GCG

NEWSLETTER OF THE GEOLOGICAL CURATORS GROUP

NUMBER 9 APRIL 1977

PLANTÆ FAVERSHAMIENSES.

A CATALOG OF THE MORE PERFECT PLANTS Growing ſpontaneouſly about FAVERSHAM, IN THE COUNTY OF KENT. WITH AN APPENDIX Exhibiting a SHORT VIEW of the FOSSIL BODIES OF THE ADJACENT ISLAND OF SHEPEY.

By EDWARD JACOB, Esq; F.S.A.

Conſider the Lillies of the Field how they grow — Matt. vii. 28.

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"But alas! One disagreeable Circumstance attending a considerable Part of the Fossils here collected, is, that they are so much impregnated with Pyritical Matter, that after being for some Time placed in a Cabinet, the Salts thereof shoot and entirely destroy them. Happy would it be, could some certain Remedy be discovered whereby this Accident might be prevented. The Loss of many valuable Specimens by this Cause, together with his Distance from any inquisitive and able Naturalists, at last induced the Author to dispose of his whole Collection to INGHAM FOSTER, Esq; Merchant of London, where it now forms no inconsiderable Part of that Gentleman's very valuable Cabinet."

COVER

The man featured on our cover and the author of the sad quotation is Edward Jacob, who was born about 1710 in Canterbury. He moved to Faversham, Kent about 1735 following the family profession of surgeon there. He was here well placed to collect the nearby natural curiosities of the Isle of Sheppey and he started this in the 1740's; and contributed a paper on them to the Royal Society in 1754. In 1777 he published the work featured on our cover which mainly dealt with the botany of the Faversham area but also included on pp. 129-46, 'A short view of the Fossil Bodies native [i.e. minerals] and extraneous [fossils] of the Island of Sheppey in the County of Kent'. This gives short notes on the common minerals and fossils mainly of the London Clay here but also includes derived fossils from the alluvial deposits above like a single Belemnite and the bones of elephants. He cites "thousands of fossil crabs" having passed through his hands. Among the most common fossils were the fossil fruits described by his friend James Parsons in the Royal Society Transaction in 1758 which were sadly so often impregnated with pyrites. This process created problems which Jacob was unable to solve and which still provide much difficulty. Jacob died in November 1788 and had, several years before, disposed of his geological collections to Ingham Foster (1725-1782) a London merchant and ironmonger who predeceased him. Foster's fine geological collections were auctioned in London in March 1783 and May 1784 but no copies of the sale catalogues have yet been located. Material of his collection later passed into the collection of James Parkinson which were dispersed by auction in 1827 and of which again no sale catalogue survives.

H. S. T.

Backnumbers of Newsletters are still available at £1.50 each (including postage). Remuneration must accompany all orders, which should be sent to Tim Riley, Sheffield City Museums, Weston Park, Sheffield S10 2TP.

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.

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

GEOLOGICAL CURATORS GROUP

(AFFILIATED TO THE GEOLOGICAL SOCIETY OF LONDON)

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

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THIRD ANNUAL GENERAL MEETING

Held at 14.00 on Friday, 8 December at the British Museum (Natural History) and attended by 36 members of the Group.

1. Minutes. The minutes of the 1975 A.G.M. were taken as read.

2. Chairman's Report. Written reports had been produced by the Secretary, Treasurer, Editor and Recorder. Three matters discussed at the 1975 A.G.M. (the Recorder's report on geological collections; the IRGMA site documentation scheme; and the Standing Commission survey of provincial museums) were still outstanding but progress had been made in all three which should yield positive results in 1977.

Other on-going business included the Group's relationship with the Museums Association. The existence of the G.C.G. and other special interest groups had led to a proposal to set up a Professional Services Committee within the Association. Group representatives would take part in the preliminary discussions but the extent to which the Group would wish to become involved in the Association's affairs would need to be carefully considered.

