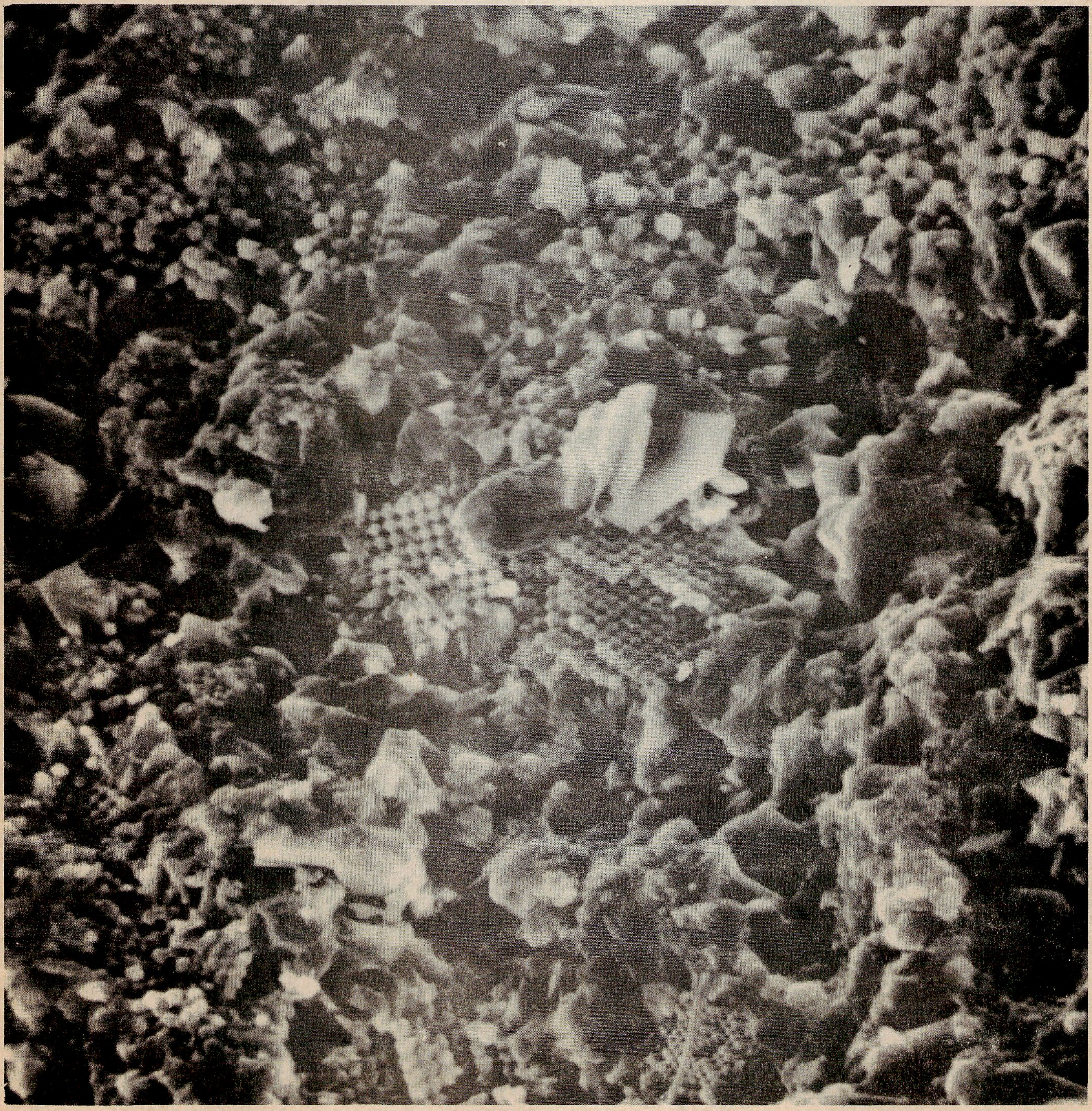
ISSN 0308-681X.

GCG

NEWSLETTER OF THE GEOLOGICAL CURATORS GROUP

NUMBER 10 & INDEX TO VOLUME 1 SEPTEMBER 1977



SEM × 3600

COVER

On the front cover is a scanning electron photomicrograph illustrating the the textural characteristics of the pyrite infilling a fossil Nipadites sp. fruit from the London Clay of Sheppey. Such microcrystalline and, in this case, framboidal pyrite frequently occurs associated with fossil remains from clay and shale deposits. The porous nature of the pyrite facilitates air and moisture penetration, and the area illustrated shows the beginnings of deterioration with the growth (centre right) of hexagonal crystals of a hydrated iron sulphate.

F. Howie

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 (0533 539111).

Submission of MSS

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

March 1st for April issue

August 1st for September issue

November 1st for December 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.

© Published by the Geological Curators Group. Printed at Keele University.

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

GEOLOGICAL CURATORS GROUP

(AFFILIATED TO THE GEOLOGICAL SOCIETY OF LONDON)

CONTENTS

The Editor extends his sincere apologies for the inordinately late publication of this issue. It was due to circumstances beyond his control.

COMMITTEE NOTES MARCH—JULY 1977

In May the Committee met for the first time under its new Chairman Dr. Hugh Torrens, to consider both its current commitments and its plans for future activities. It endorsed continued work relating to the National Plan and Site Documentation Scheme, two major areas of current activity details of which are given below. With regard to future activities, Committee decided that a major part of its efforts should now be progressively re-directed towards attempting to alleviate the more serious curatorial problems relating to some of our geological collections, one of the main constitutional objectives of the Group. This is rightly recognised as an area in which progress will only be acheived slowly and as a result of prolonged and persistent efforts. Since it was imperative that the Group should establish itself as quickly as possible after inauguration this was not considered to be an area suitable for initial Group activity and accordingly efforts were directed towards establishing the Group via its Newsletter and the Site Documentation Scheme, both of which are proving conspicuously successful. Whilst continuing our efforts on these two fronts the time has now come to direct a major proportion of resources to other areas of activity, likely to be less productive of immediate and spectacular results but in terms of Group objectives equally if not more justifiable.

It is with regret that we accept the resignation of Tim Riley from the Committee. Having served the Group from its formation in 1973, firstly as a Committee Member and then as a co-opted member handling the distribution of the Newsletter, his contribution has been a significant and much appreciated one. Newsletter distribution will now be handled from Leicestershire Museums by John Martin.

Site Documentation Scheme

Since the last report, in Newsletter Number 9, the Working Party empowered to implement the Scheme has met on several occasions and has completed much of the preliminary development work. In drawing up proposals for future management particular emphasis has been placed upon the need to devise an organisational structure capable of handling both day to day administration and long term direction. It was naturally tempting to retain the Scheme as a solely G.C.G. concern. However the working party felt that the long term future was best assured by drawing on a wider sphere of interest and influence than either the Group or the Museums profession could supply. At the same time it was recognised that the impetus behind the Scheme must be maintained by G.C.G. and that the Group would have to continue to provide a substantial input of direction and labour. Accordingly the working party recommended that a Committee for Geological Site Documentation (C.G.S.D.) be formed, combining an Executive which would be responsible for the day to day administration of the scheme and a legislature of Members primarily responsible for policy. Terms of Reference and a constitution for such a Committee were prepared and ratified by G.C.G. Committee on 3rd May and the C.G.S.D. is to meet and formally assume responsibility for future management of the Scheme on July 28th.

The Executive which consists of four Officers is to elect from its own numbers an Executive Chairman who will be co-opted onto the G.C.G. Committee. The Treasurer of G.C.G. will ex-officio be an Officer of the G.C.S.D. Executive. An initial eight organisations have been invited to nominate a representative Member to the legislature one of which may be elected by the whole Committee as Committee Chairman.

This structure allows G.C.G. to maintain the necessary input of support during the initial years whilst at the same time providing scope for representation of a wider range of views and interests than just those of the Group. It also allows for the retention of financial control by G.C.G., a necessary prerequisite since as grantee the Group is legally responsible for disbursement of the grant aid upon which the Scheme depends.

The Working Party also recommended that for the purposes of the Scheme a distinction should be made between Record Centres and Recording Units. Recording Units would undertake to document sites in a specified area not covered by a Centre and to pass on copies of the Field Record Cards and/or Summary sheets to an appropriate Centre. Record Centres would undertake to document, and maintain and display records of sites in a specified area and where appropriate maintain and deploy site records for adjacent areas covered by a Unit or Units. This proposal is based largely on the need to accommodate the many and diverse local recording efforts either anticipated or already operational, taking account of their varying abilities to meet the objectives of the Scheme. As such it is a functional and not a qualitative division.

Both the procedure and the criteria for designation of Centres and Units have been established and all organisations which have shown interest in the Scheme to date will be sent application forms in due course. Designation will entitle the organisation concerned to receive free of charge, Field Record Cards, Summary Sheets, Instructions for Use and other appropriate literature. Guidance will also be given by the Executive regarding applications to the N.C.C. for grant aid towards local costs.

On 14th July a briefing meeting for 30 representatives of prospective Centres was held at the Geological Society to endorse these and other proposals for the future management of the Scheme. Further briefing meetings, either nationally or regionally, will be called as required.

Any enquiries relating to the Scheme or requests for copies of the C.G.S.D. Constitution and Terms of Reference should be directed to John A. Cooper, Executive Chairman, Committee for Geological Site Documentation, C/o Earth Science Section, Leicestershire Museums, 96 New Walk, Leicester. LE1 6TD. (Tel. 0533 539111).

Museums Association

On 4th May a meeting of representatives of specialist groups was called by the Association's Working Party on the Constitution to discuss a proposal for establishing a Professional Groups Committee to foster collaboration between the Association and the groups. This proposal was endorsed by the meeting and was subsequently ratified at the Association's Annual General Meeting in July. The first meeting of the new Committee, to which we have been invited to send a representative will be held on 19th October.

National Plan for Museums

The GCG submission to the Standing Commission on Museums and Galleries was compiled by the Chairman and sent to the Commission in July. It is reproduced below and it is suggested that any serious doubts about its coverage or bias should be sent both to the Commission and the Newsletter.

Of the panel of assessors to whom a preliminary submission was sent only one did not reply. In addition copies were sent to nine additional people all of whom sent valuable comments.

The first point of discussion was the concept of a centre of excellence. One assessor was largely opposed to the whole concept as he felt such planning and development structures could not be good for the spirit of museums. Other assessors who work in Museums, saw, as a prime objective for a centre of excellence, the provision of what the Museums Association and Standing Commission working party has called "parochial duties".

The prevailing opinion however by a large majority was that the prime concern should centre on the collections; in this case the scientifically important geological collections in provincial museums in the country. This was the attitude of the Wright report (para. 4.7). Thus in this submission the prime consideration has been to designate those centres which are excellent because of a) their geological collections, and which b) secondarily reflect this excellence by permanently employing a full time qualified geologist on the Museum staff. The need for adequate technical staff in support is also obvious but too rately realised.

If the provision of parochial duties is an essential part of such planned centres of excellence then some of the geological and other collections of highest importance in the country are in danger of being ignored. In our submission these will include the collections of the Universities of Birmingham, Cambridge and Oxford among others. But believing these collections to be of such undeniable importance and that this is the single most vital ingredient for a centre of excellence, we have included some museums in this category in our submission. Those in charge of such collections support the idea that they should be included and the original Panel recommendations already included some museums wholly or partly in this category. It will in any case be easy to isolate those centres whose names are submitted but which are unable or unwilling to provide the "parochial" services envisaged by the Wright report, as one of the features of centres of excellence.

A further point which is unclear is whether it may be possible to bring some of the most seriously threatened collections in the field of geology under the care of the nearest centre of excellence. Obviously this is a serious and delicate matter but so great are the problems of neglect and decay in some important geological collections that we have felt it right to draw attention to them in this way. In no case has the inclusion of collections of this sort affected our listing of 'centres of excellence'.

The list which follows is arranged in the order of the Area Councils given in the Museums Yearbook 1977 (pp 20-21), and then in order of preference within each area (in case some pruning is needed).

For each Museum a) its name and b) authority are given and c) its geological collections rated from 1 the lowest to 5 the highest category. The symbol * indicates permanent employment of qualified staff.

A. Midlands Area Council

1.a) Leicestershire Museums*
  b) (Leicestershire Co. Council)
  c) although not possessing first class geological collections (rated 3) an obvious centre of excellence on all grounds, especially when the proximity of the University Geological Collections (with collections rated 4^+ esp. in mineralogy) and Museum Studies Department are taken into account.
  d) We would like to draw attention to the plight of the excelllent Northampton Central Museum Geological Collections (see Newsletter 2 of GCG pp 40-51) and hope these could come under the care of this - the nearest proposed centre of excellence.

2.a) Dept. of Geological Sciences Museum*
  b) (University of Birmingham)
  c) of first rate importance (rated 5)

We cannot support the proposed designation of the Birmingham City Museum as a centre of excellence in Natural Sciences (Geological Sciences) as being inapplicable to Geology.

B. South West Area Council

3.a) Bristol City Museum*
  b) (Bristol City Council)
  c) despite the depredation of the Second World War the geological collections here are of much importance (rated 4).
  d) We would hope the Bath Geological Collections which have suffered much neglect and are now an embarrassment to the Bath City Council (see Newsletter 3 of GCG pp 88-124) should come under the care of this nearby Centre of Excellence. The Bath collections are rich in Type material and rated 5.

4.a) Royal Institution of Cornwall*
  b) (Private - grant aided by Cornwall Co. Council)
  c) Rated 5 (primarily mineralogical)

5.a) Exeter City Museums*
  b) (Exeter City Council)
  c) collections rated 3.
  d) no permanent post for a geologist exists here.

We would wish to support the existing panel recommendation that the private but important geological collections of the Torquay Natural History Society should become associated with this centre of excellence.

C. South East Area Council

We cannot support in <u>first</u> place either of the two currently designated centres of excellence in Natural History Brighton and Norwich when the claims of the two following musuems are considered. Norwich is thus placed third here.

6.a) Sedgwick Museum of Geology* and with the University Museum of Mineralogy* & Petrology.
  b) (University of Cambridge)
  c) both rated 5^+

7.a) University Museum*
b) (University of Oxford)
c) palaeontological and mineralogical collections both rated 5+

8.a) Castle Museum Norwich
b) (Norfolk County Council)
c) collections rated 3-4 (especially palaeontological)
d) recommended as the best local authority museum in this area.

D. North Area Council

9.a) Hancock Museum*
b) University of Newcastle-on-Tyne.
c) collections rated 5 (especially palaeontological)
d) we fully support the existing panel recommendation for this Museum as the only centre of excellence in this area. We must also note the serious financial situation of this Museum.

E. Yorkshire and Humberside Area Council

10.a) Yorkshire Museum*
b) (North Yorkshire Co. Council)
c) this has one of the largest geological collections outside the National collections. It is particularly strong in palaeontology (rated 5).
d) we would like to draw attention to the plight of the Whitby Museum Geological Collections which are of fine quality.

F. North Western Area Council

11.a) Manchester Museum*
b) (University of Manchester)
c) collections rated 5.
We fully support the existing panel recommendation for this Museum.

12.a) Merseyside County Museum*
b) (Merseyside Co. Council)
c) collections rated 3-4 in view of serious war time losses, but still a considerable collection and an obvious centre of excellence.

G. Scotland Area Council

Apart from the existing designation of the Royal Scottish Museum, (Scottish Education Department) which we fully support - regarding it as the National Museum for Scotland we wish also to propose a joint Glasgow centre of excellence based on

13.a) Kelvingrove Museum
b) (City of Glasgow District Council)
c) collections rated 5 - rich in Type material for which see E. Campbell (1976). There seems to be no permanent geological post here.

The Panel's designation of the Botanic Gardens, Edinburgh is obviously inapplicable to this category.

H. Wales Area Council

14.a) National Museum of Wales*, Cardiff
b)
c) collections rated 5.

