene, allowing specimens to be completely visible. They are all stackable, thus enabling the user to store numerous items individually in a limited space.

Cat.No.	Size
* A4-60	315 x 250 x 72 mm
* A5-60	228 x 178 x 72 mm
* A6-60	178 x 117 x 72 mm
* 400	295 x 268 x 64 mm
86-50	80 x 60 x 50 mm
128-20	122 x 82 x 22 mm
128-30	122 x 82 x 32 mm
128-50	122 x 82 x 52 mm

* Available with partititons, if required.

Univ. of Sheffield
Dept. of Geology

sample of one of our labels.

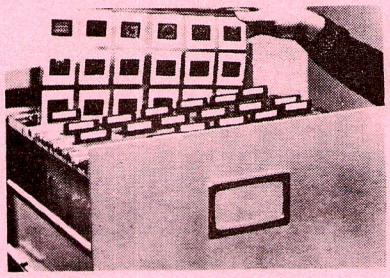
Prices and samples will be sent on application. All Enquiries to:

HENLEYS MEDICAL SUPPLIES LTD.

HORNSEY N8 ODL.

Telephone: 01-889-3151/6

VISUAL AIDS



V30-300

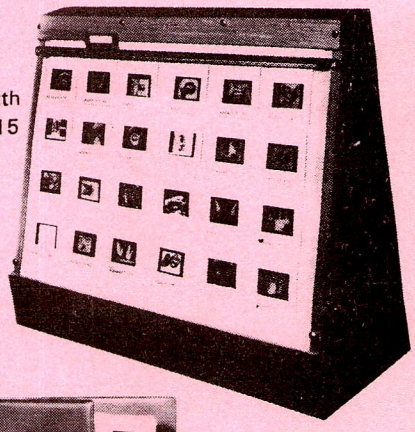
THE ROGERS SLIDE HOLDER.
Slide Holders—The problem of storing a large number of 2" x 2" photographic slides compactly, and yet in a way which makes them readily available for inspection and selection, is solved by the use of the Rogers Slide Holder. The holders are made of natural pvc with transparent pvc welded pockets and are supported on a foolscap filing cabinet metal support bar. The holders can then be placed in a foolscap filing cabinet drawer, each drawer holding about 100 frames. Each holder holds 24 slides and they may be viewed by holding the frame up to window light (the pvc diffuses the light giving a standard illumination) or by hanging in front of a standard X-ray viewing box.
For transport of slides, the metal support bar can be withdrawn; the whole plastic framework can then be folded into a neat package and carried in the pocket or brief case.

V30-300 **ROGERS SLIDE HOLDER** to hold 24 slides 2" x 2".
Foolscap size with metal support bar (Standard packs of 1 dozen)

V30-305 **ROGERS SLIDE HOLDER** to hold eight slides $3\frac{1}{4}$" x $3\frac{1}{4}$" with metal support bar. (Standard packs of 1 dozen).

V30-310 **ROGERS SLIDE HOLDER** to hold 20 slides 2" x 2".
A4/Quarto size with metal support bar. (Standard packs of 1 dozen).

V30-315 **WINDOW SIGNALS**—a clear plastic window signal ensuring a firm grip on the slide holder bar, boxes of 50.



V30-320 with V30-300/315

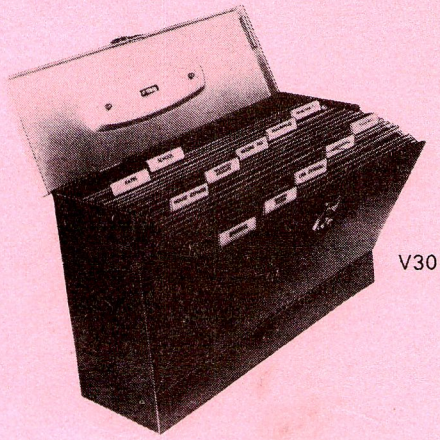
V30-320 **VIEWING BOX**—manufactured in hard wood with opal glass viewing panel illuminated by a 60W strip light. Usable in two positions, horizontal, or vertical. Supplied complete with 6 feet length plastic covered cable.

V30-325

THE ROGERS SLIDE HOLDER, BOOK FORM. This Rogers Slide Holder has all of the proven advantages of the existing system PLUS the added convenience of being compact and fully portable.
Ring Binder—An attractive and sturdy pvc covered loose-leaf ring binder, fitted with a transparent pocket on inside front cover for notes, data, etc. Specially designed to contain the Rogers Slide Holder and ideal for shelf filing, this binder is particularly convenient for the scientist or executive who wishes to carry slides whilst travelling.
A complete binder contains twelve pages each page accommodates fifteen 2" x 2" photographic slides. The 180 slides can easily be viewed without removal from the holder.

V30-325 **RING BINDER,** complete with 12 pages.

V30-330 Spare pages for above. (Packs of 1 dozen).



V30-340

V30-340 **PERSONAL FILE.** A lockable metal filing unit with carrying handle and hinged drop-down front.
Suitable for accommodating 20 foolscap Rogers Slide Holders V30-300 (480 2" x 2" slides). Choice of blue or grey finish.

MACFARLANE ROBSON LIMITED

Head Office:
HEDGEFIELD HOUSE
BLAYDON-ON-TYNE, TYNE & WEAR
NE21 4LT
Telephone: 089–422–2381
Telex: 53698

Glasgow Office:
BURNFIELD AVENUE
THORNLIEBANK, GLASGOW
G46 7TP
Telephone: 041–637 2333
Telex: 778301