The G.C.G. was basically concerned with geological conservation in its broadest sense - observation of sites, conservation of specimens, conservation of data. In all these fields the Group's role needed to be discussed, clarified and defined.

The Chairman thanked his fellow officers and co-opted members of the Committee for their continued support throughout the year. Ann Pennington George was retiring from the post of Treasurer; although often working under difficult conditions, she had established the Group's affairs on a fine financial basis. Peter Embrey was also retiring after a valuable year's service on the Committee.

3. Secretary's Report. 43 written enquiries had been received concerning Group activities including a significant number from overseas (particularly Scandinavia, Canada & U.S.A.). The total membership now exceeded 200 and was increasing steadily.

Important aspects of the year's work had been:

a) Site Documentation Scheme. Representatives from all institutions willing to become record centres had been invited to a series of one-day seminars in March. As a result of these seminars, an outline scheme for site documentation was published. Special Report No. 1 in August. Much of the work entailed in formulating the scheme had been carried out by John Cooper, who had been co-opted onto the Committee in January.
An application for grant aid had been made to the N.C.C. (The development of the scheme is described in Committee Notes , pp. 442-3).

b) National Plan for Museums. The Standing Commission were considering the recognition of provincial "Centres of Excellence" as the basis of a National Plan for Museums. The G.C.G. Committee had submitted a memorandum urging that Geology should be considered as a separate discipline and not linked with the biological sciences under the heading of 'Natural History'. (Further details are given in Committee Notes, pp. 443-4).

c) G.C.G. Meetings. Apart from the A.G.M., two meetings had been held: on 12 March at Birmingham Museum on 'Replication of Fossil Vertebrates', and on 24 September at the Yorkshire Museum on 'Mineral Collections in Small Museums'. Both meetings were attended by 30-40 members.

Financial cutbacks were likely to reduce the numbers attending future meetings and suggestions to counteract this would be welcomed.

d) Geological Society business. The Chairman and Secretary had represented the Group at a meeting of the Specialist Groups Committee in June. The Society propose to publish a series of booklets for resale and Group contributions by Roy Clements and Ron Croucher on 'Collecting' and 'Preservation and Conservation' are in process of preparation.

The Geol. Soc. also sought the Group's advice on proposals for closer collaboration with the Nature Conservancy Council. As a result the N.C.C. Geology Section Newsletter is being circulated to the Society and G.C.G. members.

e) Liaison with the Museums Association and other bodies. The Association had sought the Group's views on the possibility of holding specialist groups' meetings during the Annual Conference, and on the desirability of relocating the Association's offices outside London. Evidence had also been submitted to the working party who were examining the Association's Constitution. Philip Doughty, as M.A. representative on the G.C.G. Committee, had kept the Group informed of all relevant matters.

Other organisations with which the Group had had more than a routine liaison included the Association of Teachers of Geology, the Council for Nature and the Mineral Museums Advisory Council of North America.

f) Curatorial Services. The Committee had been conscious of the slow progress which had been made towards meeting the Group's constitutional obligations relating to collections at risk. To date, a number of collections had been surveyed by the staff at Keele University. Mike Bassett had now taken on responsibility for co-ordinating this work and, once the information provided by the Recorder's questionnaire was available, hoped to produce recommendations for further action. In addition the Yorkshire Museum was to develop a directory of sources for curatorial advice and information.

4. Treasurer's Report.

a) Membership. Membership had increased steadily during the year and stood as follows:

Ordinary members	161
Ordinary overseas members	5
Subscription members	45
Overseas subscription members	5

b) Accounts. On 2 December 1976, the bank balance stood at £82.13 from which the expenses of Newsletter 8 would have to be met. The accounts for the year had been audited by D. Bramley and circulated to the meeting.

c) Charity Status. Enquiries had been made concerning the possibility of the Group becoming a registered charity. A copy of the constitution had been sent to the Charity Commission who had pointed out that several amendments would be necessary before the Group was eligible for registration. As the benefits of charity status seemed to be minimal at present, the Committee had decided not to pursue the matter for the time being.