We have no further recommendation

I. Northern Ireland Area Council

We believe this is now within the ambit of the Standing Commission and Museums Association working party, and accordingly designate

15.a) Ulster Museum*, Belfast
   b) (Ulster Museum Board of Trustees)
   c) collections rated 4-5

In conclusion we too note that "few of the recommendations in previous reports on the needs of museums and galleries in the provinces, published over a period of some 50 years, have been implemented" (Wright report para 15.1 - conclusions and recommendations). We fervently hope something may come of this report and offer our assistance in any implementation of it, and our thanks to those who commented on our proposals.

H. S. Torrens
for the Geological Curators Group
July 1977

We are very grateful to our panel and other experts who commented on an early draft of these proposals. These were:- (P = Panel Member)

1. Brian Atkins (Oxford University Museum)
2. Mike Bassett (National Museum Wales)
3. Ron Cleevely (British Museum(Natural History))
4. John Cooper (British Museum (Natural History))
5. Mike Crane (Bristol City Museum)
6. Ron Croucher (British Museum (Natural History)) P
7. Justin Delair (Oxford)
8. Phil Doughty (Ulster Museum) P
9. Peter Embrey (British Museum (Natural History))
10. E.A. Jobbins (Institute Geol. Sci. Museum) P
11. Mike Jones (Leicester Museum) P
12. Bob King (University of Leicester)
13. Harry Macpherson (Royal Scottish Museum) P
14. Barry Rickards (University of Cambridge) P
15. Tim Riley (Sheffield Museum)
16. Ian Rolfe (Hunterian Museum) P
17. Geoff Tresise (Liverpool Museum) P
18. Susan Turner (Hancock Museum) P

COLLECTIONS AND COLLECTORS OF NOTE

(SUPPLEMENTARY NOTES)

3. YORKSHIRE MUSEUM

GCG 2 p. 56. 3 153.

The fascinating "Legend of John Phillips "lost fossil collection" which we referred to has been discussed by J.M. Edmonds in the latest issue vol. 8 pt 2 1977 of the Journal of the Society for the Bibliography of Natural History pages 169-175. Mr. Edmonds demonstrates that Phillips suffered only a minor loss in 1837 of a few specimens stolen in London by thieves, but that Phillips himself was at least partly responsible for later writers such as S.S. Buckman (1909 p iii) statements that "Phillips types are lost, stolen in London from the coaching inn perhaps they lie at the bottom of the Thames". This new article documents the actual extent of the number of lost specimens and discusses the many reasons why this legend had continued to the present time. It was certainly encouraged in these columns.

One of the collections on which Phillips drew extensively was that of William Gilbertson of Preston purchased largely in 1841 by the British Museum. While searching in Goosnargh churchyard Lancashire recently for some one else Gilbertson's grave was accidently found and it seems worth recording the details of his gravestone which reads

"Underneath are interred the Remains of Ellen, the wife of W. Gilbertson of Preston who died January 5 1823 aged 34 years. Also of the said William Gilbertson who died February 10 1845 aged 56 years. Also of Jane, daughter of the above who died on the 17 April 1862 aged 41 years"

Reference

BUCKMAN, S.S. 1909 Yorkshire Type Ammonites vol. 1. London.

4. THE BATH GEOLOGICAL COLLECTIONS

GCG 3 p. 88.

Further information has come to light about the collection donated to the Bath Literary and Scientific Institution in 1825 by the Bath and West of England Agricultural Society. in 1819 this latter Society formed a committee of Chemical and Geological Research, and appealed for material to help build up a geological collection. Their report of November 30 1819 recorded that the following had contributed.

1. Mrs. GENT of Devizes
   60 fossils from the Devizes area.
2. Mr. (William) HILL (c. 1776-1868)
   see Eyles 1974 p. 151, Clew 1970 p. 76, 100 and Bath Chronicle 5 March 1868. He was born at Stow-on-the-Wold and became involved via William Smith in mining operations near Liverpool and Bath and was appointed in 1813 engineer to the Somerset Coal Canal living in Caisson House, Coombe Hay. His donation is noted as "an extensive series of Rock and other specimens, arranged according to their natural order of stratification chiefly from the neighbourhood of Bath". This is further indication of the influence of his friend William Smith.
3. Professor (William) BUCKLAND (1784 - 1856) of Oxford University.
   4 specimens of minerals and rocks.
4. (Thomas) MEADE (c. 1755-1845) of Chatley, Bath.
   11 specimens of minerals and organic remains.
   Meade was one of the original honorary members of the London Geological Society and presented material to the Bath collections in 1826 (see GCG 3 p. 101).
5. Rev. Dr. (Charles Abel) MOYSEY (c. 1780-1859) Archdeacon of Bath from 1820-1839.
   17 specimens from the Mendips.

6. (Thomas) GRAEME Esq. (dates ?)
of Oldbury Court near Bristol. Vice-President of the Bath & West of England Agricultural Society.
7 specimens from Glen Froome.
7. Rev. (William) PHELPS (1776-1856) FSA.
Vicar of Meare and Bicknoller, Somerset from 1824 to 1851. A native of Somerset he is best known for his elaborate but incomplete "History and Antiquities of Somersetshire" 1835-1839. See D.N.B.
14 specimens chiefly from Switzerland.
8. Rev. (Robert) HOBLYN (c. 1751-1839)
Cornish born lived many years at Bath.
25 Cornish ore specimens.
9. Rev. (John Josiah) CONYBEARE (1779-1824)
Vicar of Batheaston, Bath from 1812-1824 and Prebendary of York 1803-1824. In 1817 he began to publish on Geology see D.N.B.
150 specimens of Rocks, Minerals and Ores.
10. Dr. (Charles Henry) PARRY (1779-1860)
of Cheltenham 1807-1814 and Bath son of Dr. Caleb Hillier Parry (1755-1822) whose fine and historic collections he inherited see GCG 3 p. 102-103. He was largely instrumental in the building up of the collections by the Bath and West of England Agricultural Society.
69 rocks, minerals and ores from Cornwall, Germany, the Faroes, etc.
11. Dr. (Charles Hunnings) WILKINSON (1763/4-1850)
of Bath. Medical pioneer and keenly interested in geology (see GCG 3, p. 106-7) on which he lectured in Bath.
Specimens of minerals and fossils.

Whether any of these potentially important collections still survive is as yet unknown. But a few years later in December 1825 the Bath and West of England Agricultural Society had agreed to limit the relevant committee to Chemistry alone. The Mineralogical and Geological Specimens were agreed should be transferred to the Bath Literary and Scientific Institution. This was rapidly done and on 23rd. January 1826 Henry Woods Secretary of the latter wrote thanking the Bath and West for their donation of
35 Earthy Minerals
69 Metallic Minerals
42 Small volcanic specimens.
Suites of Tertiary fossils from France and Hardwell Cliff.
29 Fossils from the neighbourhood of Bath.

How these relate to the earlier lists of 1819 is again not clear but this new information should stimulate further detective work on what does still survive at Bath.

We can also take the opportunity to confirm the date of Charles Moore's birth. There has been much confusion about this the Dictionary of National Biography giving 1815 and our article 1814 (GCG 3 p. 109). The original registers of the Old Meeting of the Ilminster Presbyterians (Public Record Office RG4 1554) record p. 68, his baptism as "Charles son of John and Anna Moore of the Parish of Ilminster was born June 8, 1815 and baptised August 6, 1815 by me John Evans"

References

CLEW, K.R. 1970 The Somersetshire Coal Canal and Railways. Newton Abbot.
EYLES, J.M. 1974 William Smith, Richard Trevithick and Samuel Homfray: Their Correspondence on Steam Engines 1804-1806. Tr. Newcomen Soc. 43, p. 151.

6. THE PLYMOUTH CITY MUSEUM MINERAL COLLECTION
GCG 3 p. 132.
See under COLLECTIONS & INFORMATION FOUND, Isaiah DECK no. 28.

12. GLASGOW ART GALLERY AND MUSEUM

Further information has come to light concerning the history of the David Corse Glen Collection (GCG 7, 341), purchased in 1896. Richard Barstow, the mineral dealer, while looking at our collections recently, noticed that some distinctive labels on the old (pre 1805) specimens were the same as some in Plymouth City Museum. David Curry of Plymouth has confirmed that these labels are on material from the Sir John St. Aubyn Collection, and are almost certainly those used by the Count de Bournon when he catalogued the St. Aubyn Collection around 1806 (see GCG 3, 133). The preliminary Address of our 1805 sale catalogue which was the basis of the Glen collection states that this catalogue was compiled by Dr. William Babington 'and other intimate friends of the deceased'. It seems that de Bournon also compiled a part of the 1805 catalogue as his labels are only found on specimens belonging to Babington's Class 2 - Earths.

This information makes it worthwhile giving the full details of the early history of this collection incorporated into Glen's, as far as it is known. The original collection was assembled, according to the catalogue Address, by 'a Gentleman deceased, well known to the first Mineralogists in this country'. Peter Embrey originally supplied the information as to the name of this gentleman. In Sir Arthur Russell's copy of the sale catalogue there is a note "This collection is said to have been Mr. Atkinson's and to have been purchased by Mr. Fraser for £550. Entry in Philip Rashleigh's handwriting in his unbound copy. AR 1946". As Rashleigh (1729-1811) was contemporary to the sale his information is presumably trustworthy, but I have found no biographical details of Mr. Atkinson.

A little more can be said about the provenance of some of Atkinson's specimens. Some came from the Museum Geversianum, the collection of Abraham Gevers (1712-1780), a magistrate of Rotterdam (Mueschen 1787, Dance 1966, p.82-3), which was sold around 1887. The Buteau Collection was of course that of Lord Bute, the ex-Prime Minister. As none of the specimens ascribed to Bute in our catalogue can be matched to the descriptions in the Bute sale catalogue for June 3rd 1793 (Chalmers-Hunt 1976, p. 64) they were probably purchased from the March 4th-15th sale (Turner 1967, p. 242).

The Atkinson Collection at the time of the 1805 sale comprised of 2701 lots arranged according to Babington's system. The purchaser was one of the Frasers of Lovat - a famous Scottish family - and the collection remained in the Fraser family until 1886. The 'Mr. Fraser' who purchased the collection must have been the Hon. Col. Archibald Campbell Fraser (1736-1815) who was an M.P. and a foreign Consul (MacKenzie 1896). We know that this Fraser was a collector of art and natural history objects as the remainder of his collection was sold by his family in 1865 (Chalmers-Hunt 1976, p. 103). This Col. Fraser left some of his estates and the Atkinson Collection to his illegitimate grandson Archibald Thomas Frederick Fraser (c 1800-1883) as his son had died in 1803. A letter presented to the museum by one of Glen's descendants tells of how A.T.F. Fraser was involved in a life-long legal battle with the Frasers of Lovat over this inheritance. The letter also reveals that Glen paid only £25 for the collection. When Glen acquired the collection in 1886 it was still complete apart from about 100 specimens. After Glen's death in 1892 his entire collection, including minerals, fossils, rocks, shells, and antiquities, was purchased from his executors by the museum for £500.

Ewan Campbell
Department of Natural History,
Glasgow Museums,
Kelvingrove,
GLASGOW G3 8AG

References

CHALMERS-HUNT, J.M. 1976 Natural History Auctions 1700-1972.
DANCE, S.P. 1966 Shell Collecting : An Illustrated History.
MACKENZIE, A. 1896 A History of the Frasers.
MEUSCHEN, F.C. 1787 Museum Geversianum, sive index rerum naturalium... Rotterdam.
TURNER, G. 1967 The Bute collection of scientific instruments Ann. Sci. 23.

13. DERBY MUSEUMS & ART GALLERY

In this article we mentioned the famous inlaid tablets produced by White Watson (1760-1835)(GCG 8, 399). Dr. R. J. King reports that the Museum of the Geology Department, University of Leicester has recently acquired a further example marked as by White Watson. It came in the Foljambe collection which the department acquired earlier this year from G.M.T. Foljambe Esq. of Osberton Hall, near Retford, Nottinghamshire. Bob King thinks the majority of this collection dates from the early 19th century which is confirmed by this "new" White Watson tablet. It is a further example of the "Section of Bewerly Liberty Yorkshire" made about 1797 (see Ford 1973) for which a descriptive booklet was published in 1800.

Bob King also thinks the Foljambe collection may be found to contain other White Watson material when the collection is sorted out. There is an interesting connection between Watson and the Foljambe family. Joseph Hunter (1783-1861) the famous antiquary recorded during a visit to Bakewell church c. ? 1804 that he found Watson at work in the church repairing the monument to Godfrey Foljambe who died in 1376. He was directly related to the donor of this collection some 600 years later.

A further inlaid Derbyshire tablet has also been discovered at Saffron Walden Museum. It is a two sided version almost identical to that shown on page 400 of the Derby Museum article. One section is entitled "Strata of Derbyshire" while the reverse is headed "Vien (sic) of Copper Ore". The length of the tablet is 167mm and the height 115mm. White Watson's version of this tablet was made about 1794. The present example is clearly labelled Brown, Son and Maw, London. In 1800 the same firm then called Brown and Mawe with works in Derby and a warehouse in London were advertising "Sections of the Strata of Derbyshire", (Hedinger 1800) as the Saffron Walden example is labelled. This example may be one which Watson made and that Brown, Son and Mawe labelled and sold. However since it appears to be of inferior quality of workmanship and so clearly labelled it seems more likely to be a pirated version made by Brown, Son and Mawe from one of Watsons. Brown senior lived c. 1736-1816 and Brown and Son were in business in 1790 and had been joined by John Mawe (1764-1829) by 1800 so the tablet must date from 1790-1800.

References

FORD, T.D. 1973 Introduction to Reprint of White Watson's (1811) "The Strata of Derbyshire". Buxton.
HEDINGER, J.M. 1800 A short description of Castleton in Derbyshire. 4th edition.

Compiled by H. S. Torrens

AN OPPORTUNITY LOST ?

Weymouth November 11 1837

(Addressed to)
To the Directors of the British Museum

Gentlemen:-

It is probable that you may recollect of my calling at the British Museum, to dispose of the Head of the Cornu Ammonis with a body attached to the Head, about the time when some Gentlemans private Museum was purchased in August 1837. - I need not comment on the rarity of such a production, the Head and boddy (sic) alluded to, as it is generally acknowledged to stand alone on the Earth, and it cannot fail to be as great a national production if not a greater, than any at the present moment, in the British Museum. - I consider it a great sacrifice to the feelings of many that are parcial (sic) to, and who have studied, and are acquainted with Natural History and particular, those spiceis (sic) that are extinct, the Cornu Ammonis, one among the few. - I have not offered to dispose of it, although a sale might have been effected with a forign (sic) Museum, but for that unpleasantness that must naturally arise from it to the Nation as well as the Directors in being so very particular on a few Pound, to purchase so rare a natural production as this is, the greatest that is known, by which the Naturalist, the Historian, as well as all the curious may satisfy themselves on different points, now hid from him, all will then be elucidated. - I beg to state, that I am still inclined to dispose of it, for the British Museum, out and out, or I will dispose of it, so that I may have it again, on paying the amount that may be paid for it myself, or I will arrange for a certain sum, to be paid to me annually at any time that may be stipulated and at the expiration of such time, the Head and its parts to be returned to me, free of expence and uninjured. Should a personal interview be wished for, on my expences being reimbursed to and from London, about of £5, it will be attended to, or any further information being required, it will meet with attention, on the Postage being paid, the lowest price to purchase it out and out £20,000.

I remain
Gentlemen
With every respect
Your most Humble Servant
Joseph Bennett
No 86 St. Mary Street

P.S. I beg leave to observe, that supposing the Head of the Cornu Ammonis was exhibited in the City and Suburbs, taking the population at the computed number 1,500,000 that one in 40 at 1/- each for seeing it equal to £37,000 near double the price now demanded.

JB

Apart from observing the gentleman's spelling is only a little better than his arithmetic this letter needs little comment. Cornu ammonis is an old term for an ammonite, of which the British Museum (and all others) still lacks a completely preserved head. The original of this document is preserved at the British Museum (Natural History).

H. S. Torrens

COLLECTIONS AND INFORMATION LOST AND FOUND

COLLECTIONS AND INFORMATION SOUGHT

We have rather a large number of items in this column in this issue, some of them relating to collections of considerable importance. As usual it is difficult to decide whether some of the information given qualifies for the lost or found section!

26. HENRY ALLEYNE NICHOLSON (1844-1899).

Aberdeen University, Geology Department has a collection of over 5,000 hand specimens and 1,000 slides of corals, graptolites, bryozoa, etc. which belonged to Nicholson, who was Professor there. Michael BENTON, 17 COUNTESSWELLS CRESCENT, ABERDEEN, AB1 8LN, SCOTLAND is trying to catalogue the Type and Figured specimens among these and would much appreciate information on Nicholson, the present location of material collected and/or described by him and to contact anyone revising any of his work.

(N.B. In 1877 a privately printed "Scientific Works and Memoirs of Henry Alleyne Nicholson" was published at St. Andrews; 12 pages giving details of his work up till then.)

27. HULL MUSEUM TYPE SPECIMENS

In the summer of 1943, in one of the last air raids on the heavily bombed City of Kingston upon Hull, the Central Museum, Albion Street, was completely destroyed by fire (while the building was being used temporarily as a Department Store!). Virtually the whole of the large and important geological collection was destroyed: only the Mortimer Collection (mainly Yorkshire Chalk fossils), some Oxfordian and Kimmeridgian material from the Vale of Pickering (including items from the early nineteenth century Malton Museum), and one tea chest of recent and sub-fossil non-marine molluscs from the Hans Schlesch Collection survived. Moreover all of the Museum's catalogues and other records were lost at the same time, making it extremely difficult to identify even the collections, let alone the individual specimens destroyed in the fire.

An attempt to catalogue, largely by means of literature searches, but also with assistance from past members of staff and research workers who remembered the pre-war collections, was started by D.A.E. Spalding in the early 1960's and has been continued by Patrick J. Boylan, who now has a draft catalogue of the First and Second Class Types believed to have been lost, together with details of many figured and cited specimens. The geological type material appears to have been predominantly local i.e. from the East Riding, the North Yorks. Moors and coastal districts of the North Riding, and North Lincolnshire. Almost all of the possibly relevant Palaeontographical Society Monographs, Buckman's Type Ammonites, together with all geological papers relevant to the Hull Museum cited in The Naturalist and the 212 numbers of Hull Museum Publications during the forty years or so that Tom Sheppard edited both of these, have been searched, as have many other papers.

Anyone who has details of type or figured material that was definitely, or may have been, in the Hull Museum in 1943, and which may not have been covered by the above searches is asked to get in touch with Patrick J. Boylan, Leicestershire Museums, Art Galleries & Records Service, 96 New Walk, LEICESTER, LE1 6TD (Tel: 539111, extension 240).

28. ISAIAH DECK (fl.1826-1827)

In GCG 9, p. 455 we recorded an annotated copy of Wm. Babington's book 'A New System of Minerology 1799' which has now been acquired by the City of

Plymouth Museum. We quoted the annotation and gave the name of the annotation as A. or H. Deck. Both John Thackray and Peter Embrey have written to say the initial letter of Deck's name was most likely a florid capital I and that the annotator is thus I(saiah) Deck who describes himself as 'Practical Chemist and Mineralogist of Trumpington Street, Cambridge' in his publications. These include an undated 12 page Catalogue of Geological Series according to Werner (Thackray collection) and two Mineral Catalogues in the British Museum (Nat. Hist.) Mineralogy library one dated 1826 the other undated. I. Deck of Cambridge also wrote to the Cambridge Chronical of 9 November, 1827 a letter on the Decay of Elm Trees which was reprinted in Mag. Nat. Hist. 4 1831 pp. 152-153. This mentions similar decay of trees in the Hartz Forest in Germany and from this and Deck's announcement in the first pamphlet noted above that:

I. DECK,

RESPECTFULLY begs leave to inform the admirers and collectors of the interesting science of Mineralogy, that from his connexion with one of the first Establishments on the Continent, he will be enabled to supply every choice and rare specimen, of any size and denomination, with its locality, at reasonable prices.

MINERALS NAMED, ARRANGED, AND LABLED,

DUPLICATES EXCHANGED.

SLITTING & POLISHING MILLS,

WITH PRACTICAL INSTRUCTIONS IN THE ART.

Mineral and Geological Hammers, Blowpies, Goniometers, and all Apparatus connected with the sciences of Chemistry and Mineralogy, upon the newest principles.

ENTOMOLOGICAL INSTRUMENTS,

AND

A VARIETY OF FOREIGN AND ENGLISH INSECTS

ON SALE.

It seems likely Deck was of German origin, hence the interest in Werner.

All three pamphlets above were printed by "Deck, printer, Ipswich". This must be a relative and perhaps the J. Deck of Harwich, who writes about the newly introduced printing by lithography in the Monthly Magazine, vol. 40 p. 130 of 1815. This was a German invention introduced to Britain.

The Norwich Castle Museum also contains the collection of G. Deck of whom we hope Peter Lawrence may be able to send us further details. This last is perhaps that recorded in 1829 as "Mr. Dyk's collection of Crag fossils at Harwich".

Any more information about the Deck's or Dyk's will be gratefully received.

COLLECTIONS AND INFORMATION FOUND

12. JAMES ECCLES (?-1915)

In GCG 6 297 we appealed for information about this collection. Although not qualifying as found it is worth recording that Howarth and Platnauer (1911 p. 51) state that one of the special collections of Blackburn Museum and Art Gallery was then the Eccles collection of Solenhofen (W. Germany) fossils. Since James Eccles then lived in Blackburn it may be that his entire collection including those figured specimens sought by Howard Brunton, may have gone to Blackburn.

13. DAVID CHRISTOPHER DAVIES (1827-1885)

In GCG 6 298 and 7 346 we told the sorry tale of this collection as far as it concerned Oswestry. The same source quoted above adds more information about this collection. Howarth and Platnauer (1911 p. 40) record that the Museum of the University College of North Wales, Aberystwyth then included the "D.C. Davies collection of fossils from the Mountain (= Carboniferous) Limestone of the Vale of Llangollen". We hope Anthony Wyatt our member and curator there can shed more light on whether this collection is still at Aberystwyth and whether the figured material Robin Cocks seeks is still preserved there and not, as was presumed, lost at Oswestry.

25. SPENCER GEORGE PERCEVAL (1838-1922)

Peter Embrey BM(NH) kindly writes that the British Museum (Nat. Hist.) had the pick of Perceval's specimens of Mendipite and other minerals.

29. REV. WILLIAM RYTON ANDREWS (c. 1834-?)

worked on the rocks of the Vale of Wardour in Wiltshire. He was born about 1834 and entered Wadham College, Oxford in 1853 graduating MA in 1860. In 1873 he was appointed Rector of Telfort Evias, west of Salisbury. In 1894 with A.J. Jukes-Browne he published a paper on the Purbeck Beds of the Vale of Wardour QJGS 50 44-71 with others in the same and other journals.

C.D. Sherborn (1940 p. 9) noted his collection but stated its whereabouts was then unknown. In 1895 Woodward (p. 349) had said it was in Eastbourne where Andrews had evidently gone to retire.

R.S. Barron of Holly Cottage, West Lavington, Wilts. very kindly writes (August, 1977) giving details of its arrival at Devizes Museum and the circumstances surrounding this. "About May 1976 the Curator of the Wiltshire Archaeological and Natural History Society (Ken Annable) had a letter from Mrs. Pember, living near Lewes, offering the collection to Devizes Museum on behalf of Miss Elizabeth Andrews of 25 Engs Road, Eastbourne. So I agreed to motor to Lewes, pick up Mrs. Pember and go onto Eastbourne where I collected two cabinets each with 10 drawers of fossils and minerals. Miss Andrews, aged about 90, had expressed a wish that her father's collection be safely housed in some museum rather than just be one item of an auction sale. Miss Andrews was there to see us take the cabinets and Mrs. Pember, together with the derated housekeeper, were able to make clear to her that her wish was being fulfilled. Of the 20 drawers only three or four have Vale of Wardour fossils;

in the other drawers are fossils Andrews collected from the Dorset coast and around Eastbourne also 2 drawers of minerals and one of sea shells. I have moved out the two latter classes in order to give more space for the Wardour collection which is closely packed.

Another Miss Andrews (niece or greatniece of Rev. Andrews) also kindly sent to us all the note books, maps and published offprints of various papers. Mr. Sandell, the museum librarian, has catalogued all these".

We are very grateful to Mr. Barron for sending this information.

30. CHARLES LYELL (1797-1875)

Peder Aspen, Curator, Grant Institute of Geology, University of Edinburgh writes (July 1977) "over the past two years I have been discovering parts of a collection made by Charles Lyell in our Departmental Collections; this consists of

a) manuscript material for his visits to North America 1841-1842 and 1845-1846 - mostly lectures,

b) a meteorite collection,

c) various geological specimens from the Canary Islands 1854, Arthurs Seat Edinburgh and

d) a piece of the glaciated surface near Edinburgh which he visited in 1840 with Agassiz who pronounced it "the work of ice"." Peder Aspen hopes to prepare a fuller account for us when his explorations are completed.

31. GEORGE HIGHFIELD MORTON (1826-1900)

In our account of the Merseyside Museum geological collections GCG 6 253-289 reference was made to G. H. Morton who wrote on the "Geology of the country around Liverpool" but not to his collections. In June Stanley J. Dibnah, Curator of the Huddersfield Museum wrote asking for information about a few specimens in his collections bearing numbers from G.H.M. no. 896 to 989 and wondering if we could suggest their provenance. All are Coal Measures fossils and seem likely to be some of Morton's since the Huddersfield collection was curated in 1911.

Notices of Morton's life are given in QJGS. vol. 57, pp. liv-lv, 1901 and Geol. Mag. 1900, p. 288.

Further information about his collections would be welcomed for these columns.

32-43 ANTIPODEAN TREASURES

In GCG 3 p. 153 we drew attention to an article by F. Chapman (1942) which was a Review of C.D. Sherborn's book of 1940 "Where is the — Collection". In this Chapman referred to the activities of Sir Frederick McCoy (1823-1899) who went to Melbourne Museum in 1856. McCoy had first worked for the Irish Geological Survey having been born in Dublin. In 1846 he commenced work for Adam Sedgwick in arranging the fossils of the Sedgwick Museum which continued until 1853. His 'British Palaeozoic Fossils' was finally published in 1855. By 1855 he was appointed first Professor of Natural Science at the University of Melbourne where he also established the National Museum of Natural History and Geology as it was then called. His contacts with European and especially English Geology enabled him to build up the Melbourne collections as will be seen by the following names, details of whose collections at Melbourne have been very kindly provided by the Deputy Director, Thomas A. DARRAGH, National Museum of Victoria, 285-321 Russell Street, MELBOURNE, Australia 3000.

32 DAMON (ROBERT) (1813-1889)
with his son Robert Ferris Damon (died - 1929) was a famous dealer in all natural history specimens, based in Weymouth. Fossils and zoological specimens were purchased from this dealer from 1861 through to 1889. It included portions or the complete collections of those with an asterisk in the list below.

33 DARWIN (CHARLES) (1809-1882)
author of the Origin of Species. A few fossil barnacles described and figured in his Palaeontographical Society monograph of 1851-55 were present in the J. Morris collection (qv) purchased from A. Krantz a dealer in Bonn, Germany in 1863.

34 DAVIDSON (THOMAS) (1817-1885)
world authority on fossil and recent Brachiopoda and author of the Pal. Soc. monograph on these (1851-1886). Again a few fossil brachiopods described by him were present in the Morris collection (qv) purchased from Krantz in 1863.

35 HARRISON* (JAMES) (1819-1864)
of Charmouth. Harrison's life and work are well described in an article by W. D. Lang 1947. He came to live at Charmouth about 1850 but was taken seriously ill in 1858 and this greatly restricted his geological activities. He died in September 1864. His most important specimens were purchased by the British Museum (Nat. Hist.) in 1861 and 1865 and are listed by Lang, p. 105-106. Lang also mentions a small portion of his collection given to Lyme Regis Museum in 1937. What does not seem to have been widely known before is that the major part of his collection was sold to Robert Damon (qv) and from him was purchased by the National Museum of Victoria. It includes mostly Jurassic cephalopods with some crinoids and reptile remains.

36 KETLEY (CHARLES) (fl 1862-1875)
of Smethwick. His collection is mentioned by Sherborn (1940, p. 79) as being of Silurian fossils from Dudley and Malvern in the Mason College (now the University of) Birmingham collection with others in the Sedgwick Museum Cambridge. Woodward (1904, p. 303) gives some information about him and that his specimens are in many Museums. The National Museum of Victoria purchased 91 Wenlock fossils from Dudley in 1862. Ketley published on 'The Silurian Fossils and Rocks of Dudley' in the British Association Report for 1865. His collections were used by J. W. Salter in his Pal. Soc. "Monograph and the British Trilobites 1864-1883".

37 LYCETT (JOHN) (1804-1882)
From 1840 to about 1860 Lycett was a medical practitioner at Minchinhampton in Glos. and his collecting here provided much of the material for his joint Monograph of the Mollusca from the Great Oolite chiefly from Minchinhampton and the Coast of Yorkshire with John Morris (qv) published by the Palaeographical Society 1851-1855 with a supplement in 1863. His collections are always thought to have been divided between the Geological Survey Museum and the Sedgwick Museum (see Cox & Arkell 1948-1950, p. xxii, Woodward 1894, p. 517 and Sherborn 1940, p. 99). But his obituary notice in Glos. Notes and Queries vol. 2, p. 172 1884 gives additional information and adds that Lycett disposed of a considerable part of his collection on his removal to Scarborough in 1860. "A large portion was subsequently presented to the several museums at Sydney and Melbourne in Australia, at Vienna and at Cambridge". The material at Melbourne includes the following important figured specimens from his Great Oolite Mollusca monograph cited above which were among the 3100

specimens purchased from Lycett in 1862.

Monodonta labadyei	Pl 11, fig. 11, 11a
Phasianella acutiuscula	Pl 9, fig. 2
Bulla doliolum	Pl 8, fig. 16, 16a, b
Cylindrites angulatus	Pl 8, fig. 11, 11a, 11b
Purpuroidea moreausia (Morrisea)	Pl 4, fig. 4
Phasianella leymeriei	Pl 11, fig. 32
Patella rugosa	Pl 12, fig. 1, 1a, not 1f, g.
Patella inornata	Pl 12, fig. 11, 11a reversed
Gervillia monotis	Pl 2, fig 14a
Cucullaea goldfussi	Pl 5, fig. 4, 4a
Cucullaea cucullata	Pl 5, fig. 5
Cardium subtrigonum	Pl 7, fig. 3
Cardium stricklandi	Pl 7, fig. 5a
Cardium semicostatum	Pl 7, fig. 6, 6a. Both labelled 4a
Cypricardia bathonica	Pl 7, fig. 8, 8b
Cypricardia nuculiformia	Pl 7, fig. 10
Corbis lajoyei	Pl 7, fig. 12b
Alaria laevigata	Pl 3, fig. 3a
Alaria paradoxa	Pl 3, fig. 9, 10
Alaria trifida	Pl 3, fig. 11b
Turbo capitaneus	Pl 9, fig. 33
Lima cardiiformis	Pl 3, fig. 2, 2a
Hinnites velatus	Pl 2, fig. 2
Opis lunulatus	Pl 6, figs. 3

None of these specimens were known to the revisers of Morris and Lycett's monograph Cox and Arkell 1948-1950.