d) Annual Charge. The rising cost of the Newsletter and the drop in advertising revenue had forced the Committee to increase the annual charge. The new rates would be:

Ordinary members	£2.00
Ordinary overseas members	£3.00
Subscription members	£2.50
Overseas subscription members	£3.50

5. Editor's Report. The costs of Newsletters 6, 7 and 8 had been £74-50, £86-30 and £63-80 respectively (compared with £28-55 and £41-36 for issues 1 & 2). A further doubling of costs was forecast for 1977. In view of this, the increased annual charge and the proposed increases in advertising charges were inevitable. The possibility of a reduced type size for further issues was also being investigated.

The new section 'Committee Notes' would be a regular feature of the Newsletter and was intended to inform members of the business currently in hand. Articles in the 'Collectors and Collections of Note' series would be welcomed for future issues as would any information on the 'Collections Lost and Found' queries. A circular had been sent to the heads of technical sections in University Geology departments soliciting articles on technical topics and a number of replies expressing interest had been received.

In discussion, concern was expressed regarding the decline of advertisers in the Newsletter. The Editor stated that a number of firms had expressed initial interest but later changed their minds, pleading financial constraints. It was hoped that an Advertising Manager, co-opted from within the Committee, might relieve the Editor of this job in the future.

Dr. A. Smout suggested that an agent be appointed to solicit advertisements. While advertisements could never be justified on a cost-effective basis, they could still be forthcoming if the Newsletter were established as the definitive publication in its own field. On the other hand, a large revenue from advertisements, particularly if coming from a small number of sources, could be a disadvantage since it might lead to pressure to influence the editorial content of the Newsletter. The Chairman suggested that Dr. Smout should set out his ideas in a letter for discussion at the next Committee meeting.

6. Recorder's Report. The questionnaire on geological collections had been sent to all known museums in the U.K. In all, almost 700 questionnaires had been sent out and, by the end of September, 96% had been returned. Edge-punched cards had been prepared for all returns but analysis of these had not yet commenced. It was hoped that a report would be completed by the spring of 1977.

Another recording project had been undertaken by Barbara Pyrah. In the spring a questionnaire had been sent out to members since it was felt that a directory of museum-orientated geologists might be of use to those who require help with geological displays, conservation, etc. 46 replies had been received and an article based on the results was being prepared for the Newsletter.

7. Election of Officers and Committee for 1977. In the absence of alternative nominations, the Chairman declared the following elected:

Chairman:	Dr. Hugh Torrens, University of Keele
Secretary:	Mike Jones, Leicestershire Museums
Treasurer:	John A. Cooper, Leicestershire Museums
Editor:	Brian Page, University of Keele
Minute Secretary:	Dr. Geoff Tresise, Merseyside Museums
Recorder:	Phillip Doughty, Ulster Museum
Members:	Barbara Pyrah, Yorkshire Museum
	Dr. Michael Bassett, National Museum of Wales
	Mike Stanley, Derby Museum
	Ron Croucher, British Museum (Natural History)

Tim Riley continues as co-opted Assistant Secretary

8. Any Other Business. P. Whybrow proposed a vote of thanks to the Chairman and outgoing Committee.

There being no other business, the Chairman closed the meeting at 14.45.

5 January 1977 Geoffrey Tresise

MEETING AT LIVERPOOL FEBRUARY 1977

The meeting on "Geological Information Services and Sources in Museums" held at Merseyside County Museum on Friday, 4th February, was arranged as a joint meeting of the G.C.G. and Geological Information Group. In the event, the 31 people attending included only two G.I.G. members. Both of these took an active part in the proceedings, Don Holloway taking the chair and Judith Diment reading one of the papers.

Since one of the prime aims of the meeting had been to outline the current activities of each group, it was inevitable that the contributions of the G.C.G. speakers (Andrew Roberts, John Cooper and David Gittings) should include much that was already familiar to Group members. Each speaker was, however, careful to include some new material.