38 MARSTON (ALFRED) (fl. 1861-1870)
of Ludlow, published a paper "On the Transition Beds between the Devonian and Silurian Rocks" in the Geol. Mag. 1870 vol. 7, pp. 408-410, having earlier contributed a chapter on the Geology of Ludlow to J. Evans' Handbook to Ludlow, published in 1865. Other publications are listed by Bassett (1963). The material in Melbourne is a small collection of Leintwardine fossils purchased in July 1862 but it includes at least one of J. W. Salter's type specimens.

39 MORRIS (PROFESSOR JOHN) (1810-1886)
After training and practising as a pharmaceutical chemist until at least 1865 he became professor of Geology at University College London from 1855-1877. In 1862 he sold his large collection to the German dealer Krantz in Bonn and a part, including some types, was acquired by the British Museum (Nat. Hist.) see Cox and Arkell 1948-1950, p. xxii. The National Museum of Victoria purchased a large proportion of the Cretaceous and Tertiary material in 1863 and 1865. It contains specimens described by Darwin, Sharpe and Davidson and possibly others as yet unrecognised, (see also under 37. LYCETT (JOHN)).

40 MURRAY* (PETER) M.D. (fl. 1828-1864)
of Scarborough, collected from the Estuarine Beds of Yorkshire and some of his material was figured by Lindley and Hutton (1831-7). The British Museum (Nat. Hist.) purchased some specimens from him in 1839 but the National Museum of Victoria purchased the major(?) portion of his collection in 1864, after his death, from dealer Robert Damon (qv). Murray published a paper on the fossil plants from Gristhorpe in the Edinburgh New Philosophical Journal, 5, 1828. pp. 311-317.

41 MUSHEN (JAMES) (dates unknown)
of Birmingham. Little seems to be known of this man. His collections were however widely drawn on by J.W. Salter in his Monograph of British Trilobites. The material in Australia is 400 fossils from Dudley purchased in 1862.

42 SHARPE (DAVID) (1806-1856)
of London. For a long obituary see QJGS 1857 13 xlv-lxiv. He took up geology in 1827 becoming FGS in that year: In 1853 he published the first part of his Description of the Fossil Remains of Mollusca found in the chalk of England, a Pal. Soc. monograph left unfinished in 1857 and dealing only with Cephalopoda. A few of these figured in this work were in the John Morris collection (qv) purchased by Melbourne in 1863. This was not known to the revisers of Sharpe's Monograph (Wright and Wright 1951).

43 WRIGHT (DR. THOMAS) (1809-1884)
built up a large general Mesozoic fossil collection which was bought in 1887 and dispersed after his death by the London dealer F.H. Butler (Cox and Arkell 1948-50 p. xxiii). The British Museum (Nat. Hist.) purchased a large collection from Butler including as many of the type specimens as could be then recognised, (Woodward 1904, p.339) but some were not found. S.S. Buckman purchased some of the Wright collection from Butler. However Wright had sold two large collections to Melbourne in 1862 and 1863. This material includes echinodermata from the British Mesozoic, and the Tertiary of Malta and the Vienna Basin and also Jurassic brachiopods, corals and mollusca from Britain. It may include type and figured material of Wright's up to these dates.

Dr. Darragh gives further information about the collections and the difficulties faced in a letter of May 1977.

"Shortly after I joined the staff of the Museum, I started a systematic examination of the collections to find out what was here and, of course, found the foreign material which had been forgotten. I then investigated some of the collections more thoroughly to determine if there were any types present and found some. The task became more difficult owing to lack of literature and access to what was already in Britain and I decided to publish a history of the collections and let others ask for particular items. For example, we have a large collection of specimens from Thomas Wright which may include type material, and the task of checking would be enormous; however if someone asked if we had a particular specimen, this could be easily ascertained and the specimen checked against an original figure. Unfortunately, I have never managed to get enough time to finish off the history of the collections."

44. FOLJAMBE
collection of Osberton Hall, Nottinghamshire (see p.485).

REFERENCES

BASSETT, D.A. 1963 Bibliography and Index of Geology for Wales and the Welsh Borders, 1536-1896. Cardiff.

CHAPMAN, F. 1942 Scientific Collections: Their Romance and Tragedy. Victorian Nat. 58, 160-162.

COX, L.R. & ARKELL, W.J. 1948-1950 A survey of the Mollusca of the British Great Oolite Series. Mon. Pal. Soc. London.

HOWARTH, E. & PLATNAUER, H.M. 1911 Directory of Museums in Great Britain and Ireland, etc. London: Mus. Ass.

LANG, W.D. 1947 James Harrison of Charmouth (1819-1864) Geologist. Proc. Dorset nat. hist. arch. soc. 68, 103-118.

LINDLEY, John & HUTTON, W. 1831-7 The Fossil Flora of Great Britain 3 vols. London.

SHERBORN, C.D. 1940 Where is the ------ Collection. Cambridge University Press.

WOODWARD, H.B. 1894 The Jurassic Rocks of Britain, vol. IV. Mem. Geol. Surv. U.K.

WOODWARD, H.B. 1895 The Jurassic Rocks of Britain, vol. V. Mem. Geol. Surv. U.K.

WOODWARD, A.S. 1904 The History of the Collections contained in the Natural History Depts. of the British Museum, vol. 1. London.

WRIGHT, C.W. & WRIGHT, E.V. 1951 A survey of the Fossil Cephalopoda of the chalk of Great Britain. Pal. Soc. monogr.

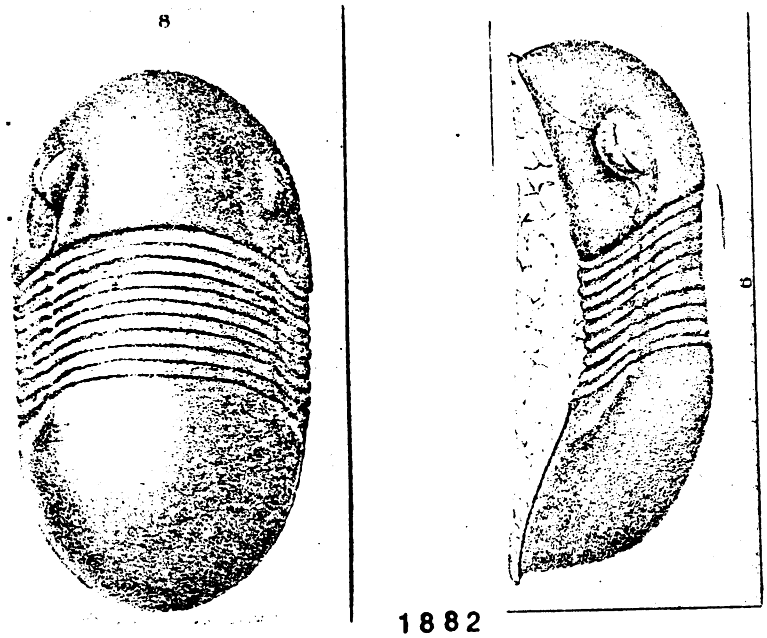
This section is compiled by
H. S. Torrens
to whom all related correspondence
should be addressed.

WANTED

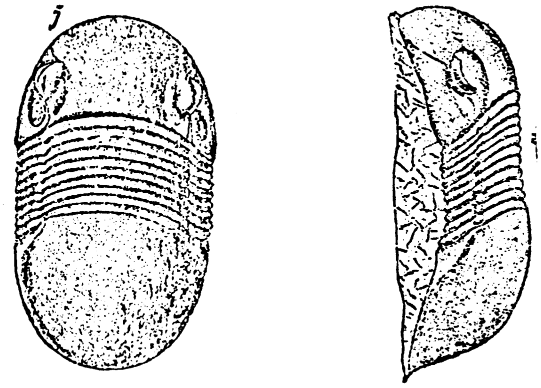
FOR INTERSTATE FLIGHT

ILLAENUS NIAGARENSIS

ALIASES: BUMASTUS NIAGARENSIS
ILLAENUS MADISONIANUS



1882



1883

DESCRIPTION

AGE: 420 M.Y. (SILURIAN); BORN AT SCHOONMAKER REEF, WAUWATOSA, WIS. USA

HEIGHT: 18mm
LENGTH: 70mm
WIDTH: 40mm
BUILD: INTERNAL MOLD
OCCUPATION: HOLOTYPE

EYES: HOLOCHROAL
COMPLEXION: DOLOMITIZED
RACE: TRILOBITA
NAMED BY: R. P. WHITFIELD, 1879
SEX: UNKNOWN

DISTINGUISHING MARKS: SMOOTH CEPHALON & PYGIDIUM, 10 THORACIC SEGMENTS, SHORT DORSAL FURROWS

PREVIOUS RECORD see back

IF YOU HAVE ANY INFORMATION ON THIS TRILOBITE PLEASE CONTACT:

DONALD MIKULIC
FEDERAL BUREAU OF SILURIAN
TRILOBITE INVESTIGATION
DEPT. OF GEOLOGY
OREGON STATE UNIVERSITY
CORVALLIS, OREGON 97331
USA

CAUTION: WANTED FOR INTERSTATE FLIGHT TO AVOID ANSWERING QUESTIONS ON TAXONOMY, MORPHOLOGY AND EVOLUTION. ESCAPE RISK. HANDLE WITH CARE.

PREVIOUS RECORD

Illaenus niagarensis was first described by R. P. Whitfield in Descriptions of New Species of Fossils from the Paleozoic Formations of Wisconsin. Ann. Rept. Wisconsin Geol. Survey for 1879; 1880: p. 68.

It was not figured at that time and was said to have been the property of the State Historical Society at Madison, Wis. No locality was given.

It next appeared as Illaenus madisonianus in Whitfield, R. P., 1882, Geology of Wisconsin, Part 3, Paleontology: p. 307-309. The description was the same as before. It was illustrated on Plate 20, figs. 8 and 9. No explanation was given for the change in name.

In 1883 it was again figured as I. madisonianus by T. C. Chamberlin in Geology of Wisconsin, Vol. 1, Part 1, General Geology; Fig. 57, j and k, p. 195.

Illaenus madisonianus was supposedly destroyed along with most of Whitfield's Wisconsin type specimens when the University of Wisconsin Science Building burned in 1884. However, few, if any, of the type specimens were stored in the building.

Illaenus niagarensis was reported to have been in the collections at the University of Wisconsin during the 1930's by the curator, Gilbert O. Raasch, but that was the last time anyone has recognized it.

In 1960 all of the Whitfield types at the University of Wisconsin were transferred to the U.S. National Museum, but Illaenus niagarensis may have never made it since it can't be found at either place.

Whitfield's collection at Berkeley has been searched, as have most major museums in North America.

The trail is now cold. Illaenus niagarensis may now be disguised with a thick coating of dust and may be labelled with an alias. Your help in finding it will be appreciated.

PYRITE AND CONSERVATION PART 2

5. Origin and occurrence of iron disulphides

Pyrite is the most widespread and abundant metallic sulphide met with in nature, occurring as an accessory mineral in many types of igneous rocks, in hydrothermal and replacement deposits, in contact metamorphic rocks, and, in most sediments deposited under reducing conditions. Marcasite, on the other hand, appears to be far less abundant, certainly in sediments, than contemporary geological literature would indicate (mainly because of the continuing mis-identification of some forms of pyrite as marcasite and, perhaps, paramorphism of marcasite by pyrite), and will not be considered further here.

The bulk of the pyritic material in Museum and other collections is of sedimentary origin, with fossil specimens both representing the greater proportion and giving the most problems in terms of conservation. For these reasons I will mainly concentrate, in this article, on the associations of pyrite with fossil material. The observed variations in stability to oxidation shown by pyritic fossil material suggest that various types of pyrite are present. To obtain a basis for studying pyrite it will be informative to consider its formation.

Data from Recent and fossil marine sediments and experimental work suggest that the formation of much sedimentary pyrite is a fairly rapid process occurring at low temperatures under the anaerobic or reducing conditions prevailing during the earliest stages in the formation of certain deposits. Berner (1970) and others suggest that pyrite and other, less stable, iron sulphides in marine sediments are produced by a succession of reactions involving initially the aerobic metabolism of biological detritus forming anaerobic conditions where sulphate reducing bacteria produce hydrogen sulphide or HS^- ions; these reduced sulphur compounds combine with any reactive iron in the sediment yielding amorphous iron sulphides; these may react further, either directly with H_2S or HS^- or, indirectly, with biologically produced elemental sulphur, and sulphur produced by partial oxidation of sediments (caused by currents mixing in oxygenated water), to pyrite. Laboratory syntheses of pyrite under simulated sedimentary conditions (Rickard, 1969; Berner, 1970; Farrand, 1970; Kribec, 1975) demonstrate that organic or inorganic mechanisms, or both, can be involved.

Synthetic pyrite is normally wholly microcrystalline in form and this observation corresponds to those of Love (1964), Sweeney and Kaplan (1973) and many others who report that microcrystalline pyrite is often initially formed in most types of anaerobic sediments from lacustrine to oceanic.

The most remarkable feature of early diagenetic pyrite is its universal tendency to occur as minute spherules or globules composed of aggregates of microcrystals. These bodies, termed framboids by Rust (1935) (from the French word 'framboise', meaning raspberry), usually have diameters between a few micrometres and 50 micrometres and are entirely composed of irregularly or regularly packed pyrite microcrystals with individual diameters between a few tenths of a micrometre and about 5 micrometres. Each separate framboid is made up of similarly sized particles (which range from subspherical to well formed crystalline grains) with a ratio of microcrystal to framboid diameter in the region of 1:10, i.e. upwards of 1000 microcrystals per spherule. Although pyrite appears to be the only mineral forming framboids the processes responsible for their formation are largely unresolved. Love and Amstutz (1966) review the geographical and stratigraphical occurrence of microcrystalline pyrite, indicating that it occurs generally in shales and clays ranging from Recent far back into the Precambrian.

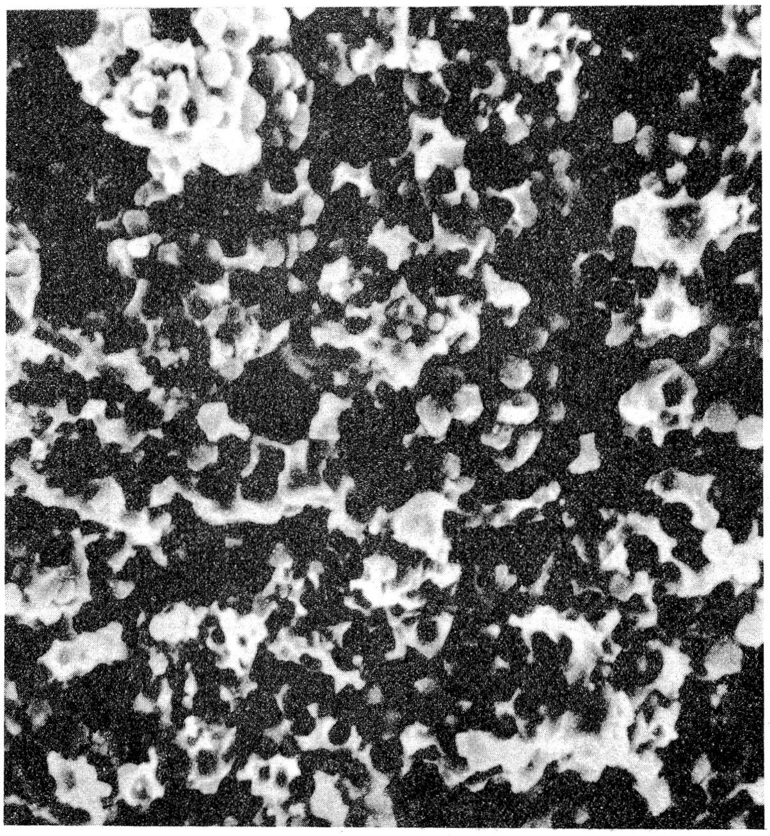


Fig. 1. Microcrystalline pyrite in L. Liassic ammonite Eoderoceras sp. SEM x 4,370

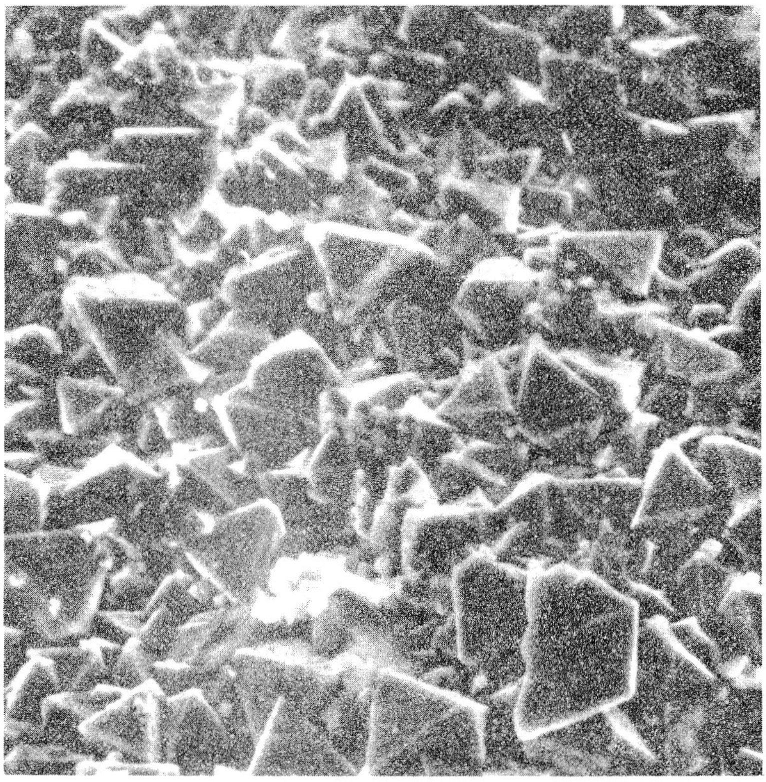


Fig. 2. Microcrystalline and octahedral pyrite in L. Liassic echioceratid ammonite. SEM x 1,266

Individual pyrite microcrystals and framboids or framboidal aggregates are finely disseminated throughout clays and shales, and indeed, give the distinctive grey colouration to some such deposits. Concentrations of pyrite however occur in nodules and as the material infilling, encrusting or replacing fossil remains. The nature of these pyrite concentrations has not been at all thoroughly investigated, although pyritization is frequently cited as a major process in fossilization. Love (1970) in a review of the phenomena, highlights the difficulties inherent in such a study, notably the poor recording and description of examples of pyritized fossils. He, however, differentiates between two main types of pyritization. The first, and most common, involves pyritic infilling or encrustation of original skeletal material, and the second very much rarer type occurs where the original skeletal material is partially or wholly replaced by pyrite. Love considers that the former process takes place at a very early stage in sediment formation, whereas the latter probably occurs at some later stage in the history of the sediment, by dissolution and direct replacement of the skeletal material, possibly by metasomatic mechanisms.

A large proportion of the material giving conservational problems in collections consists of the pyritic internal casts, or infillings, of molluscs (especially ammonites), pyritic plant material, and the pyrite-rich matrices often enclosing or infilling vertebrate specimens. It seemed to me that to commence investigations into all the various types of pyritic material at the same time would be a formidable and complicated task. I therefore concentrated initially on common pyritized molluscs, plant fossils, and the so-called 'marcasite' nodules from the chalk, where the patterns of stability during storage were relatively well known. The textural characteristics of the pyrite infilling various ammonites from the Liassic and Gault Clays of southern England, molluscs and plant fossils from the Eocene of Barton and Sheppey, and the radiating and nodular pyrite in concretions from the chalk of Sussex, are illustrated by the use of scanning electron microscopy. Freshly fractured representative sections showing both peripheral and internal features were mounted, gold coated where necessary to enhance detail, and examined using a Cambridge S600 SEM. The presence of pyrite as the major phase in the specimens examined was confirmed by X-ray powder diffraction.

Fig 1 shows the granular aggregate of poorly developed pyrite microcrystals characteristic of the infillings in many Lower Liassic ammonites from Charmouth, Dorset. (The specimen illustrated is Eoderoceras sp.). The diameters of individual microcrystals typically ranged between 1 and 2 microns throughout the material examined; in some specimens quantities of intergrown octahedral pyrite crystals, with grain diameters between 5 and 15 micrometres, were admixed with the microcrystalline aggregate; Fig 2 shows such texture in an echioceratid ammonite. Shell material, where present, was not replaced by pyrite. Other ammonites from the same locality, notably hemimicroceratids, contained compact, euhedral, intergrown pyrite crystals with average diameter of about 80 micrometres, see Fig 3. Microcrystalline pyrite occurred only in limited peripheral areas and, in some cases, replaced septal wall material. Little evidence of framboidal pyrite texture was found in the Liassic material examined.

Ammonites from the Gault of Folkestone frequently contained both microcrystalline and more coarsely granular pyrite. The microcrystalline pyrite in hoplitid ammonite infillings constituted a thin zone, between 100 and 200 micrometres in thickness, immediately adjacent to the chamber walls, and usually showed (Fig 4) admixture of irregularly and regularly ordered framboids with octahedral pyrite; the framboid diameters averaged about 20 micrometres. The inner parts of the chamber infillings consisted of euhedral intergrown pyrite crystals with diameters of up to 100 micrometres or more.

The material infilling corbiculid molluscs from the Upper Eocene of Barton

Fig. 3. Compact pyrite infilling L. Liassic hemimicroceratid ammonite. SEM x 1,313

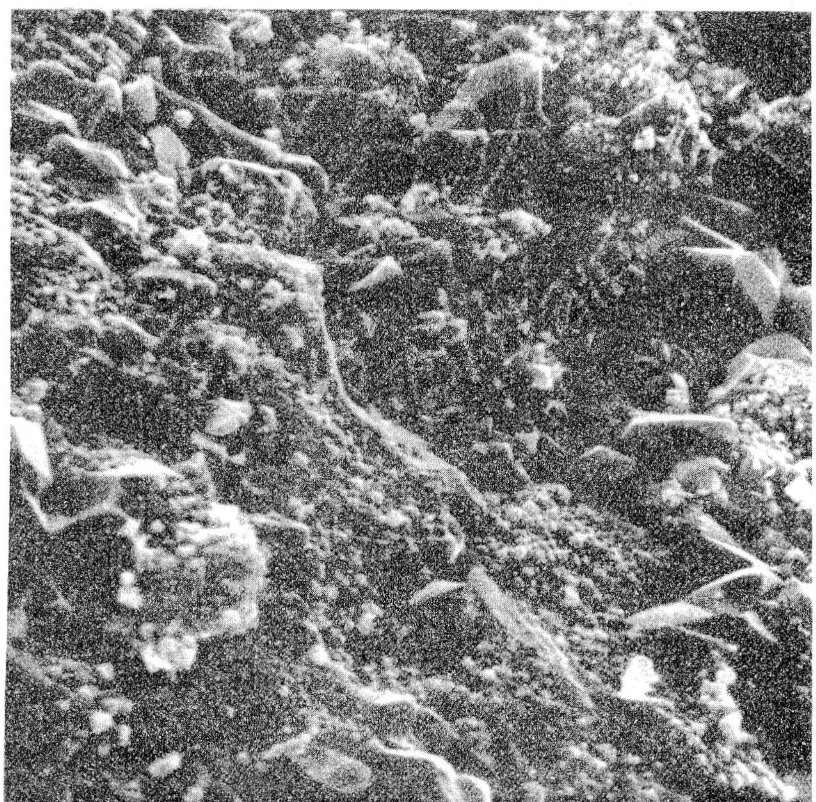


Fig. 4. Framboidal, microcrystalline and octahedral pyrite in Gault hoplitid ammonite. SEM x 4,000

consisted mainly of loose, framboidal, pyrite. Fig 5 shows a typical unfractured framboid with characteristic raspberry-like external appearance. London Clay seed cases, e.g. Nipadites sp. (Fig 6) were found to be almost completely composed of aggregates of framboidal and microcrystalline (mainly octahedral) pyrite. The texture very much resembled that seen in Gault ammonite infillings.

In nodules from the chalk of Sussex the pyrite was in the form of elongate prismatic crystals radiating from a core of microcrystalline material. The radiating pyrite crystals (Fig 7) appeared to be full of perforations, strongly resembling tension gashes. The core of microcrystalline pyrite showed some framboidal texture (not illustrated).

Considerable variation is evident in the texture of the pyrite constituting the limited number of specimens illustrated. The microcrystalline and framboidal pyrites presumably represent primary infillings, whereas the more compact euhedral pyrite infilling suggests that later recrystallization has occurred in some specimens; cf Love (1970). The contrasting textures become significant to conservation when one realizes that of all the specimens examined only the hemimicroceratid ammonites, containing mainly spongey pyrite, are more prone to oxidation. The nature of the pyrite constituting other stable and unstable fossil material and mineralogical specimens is now undergoing investigation.

6. Environmental behaviour of pyrite

Pyrite oxidation, as outlined in the first part of this article, falls into two separate, but not distinct, categories. Firstly, oxidation occurs in fully aqueous environments (streams, percolating ground waters, laboratory media) where oxygen has to be brought into solution before it comes into contact with the pyrite. The oxidation rate is substantially controlled by the rate of oxygen replenishment: remove the oxygen and the reactions cease. In the second category, oxidation occurs in air (in naturally arid regions, on dry mine faces, or in Museum storage areas), in abundant oxygen but with little water present, and that usually only available as vapour. Under such conditions, since the oxidation products are essentially hydrated, it appears very probable that the oxidation rate (at low temperatures) is strongly dependent upon the activity of atmospheric water, i.e. relative humidity (r.h.).

The effect of varying the relative humidity around selected unstable and stable pyritic specimens was monitored, at first visually, and later by measuring the rates of moisture absorption and iron release. The specimens used in these tests were examples of the stable and unstable Liassic ammonites, and unstable Eocene seed cases described in the previous section. Samples of each specimens were broken to expose fresh unoxidized pyrite, and some fragments exposed to laboratory air where monitored r.h. varied between 40% and 50%. Other fragments were exposed to an atmosphere maintained at about 75% r.h., obtained by supporting the specimens in trays over moistened sodium chloride in a sealable perspex cabinet. The specimens were examined at intervals over a period of three months, and it soon became obvious that neither the stable specimens stored at 75% r.h. (Fig 8, hemimicroceratid ammonite) nor the unstable specimens (Fig 9, eoderoceratid ammonite) stored in the laboratory were showing any signs of deterioration. The unstable specimens stored at 75% r.h. however, all effloresced considerably (Fig 10, eoderoceratid ammonite, and Fig 11, Stizocarya sp. seed case) after a few weeks exposure.

The initial tests suggested that somewhere between 50% and 75% r.h. there is a critical level above which the unstable or susceptible pyrites could be rapidly oxidized. To determine this level semi-quantitatively fragments of similar specimens, weighing between 1 and 3 g, were exposed to various relative humidities between 50% and 95%. To ensure, as far as possible, that the samples were clean

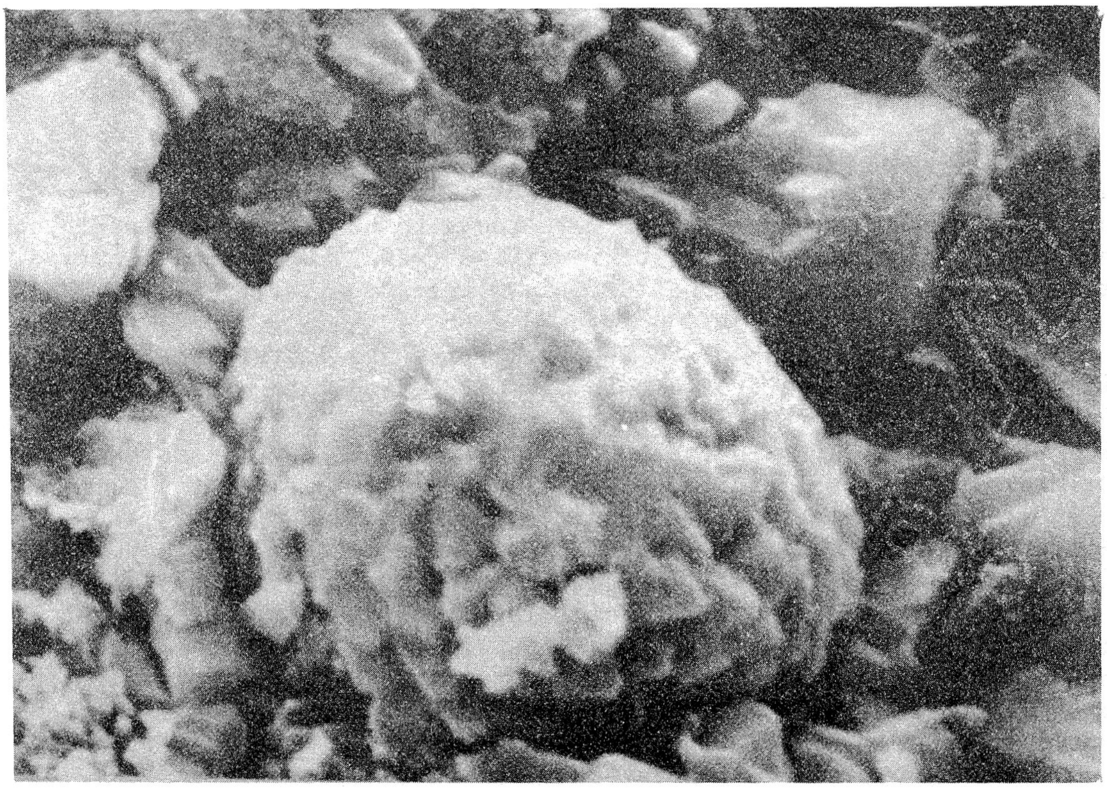


Fig. 5. Unfractured pyrite framboid in Eocene bivalve cast. SEM x 15,250

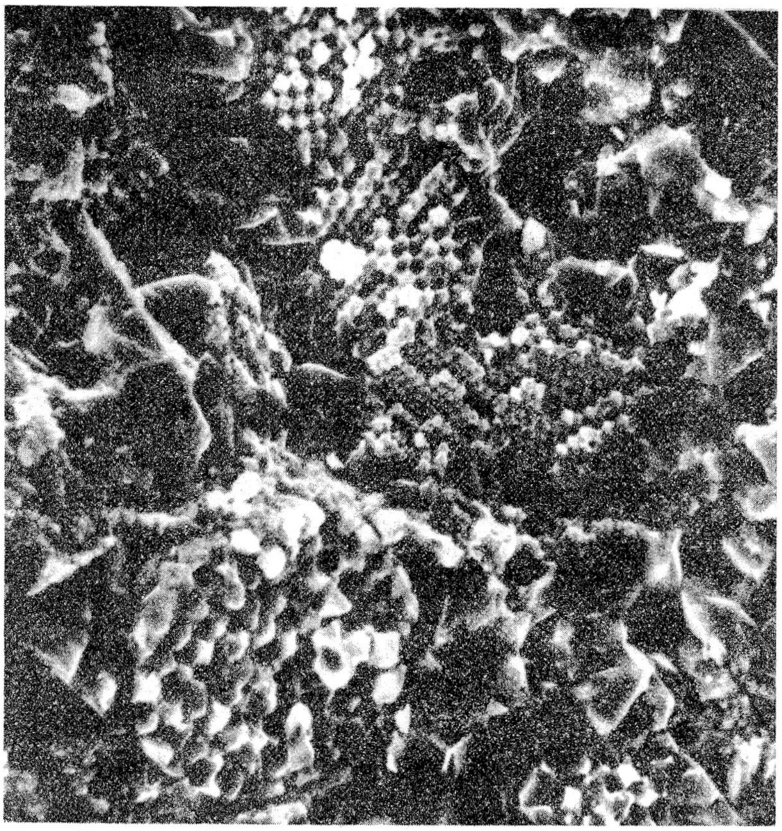


Fig. 6. Framboidal and microcrystalline pyrite in Eocene Nipadites sp. SEM x 4,400

and dry before the experiments were commenced a standardized washing and drying procedure was adopted. Washing, to remove old oxidation products, consisted of boiling the samples in 5% aqueous sulphuric acid for 20 minutes followed by boiling and washing in several changes of deionized water. The drying stage involved immersing the samples in dry acetone for several hours to remove water traces, oven drying at 90°C for two hours and finally storage over silica gel in a desiccator to constant weight.