Andrew Roberts summarized the successful launching of the IRGMA scheme and went on to consider the implications of the metamorphosis of IRGMA into the Museum Documentation Association, and of the unit's imminent move to Duxford.

John Cooper outlined the development of the site documentation scheme. He reported that the Group's application to the Nature Conservancy for financial support had been successful: £1125 had been allocated to cover printing costs, travel and administrative expenses in the first year. Requests for grant aid from recording centres (to finance extra labour for field seasons, and the publication of the results of site surveys) would also be sympathetically considered by the N.C.C. Pilot schemes would be carried out in 1977, in the hope that local schemes could be initiated in strength in 1978/79.

David Gittings described the transfer to computer of existing manual site records at Leicester Museums using the Geological Site Information System (G.S.I.S.).

The two remaining speakers were dealing with topics new to G.C.G. meetings. Even so, much of Ron Robert's outline of the work of the Education Service at the Geological Museum sounded very familiar indeed. It seemed to be a case of what the National Museums do to-day, provincial museums have been doing for the past twenty years.

Judith Diment gave a brief but lucid account of the G.I.G. project to compile a directory of sources of geological information in the British Isles. The information was being collected by means of a questionnaire sent to all libraries and other institutions likely to house books, maps or other geological material, (collections of geological <u>specimens</u> were excluded, but these should be fully covered by Phil Doughty's survey for the G.C.G.). It was hoped that the Geological Society would publish the final report. This would be arranged alphabetically by towns and indexed according to name, place and subject.

The questionnaire also asked institutions to specify their holdings of books published before 1830 and maps published before 1850. These would form the basis of a card index to be housed in the Geol. Soc. Library.

Future projects planned by the G.I.G. included a bibliography of museum publications and a revision of the Universal Decimal Code which most libraries still use, despite the fact that it is now 40 years out of date.

Geoffrey Tresise

COMMITTEE NOTES to March 1977

Since the last report on Committee activities there have been a number of developments particularly with regard to the Site Documentation Scheme and the National Plan, which in view of their importance are described here in some detail. Others are considered only briefly.

Three colleagues retired from the previous year's Committee: Dr. Roy Clements, Anne Pennington-George and Peter Embrey. To Roy Clements, Chairman since the inauguration of the Group in May 1974, we owe a great debt. He has not only been responsible for guiding the Group so successfully through its early years but was also one of the principle architects of its formation. It is encouraging to know that he will continue to be deeply involved in Group activities particularly with regard to the Site Documentation Scheme and the preparation of curatorial handbooks. Anne Pennington-George has also given sterling service, as Treasurer for nearly three years. To her and Roy our special thanks are due. We are also sorry to lose Peter Embrey, particularly after only one year, but take consolation from knowing that he also will continue to play a significant part in our activities.

Site Documentation Scheme

The Group has been awarded a grant of £1125 by the Nature Conservancy Council, for the 1977/78 financial year, towards the administrative costs of implementing the National Site Documentation Scheme. The grant is to cover travelling expenses incurred by members of the Steering Committee and representatives of record centres in attending planning and briefing meetings, all associated administrative costs and the printing and distribution costs of field record cards, summary sheets and instructional handbooks for centres and recorders.

In making this award the NCC indicated that they envisage receiving further applications from G.C.G. for aid towards maintaining the scheme, and applications from individual centres for grant aid towards local projects undertaken within the context of the Scheme. This does not of course detract from the right of any institution to apply to the NCC for aid towards geological projects outside the scope of the Scheme.

At present effort is being concentrated on finalising the record cards, summary sheets and instructions for use, in co-operation with the MDAU (Museums Documentation Advisory Unit, formerly IRGMA) so that these will be available for this year's field season. The field record card and summary sheet will be compatible with the IRGMA Museum Documentation Standard, and with the instructional handbooks for recorders and record centres will be distributed free to centres operating within the Scheme. It is probable that institutions outside the Scheme will be able to purchase the field record cards and relevant instructions for use through the MDAU.