Two or three samples of each type of specimen were then transferred to small glass jars with ground glass closures and stored, supported on perspex trays, above a) moistened sodium dichromate, b) moistened sodium nitrite, c) moistened sodium chloride, and d) water. These substances gave approximately 52%, 65%, 75%, and 95% r.h. respectively to the air contained in the jars when closed. (Data taken from the Handbook of Chemistry and Physics, 1976). The tests were carried out at room temperature, i.e. 25°C ± 2°C. The samples were weighed at two or three day intervals over a 30 day period. The total weight gain after 30 days exposure for each specimen was plotted against relative humidity (Fig. 12).

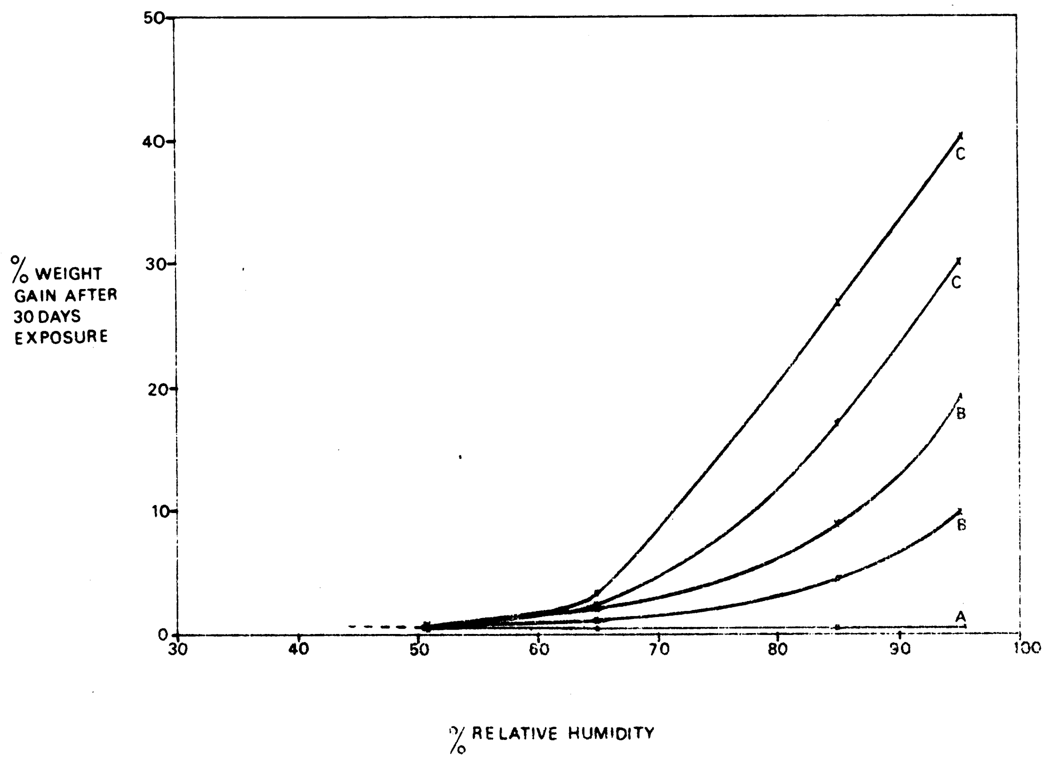


Figure 12

The stable sample (A) showed a very small but constant weight increase over the whole r.h. range, the unstable ammonites (B) and the pyritized seed cases (C) showed, in contrast, accelerating weight gain over the whole range, with marked increases in the 60% r.h. region. Subsequent drying of the samples by silica gel desiccation showed that up to 80% of the total weight gain was due to water absorption, whilst the remainder was presumably the result of chemical reactions between pyrite, oxygen and moisture. Estimation of the total iron leached from the pyrite during the tests, using a colorimetric method, confirmed that no pyrite oxidation occurred at any relative humidity in the stable ammonite, and that little or no oxidation occurred in the susceptible pyrite stored at low r.h. Maximum oxidation appeared to occur in the susceptible pyrite at about 75% r.h., where up to 6% iron leaching occurred. Measurements of the pH of extracts from the unstable specimens under test at above 60% r.h. indicated that

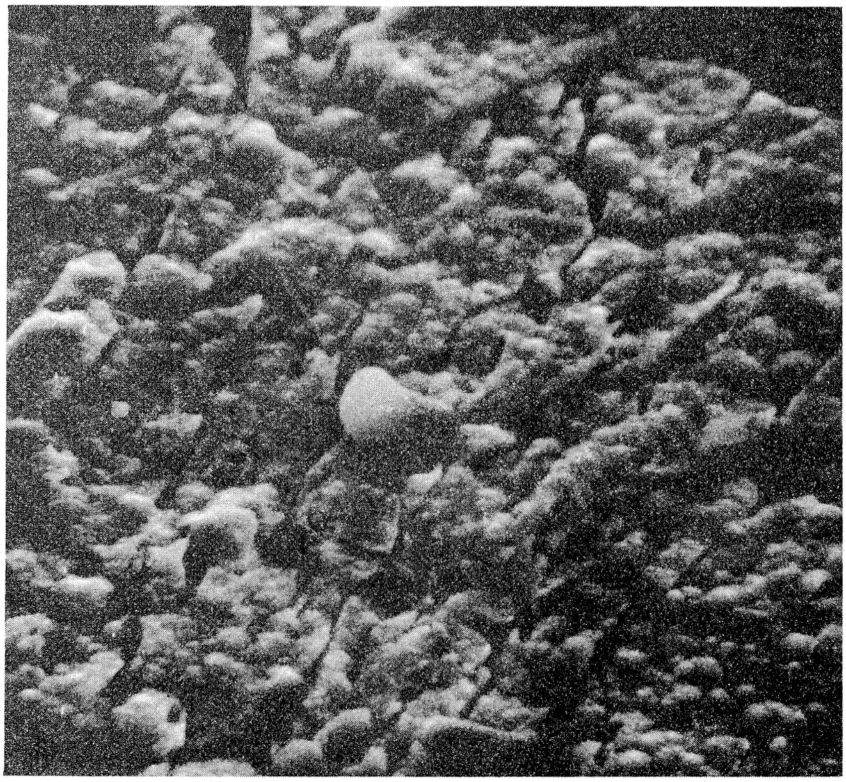


Fig. 7. Porous pyrite in 'marcasite' nodule from the Chalk of Sussex. SEM x 6,250

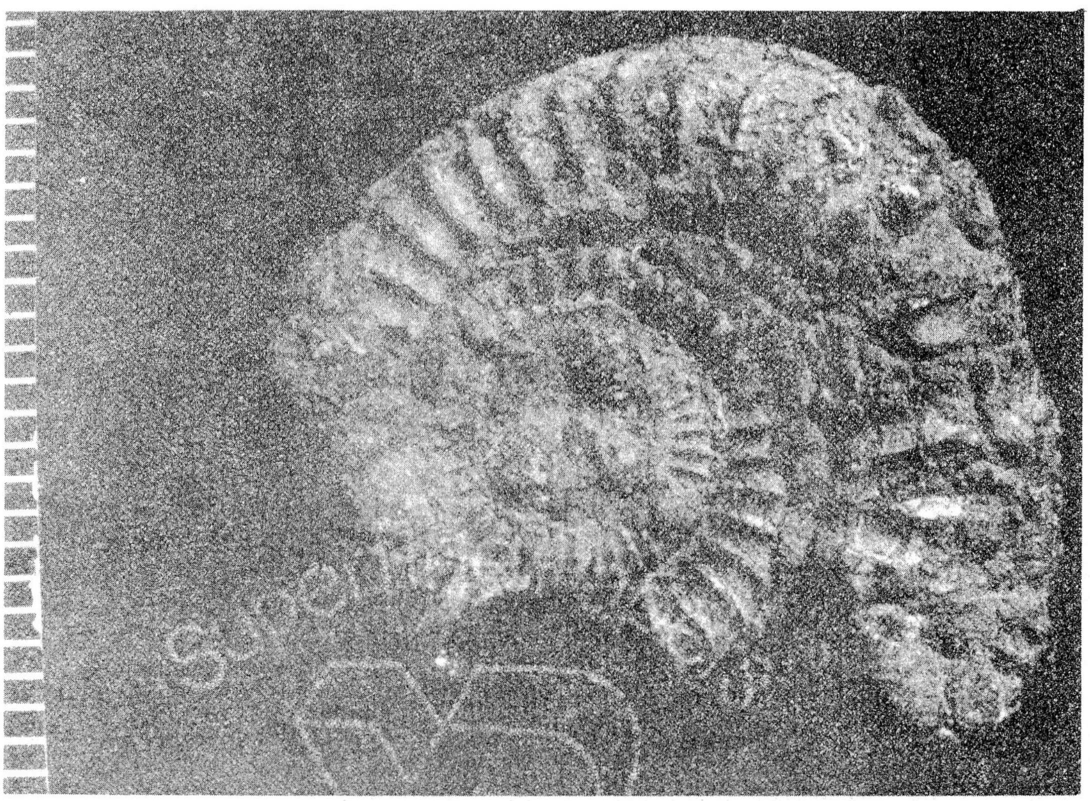


Fig. 8. Hemimicroceratid ammonite (stable pyrite) after several weeks storage at 75% r.h. Scale in mms.

sulphuric acid concentrations exceeded 10% during deterioration. Further tests of the same type on other unstable specimens, including pyrite nodules, pyritized Gault ammonites, and pyrite specimens from the Mount Isa shales of Queensland, Australia gave very similar results, i.e. commencement of water vapour absorption at about 60% r.h., accompanied by visible deterioration or development of surface acidity.

Whilst it is realized that experiments where pyrite samples are exposed to various relative humidities in closed containers do not correspond to the conditions normally met in storage (i.e. in the closed system, oxygen depletion and possible sulphur dioxide build-up could influence the reactions taking place), the results closely parallel, as will be seen later, the behaviour of material in storage.

7. Possible causes for the oxidation of pyrite in air

The onset of oxidation in the material examined appears to be controlled primarily by the capacity of porour pyrite, either the microcrystalline and framboidal aggregates present in pyritic casts of fossils or the pyrite in nodules etc., to absorb water vapour at above about 60% relative humidity at temperatures around 25°C. Significant absorption does not occur in specimens composed of compact pyrite. The initial stages in the oxidation of certain specimens were monitored using scanning electron microscopy.

Polished sections of microcrystalline pyrite were exposed, after drying in acetone and over silica gel, to 75% r.h. After a few days crystalline decay products were observed to form at the edges of, and boundaries between, microcrystals, but no growth occurred on the microcrystal sections. Fig. 13 shows hexagonal platelets, probably szomolnokite ($FeSO_4 . H_2O$), forming on pyrite in an echioceratid ammonite section. Prolonged exposure to high r.h. resulted in extensive growth of szomolnokite, and other hydrated ferrous sulphates (confirmed by X-ray powder diffraction determination), and eventual destruction of the sections. Similarly prepared sections of the compact pyrite constituting hemimicroceratid ammonite casts when exposed to 75% r.h. for up to three months showed no visible deterioration except for a slight iridescent tarnish. SEM revealed that the tarnish probably resulted from limited surface oxidation, accentuated where the compact nature of the pyrite was disturbed by scratching during polishing (see Fig. 14).

These observations suggest that pyrite, irrespective of texture, is basically amenable to oxidation in damp air. The contrasting behaviour between compact and porous pyrite may be explained by the volume increases associated with the transformation of pyrite to hydrated iron sulphates which can be in excess of 200%. The growth of these sulphates between microcrystals, or in crevices, gashes, or other imperfections in pyrite crystals, results in internal stress and eventually total destruction of the fabric.

The surface areas available to aeration in porous pyrite are obviously many thousands of times as great as those found in compact pyrite. The capacity for moisture absorption by porous pyrite reflects this fact. In addition, as the oxidation reactions produce hygroscopic sulphuric acid, this too will lead to more moisture uptake through dilution of acid as deterioration progresses. Water will also be taken up in the formation of the hydrated sulphates. Under humid conditions the reactions reach catastrophic proportions, but if the available water vapour is removed the reactions slow down and eventually cease. In the case of compact pyrite in humid conditions water can condense on the outer surface only, and probably reacts producing sulphates and sulphuric acid in minute quantities; reaction ceases quickly because the available reactive pyrite surface is limited. Increases in area, as caused by scratching, increase the

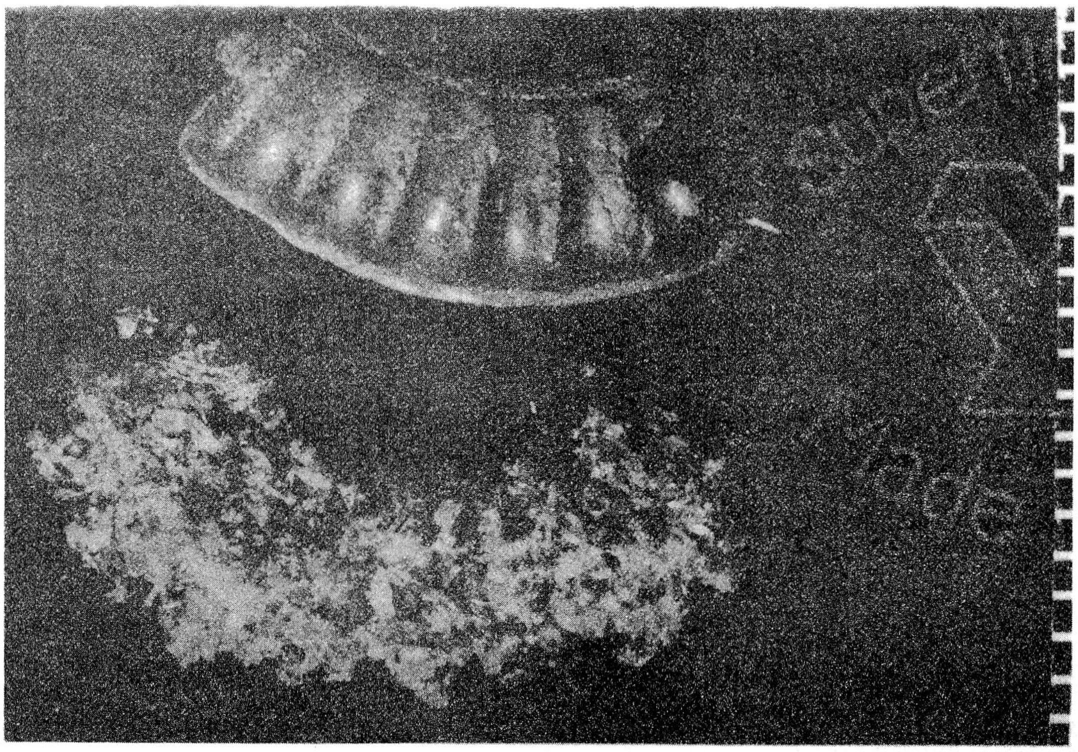


Fig. 9. Fragment of eoderoceratid ammonite (unstable pyrite) stored at between 40% and 50% r.h. Scale in mms.

Fig. 10. Fragment of eoderoceratid ammonite (unstable pyrite) after a few weeks storage at 75% r.h., showing extensive efflorescence. Scale in mms.

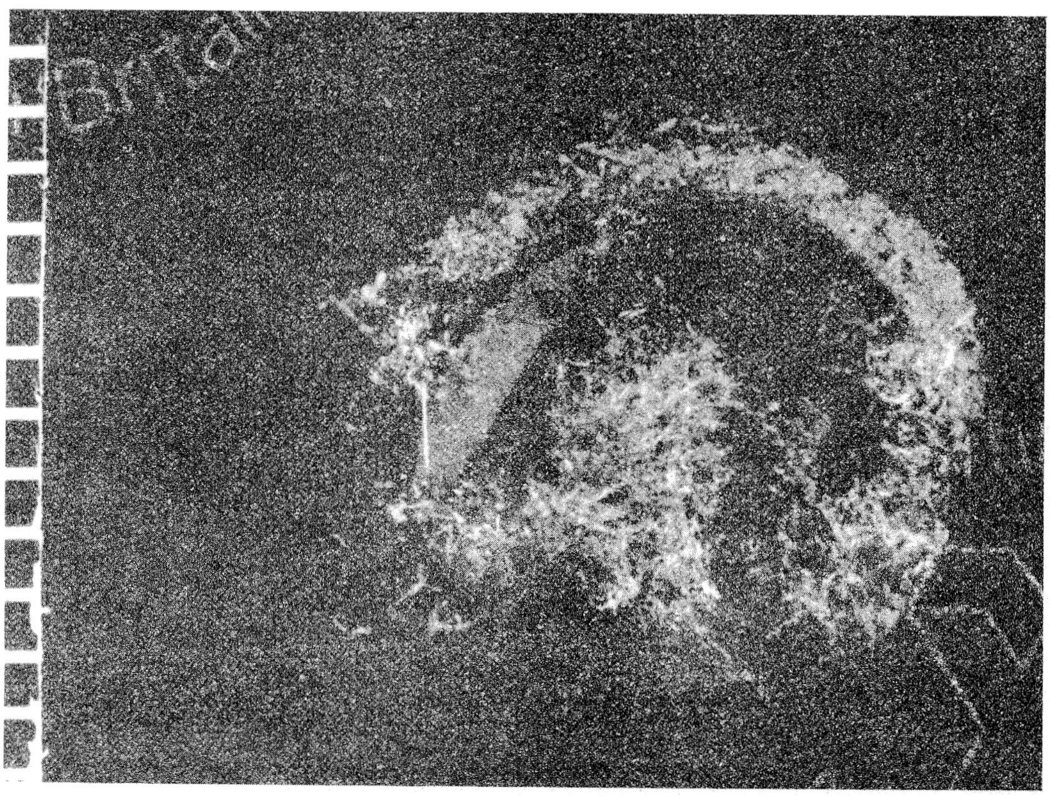


Fig. 11. <u>Stizocarya sp.</u> seed case (unstable pyrite) after exposure to 75% r.h. for a few weeks. Scale in mms.

possibility of oxidation.

The surface chemistry of pyrite, as with most sulphide minerals, is as yet little understood, but it is known (Peters and Majima 1968) that pyrite can behave passively, in the electrochemical sense, in air. This passivity is thought to be caused by the presence of a strongly adsorbed layer of oxygen on the surface; if this layer is disturbed and prevented from reforming pyrite shows corrosion characteristics very similar to metals such as iron.

The vexed question, whether or not bacterial attack either initiates or sustains the oxidation of pyrite in air, can be partly resolved at this stage. The available evidence from experimental work and observations of stored material strongly suggest non-complicity, certainly of Thiobacteria, in the deterioration process. The major arguments against their complicity are:

(a) The high concentrations of sulphuric acid, present in actively oxidizing pyrite, inhibit the activity of iron oxidizing bacteria such as Thiobacillus ferrooxidans (Silverman 1967).

(b) T. ferroxidans will not oxidize iron at sulphate concentrations above about 0.2 molar (Steiner and Lazaroff 1974); sulphate concentrations reaching saturation levels, i.e. about 1.0 molar, are probably present at decay product growth sites in unstable pyrite textures.

(c) Other thiobacteria, i.e. the sulphur oxidizers such as Thiobacillus thiooxidans, will not oxidize metallic sulphides, although they could possibly tolerate the high acidities present (Zajic 1969).

(d) The material tested experimentally had been washed in acetone (an effective sterilizing agent) and oven dried at about 90°C before oxidation occurred.

Further support for purely chemical causation came from the results of a series of microbiological screening tests carried out at Warren Springs Laboratory. Samples of several actively oxidizing pyritic fossils were put on culture in various thiobacilli media for one month. The results indicated that T. ferrooxidans was not present in any sample, and that, possibly, T. thiooxidans might have been present in one sample, but in quantities too small to be significant (Dacey 1976).

8. Behaviour of pyritic material under storage conditions and evaluation of conservation treatments

The continuing failure of the various conservation treatments for pyritic material undoubtedly results from storing treated material under conditions of high relative humidity. Published information is scarce on the storage environments in Museums generally, but it is known that temperature and r.h. fluctuate greatly in buildings without controlled heating or air-conditioning. In the more massively constructed 19th or early 20th century buildings these fluctuations are probably less than those occurring in thin-walled modern buildings. The large volumes of masonry and timber in the former buffer the interior to climatic extremes by absorbing excess water vapour and maintaining even temperatures, whereas the latter are far more prone to rapid rises in temperature at day and internal condensations at night.

The climate over much of the U.K. is fairly damp (!)for the greater part of the year, and the tendency is for high levels of r.h. to be maintained in most buildings. The storage conditions I have encountered in many museums are anything but dry, and as expected, collections of pyritic specimens are frequently in a sorry state.

Fig. 13. Growth of oxidation products in microcrystalline pyrite (echioceratid infilling) after a few days exposure to 75% r.h. SEM x 11,800

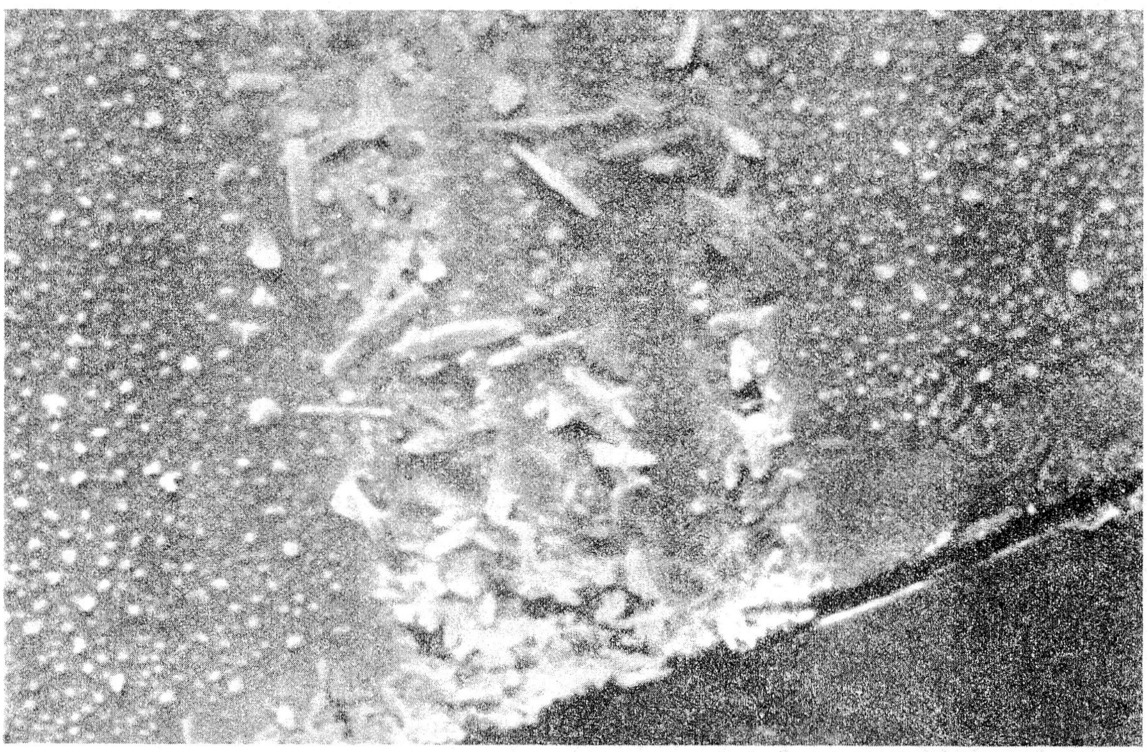


Fig. 14. Slight oxidation shown by compact pyrite (section of hemimicroceratid) after 3 months exposure to 75% r.h. SEM x 8,000

Recently (1976 onwards) monitoring of temperature and r.h. in certain storage areas at the BM(NH)) was commenced. Areas in the main (Waterhouse) building were found to be generally fairly dry, with r.h. between 30% and 55% and temperatures between 18^{o} and 25^{o}C for the greater part of the year. Pyritic specimens had been stored, reasonably satisfactorily, in old, well seasoned cabinets for several decades. (The r.h. within cabinet drawers was typically between 40% and 45%). At the beginning of 1976 large numbers of fossils were moved to new wooden storage units in the East Wing Extension (BM(NH)), and a few months after the transfer a routine check revealed that extensive pyrite deterioration was on the point of breaking out. The r.h. in the new storage area had been monitored for most of the time after the transfer and, mainly because of problems with balancing the air-conditioning system, was found to have exceeded 60% almost continuously. Measurements of the interiors of the storage cabinets when the outbreak occurred showed values nearer 65% r.h. Fortunately the outbreak was discovered before serious damage occurred, and the affected material was transferred back to the old dry storage area until the air-conditioning was improved.

Several important observations were made during and after this incident. Firstly, deterioration occurred simultaneously in widely separated parts of the collection. Secondly, it soon became apparent that both treated and untreated specimens were similarly affected. Several specimens, previously conserved by impregnation with various resins, e.g. vinyl acetate, 'Bedacryl', 'Alvar', 'Butvar', those treated with bactericides such as 'Cetrimide', 'Savlon', or 4,chloro-m-cresol, and specimens treated using combinations of resin and bactericide, e.g. 'Butvar/Cetrimide', were found to have suffered. Thirdly, transfer back to dry storage resulted in rapid cessation of deterioration. Lastly it was observed that when the r.h. in the new storage area was brought down to 50% or less, it took some months for the r.h. inside the cabinets to reach similar levels.

Most of the resins used in conservation have, when in the form of thin films (e.g. as protective coatings on specimens), a tendency to be permeable to air over fairly short periods of time. When one considers that susceptible pyrites are able to absorb water vapour above about 60% r.h., the usefulness of such resins is very limited. A thicker coating of resin might resist the penetration of damp air until such time as unavoidable flaws, e.g. air bubbles in the film, or abraded areas, allow access. However, once pyrite oxidation has started, probably within a short time (days rather than weeks) in moist surroundings, the chemical resistance of the resin to acid becomes of paramount importance. Unfortunately it appears that few, if any, resins have sufficient resistance to even dilute acids under oxidizing conditions to remain unaffected for long, and the protective film will disintegrate, aided by the disruption caused by the growth of solid oxidation products. Fig. 15 shows what happened to an Oxford Clay ammonite, thickly coated with 'Bedacryl', after a few months exposure to damp air.

The failure of the bactericidal treatments strengthens the argument for a purely chemical causation for pyrite oxidation in air. Fig. 16 shows the ineffectuality of the vapour phase bactericide, 4,chloro-m-cresol, in controlling the oxidation of pyritic specimens in damp storage.

Procedures recommended for the treatment of pyritic material

The standard treatments recommended for the salvage of decayed pyritic material have been briefly mentioned in Part I. Most methods are based on the neutralization of acid oxidation projects, removal of badly decayed areas, and thorough drying and impregnation with an 'impermeable' consolidant.

When deterioration is discovered transfer the affected material from suspect

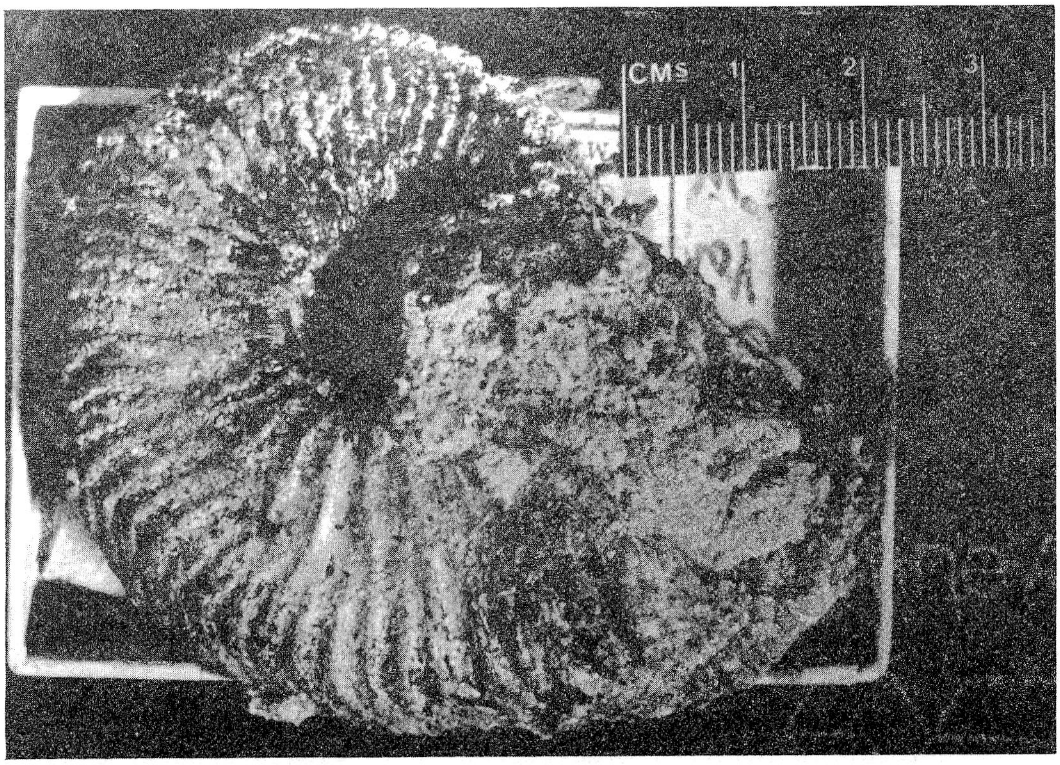


Fig. 15. Failure of a thick coating of resin (Bedacryl) in protecting an unstable pyritic ammonite. Scale in mms.

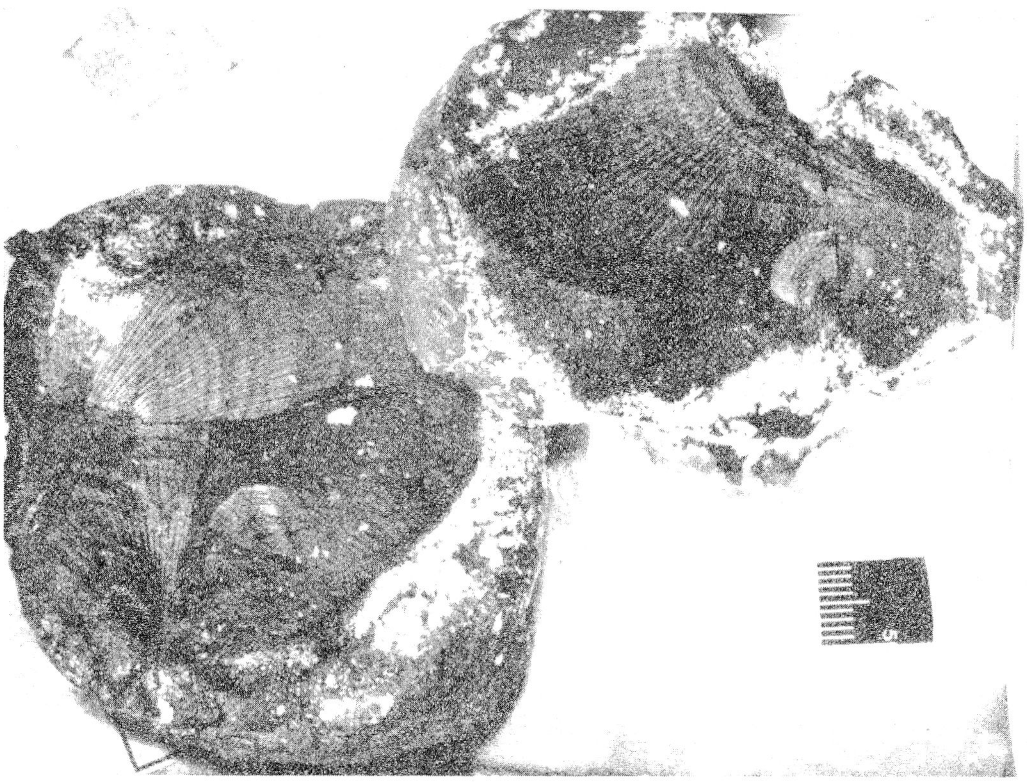


Fig. 16. Failure of 4,chloro-m-cresol in controlling decay of carboniferous pyritic bivalve casts. The tube at top left contained the bactericide. Scale in mms.

storage to a dry area immediately. Neutralization is usually carried out by exposing affected material to ammonia in a closed box or bag. The source of ammonia is normally strong ammonium hydroxide solution. I have found, however, that the air above ammonia solution can have an r.h. of 70% or more and that even under these alkaline conditions porous pyrite absorbs water vapour. These observations together with work by Burkin (1966), which indicates that pyrite oxidation can occur under aqueous alkaline conditions, suggest that a more efficient neutralization method is required, particularly as long periods of exposure to ammonia are necessary to neutralize specimens effectively.

Dilute alcoholic solutions of morpholine have been found to be effective, but their use is limited by several factors, including high toxicity of morpholine, difficulty of effective application to large specimens and the danger of damage to fragile specimens caused by the re-solution of old consolidants and glues. The use of dry ammonia gas is at present being considered, but its use requires great caution.

Neutralization is generally followed, particularly in the case of fossil material, by mechanical removal of badly decayed areas. This is not always strictly necessary, because the oxidation products, after neutralization, are converted to stable iron compounds. Where, for aesthetic purposes, reconstruction is required this should be carried out at a later stage using a non-aqueous filler such as a dough prepared from jute floc and 'Butvar', or one of the proprietary cold-setting resins. Careful drying of neutralized material by washing in dried acetone or ethanol where possible, or oven drying at about 90°C, should be immediately followed by storage either in a desiccator or in an area known to be very dry.

The last stage includes restoration, when needed, and impregnation with consolidants. There seems to be little to choose between the various resins available, but, because of the likelihood of retreatment, it would be sensible to use an easily removable consolidant such as 'Butvar B98', between 3% and 5% in isopropanol, preferably applied under vacuum.

Treated material should be stored in cabinets, preferably timber constructed and thoroughly seasoned, in dry areas (well-dried wood has a capacity for absorbing and retaining water vapour, thus shielding cabinet interiors from fluctuations in external r.h.). Where this is not possible it may be feasible to locally protect material by storage in well-sealed glass-topped boxes (not cardboard), using proprietary sealants along all joints. The most important aspect of treatment is regular checking of both material and environment. A relatively cheap and easy way to monitor storage for changes in r.h. is to keep a hair hygrometer in the vicinity of material at risk.

When treating freshly collected pyritic material do not use methods entailing exposure to damp conditions, although thorough immersion in deionized water to remove salts from specimens collected from coastal exposures probably does no harm, and is indeed necessary, as long as drying is effective and quick. I do not advise the use of bactericides as these, as well as being ineffective, have tended to lull one into a sense of false security.

Conclusions

Preliminary experimental work and observations of pyrite's behaviour under known storage conditions suggest that the variations in susceptibility to oxidation shown by museum specimens are related to pyrite grain size and state of aggregation, and relative humidity. Specimens containing porous pyrite become reactive when water vapour absorption occurs. In a wide range of specimens this commences at about 60% r.h. at normal temperatures. The cause of pyrite oxidation in air is probably wholly chemical in nature. The non-complicity of Thiobacteria at any stage during deterioration is strongly supported both by experimental evidence and by the repeated failure of bactericides in conservation. Apparent stabilization by bactericides, where it has occurred, is almost certainly fortuitous and related to other aspects of the treatment such as removal of decomposition products, effective drying, possible changes in storage environment, and the subconscious paying of greater attention to the specimens afterwards.

The shortcomings of conventional methods employing synthetic coating resins can be explained in terms of their behaviour under conditions of high r.h. and their instability in the presence of pyrite oxidation products. At this stage it appears that the only satisfactory method is control of the storage environment. The methods employed for the salvage of decayed pyritic specimens, whilst useful as consolidation techniques, do not offer any real protection in uncontrolled environments. Research into the mechanism of the oxidation reactions is continuing, and we may yet hope for a treatment that will chemically prevent deterioration.

Acknowledgements

Thanks are due to Dr. Graham Elliott, Ron Croucher and Peter Embrey for helpfully criticizing both Parts I and II, to Tim Parmenter and Frank Greenaway for the photographs, to Don Claugher for introducing me to scanning electron microscopy, and to John Francis for the X-ray powder diffraction determinations.

F. M. P. Howie
Palaeontology Department
British Museum (Natural History)

REFERENCES

Rust, G.W. J. Geol., 1935, 43, 398-426.
Love, L.G. in Sedimentology and Ore Genesis. Ed. Amstutz, G.C., Elsevier, 1964, 11.
Love, L.G. and Amstutz, G.C. Fortschr. Miner., 1966, 43, 273-309.
Silverman, M.P. J. Bacteriol., 1967, 94, 1046-1051.
Peters, E. and Majima, H. Can. Metall. Q., 1968, 7, 111-117.
Rickard, D.T. Stockholm, Contr. in Geol., 1969, 20, 67-95.
Zajic, J.E. Microbial Biogeochemistry, New York, London, 1969.
Berner, R.A. Am. J. Sci., 1970, 268, 1-23.
Farrand, M. Mineral. Deposita, 1970, 5, 237-247.
Love, L.G. West Commemorative Volume, New Delhi, 1970, 439-469.
Sweeney, R.E. and Kaplan, I.R. Econ. Geol., 1973, 68, 618-634.
Steiner, M. and Lazaroff, N. Appl. Microbiol., 1974, 28, 872-880.
Kribec, B. Mineral. Deposita, 1975, 10, 389-396.
Dacey, P. MSS. dept. Palaeont., 1976, Br. Mus. nat. Hist.
CRC Handbook of Chemistry and Physics. Ed. Weast, R.C., Cleveland, 1976.

BOOK REVIEW

Catalogue of the Type and Figured Specimens of Mesozoic Ammonoidea in the British Museum (Natural History) by Dr. Phillips published by the Museum 1977.

This fine production lists alphabetically by generic name on 189 pages all the relevant specimens (totalling approx. 4000) forming part of the collections of this Museum up to the end of 1971. A further 13 pages of references and a very essential index of specific names covering 17 pages, which will provide a lead in for those unsure of the modern generic name under which a particular specimen will have been entered, complete the work.

It is a pleasure to find the National Museum squaring up to its responsibilities as our prime custodian of type and figured fossils with the publication of this volume. It is a measure of their task that the previous catalogue of Type and Figured Specimens of Fossil Cephalopoda by G. C. Crick published in 1898 which listed all such fossil cephalopods unlike the present book, included only about 700 specimens. The equivalent number today is approximately 10 times greater and it is hoped to publish a further volume to include the Palaeozoic Ammonoids, the Nautiloids and Coleoids not considered in this book.

For each specimen the generic (using a modern name) and specific names are given with its registration number and its status as type or figured with a bibliographic reference. The stratigraphic horizon, locality and name of collector and date of acquisition are also given where known.

A few typographic errors have been noticed but this is inevitable in a work of this nature. Some entries also draw attention to the apparent indestructibility of particular specimens. We can cite as an example the Neotype of one of the most familiar British ammonites Hildoceras bifrons erected as a species in 1789 on the basis of a specimen from Yorkshire figured by Martin Lister in 1678. In 1918 a specimen agreeing remarkably well with that figured 240 years before was illustrated by S. S. Buckman with the strong probability it was Lister's original holotype having been loaned by V. E. Robson who had purchased it in London. This neotype and probable holotype returned to Robson whose collections then passed to the London dealers Gregory Bottley from whom the BM(NH) once again purchased it in 1935, and there-after confined it to a place of safety.

This volume might convince Directors of Museums with type fossil ammonites and no qualified staff how much safer such material would be in the National Collection. The Museum and Mr. Phillips are to be congratulated on its appearance.

H. S. Torrens

MUTUAL AID

The increasing cost and difficulty experienced in acquiring good teaching material prompts me to describe a scheme that I have been operating for some time with various institutes.

It consists of exchange of surplus, good quality material on a "specimen-for-specimen" basis, with the sender bearing the cost of post and packing.

We are particularly lucky in Scotland to have good supplies of metamorphic and igneous rocks and Polaeozoic fossils, but are poor in Mesozoic and Tertiary material. I list below what we have to offer as either individual specimens or suites and ask for offers.

Rhynie Chert - slabs (1 cm thick) of this L. Devonian silicified plant bed with Rhynia, Hostimella and Psilophyton stems.

Basalt - a very fresh porphyritic rock with phenocrysts of Olivine, Plagioclase and Pyroxene. Good for either thin section or hand specimen. Arthur's Seat, Edinburgh.

Eclogite and Garnet Hartzburgite - Fresh ultrabasic material as 1 cm. thick slabs. Robert Victor Mine, S. Africa.

Lugarite - 1 cm. thick slabs from a 15 cm. vein Lugar Sill, Ayrshire.

Barrow's Zones - suites of very high quality metamorphics from all zones.

Minerals for ore microscopy - a wide range of common sulphide/oxide minerals and assemblages for use as examples of standards, textures, alterations etc. As blocks 2 x 2 x 2 cms. for polishing, but can be polished by arrangement.

Cryolite - limited amounts of pure cryolite cleavage blocks. Ivigtut, S. Greenland.

Wanted in Exchange

Silurian, Mesozoic, Tertiary plants, for display.
Mesozoic invertebrates for teaching
Minerals and assemblages from S. W. England. Cassiterite Wolframite etc.

Offers to Peder Aspen, Cockburn Museum, Department of Geology, West Mains Road, EDINBURGH, EH9 3JF.

NOTICES

INTERNATIONAL CONFERENCE ON GEOLOGICAL INFORMATION, LONDON, APRIL 10 – 12, 1978

The Geological Information Group of the Geological Society of London and the Geoscience Information Society (USA) are sponsoring and organising an international conference on geological information and documentation in London on April 10-12, 1978. Other organizations associated with the conference are the Australian Geoscience Information Society, Editerra (European Association of Earth Science Editors) and AESE (Association of Earth Science Editors). It is hoped that Unesco will sponsor the meeting within the framework of its UNISIST programme. The Conference will take place at Imperial College of Science and Technology and the Geological Society of London.

This is the first major attempt to bring together geoscience information specialists from all over the world and the Conference will be of interest to information specialists, librarians and documentalists in geology and the mining and petroleum industries. It will equally concern the users of information in these fields.

The programme will include sessions on: the history of geoscience documentation and a review of the current situation; brief reviews outlining the state-of-the-art of geoscience documentation in various regional units; publishing and editing; retrieval of information including indexing and abstracting services; documentation in specialised areas e.g. maps, translations, remote sensing; user points of view; networks including national and international co-operation; communication and the structure of the literature. There will also be a workshop on information handling in applied geology.

Visits are planned to various libraries including the British Museum (Natural History) and the Institute of Geological Sciences. There will be an exhibition of related publications, both antiquarian and current and demonstrations of computer-based services.

During the Conference a proposal will be made to establish an INTERNATIONAL ASSOCIATION FOR GEOSCIENCE INFORMATION.

For full details and the first circular please contact International Conference on Geological Information, c/o Palaeontology Library, British Museum (Natural History), Cromwell Road, London, SW7 5BD or if resident in North or South America, Dederick Ward, University of Colorado Libraries, Boulder, Colorado 80309, U.S.A.

NATIONAL REGISTER OF GEOLOGICAL COLLECTIONS

GCG has been approached by the Dept. of Palaeontology, British Museum (Natural History) about co-operating with them in establishing a National Register of Geological Collections. One of the principal objectives of this is to ensure that details are available should a collection or collections "ever" be "at Risk".

Your Committee were wholeheartedly in favour of such a scheme and the details of its implementation are currently being discussed. In the meantime we need facts about where particular collections are to be found and would ask for any information to be sent in for the Newsletter which will be incorporated in the National Register.

ACKNOWLEDGEMENTS

The completion of Volume One with the issue of Number 10 seems an ideal opportunity to express the Editors gratitude to those who have made the Newsletter possible:-

Typing
Susan Tatton
Stephanie Cooper
Judy Gill
Iris Jones

Printing
Barbara Simon
Clarice Lea
Cynthia Hall
Gwynn Ford

Plate Making
Tony Vickers

Photography
David Kelsall

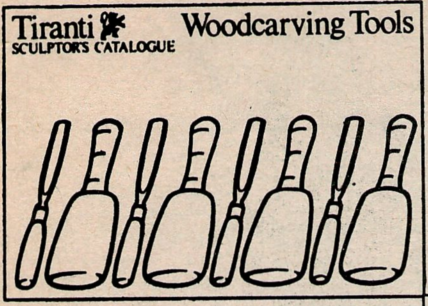
My thanks go too to the numerous referees, proof readers and collators who have assisted over the last three years.

MUSEUMS JOURNAL INDEX

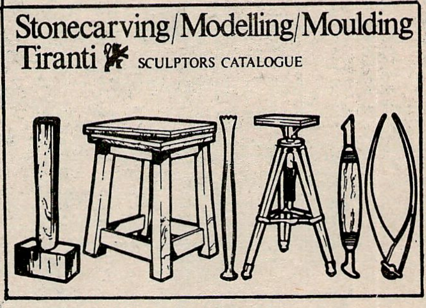
The Editor hopes, in the near future, to commence an index to the Museums Journal from its inception to the present.

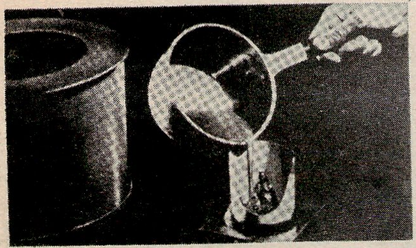
There may be a similar project already embarked upon. If any reader knows of one please inform the Editor.

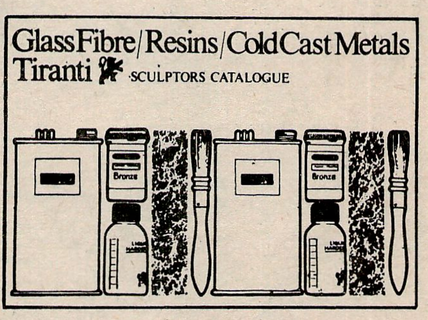
for the artist craftsman



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 WI
& 70 High St, Theale Berks