Parallel work is also under way to define the administrative procedures and management structure for the Scheme so that a steering committee can be convened as quickly as possible.

The intended time-table for 1977/78 is as follows:-

July 1977	First meeting of Steering Committee
July 1977	Field Record Cards, Summary Sheets and Handbooks for Recorders and Record Centres available.
July 1977	Briefing meeting for representatives of potential and designated Record Centres.

November 1977 — Meeting for representatives of designated Record Centres to discuss progress.

February 1978 — Second meeting of Steering Committee.

Until such time as the Steering Committee assumes control, a small ad hoc working party (John A. Cooper, Mike Jones, Roy Clements and Mike Stanley) will undertake development work. Any enquiries regarding the Scheme should be directed to John Cooper or Mike Jones at Leicestershire Museums. All those who have expressed interest in the Scheme on behalf of those institutions listed in the GCG Special Issue No. 1 will be informed directly of events as and when appropriate. All others should watch for general announcements via this Newsletter, the Museums Association Bulletin and the Geological Society Newsletter.

National Plan for Museums

In May of last year your Committee submitted a Memorandum to the Standing Commission on Museums and Galleries regarding the proposed National Plan for Museums. This Plan is being prepared in response to recommendations in the Wright Report (D.E.S. Report on Provincial Museums HMSO 1973) that provincial "Centres of Excellence" should be designated for each of the major museum disciplines and that these Centres should provide curatorial and other services to neighbouring museums in return for financial assistance received through provincial councils. At the time Committee made its initial representations to the Commission the Geological Sciences were not recognised as a separate discipline for the purpose of the Plan but were immersed in Natural History. Your Committee felt that the proposed Plan for museums, if implemented, was potentially of such importance to the future of provincial museums that every effort should be made to ensure adequate representations on behalf of the geological sciences. We were particularly disturbed that evidence submitted to the Commission by Area Council Panels, with one or two exceptions, took no account of some of the country's most important provincial museum geological collections. Museums with poor geology collections and facilities and no geology staff were being recommended as Centres of Excellence in Natural History whilst other quite substantial museums with very important geology collections were excluded. We therefore submitted a three page memorandum the main points of which are reproduced below for information and comment:-

1. We accept the grouping used in "The Summary and Responsibilities of Designated Centres of Excellence" of the Biological and Geological Sciences into Natural Sciences, as one of four major fields which museum collections and services cover.

2. We would firmly recommend however that where the term Natural Sciences is used it is defined as <u>necessarily including in equal part both the Biological and Geological Sciences</u>.

3. We would also recommend that in defining Centres of Excellence in Natural Sciences these should be designated as one of the following:-

   a. Natural Sciences (Geological Sciences)

   b. Natural Sciences (Biological Sciences)

   c. Natural Sciences (Geological & Biological Sciences)

4. We would further recommend that where designations 3 a and 3 c apply the following broad distinctions should also be made:-

   a. Geological Sciences - British Regional

   b. Geological Sciences - National

   c. Geological Sciences - International

Subsequently we were asked by the Commission to submit further evidence on the basis of the recommendations outlined in our Memorandum. A Panel comprised of the following representatives has therefore been convened to prepare a further submission.

Representing the Mineralogical Society:-

Dr. H. G. Macpherson	Royal Scottish Museum
Mr. E. A. Jobbins	Geological Museum

Representing the Palaeontological Association:-

Dr. R. B. Rickards	Sedgwick Museum
Miss S. Turner	Hancock Museum

Representing the Geological Society:-

Dr. W. D. I. Rolfe	Hunterian Museum
Dr. G. R. Tresise	Merseyside Museums

Representing the Geological Curators' Group:-

Dr. H. Torrens	University of Keele
Mr. R. Croucher	British Museum (Natural History)

GCG National Survey of Geology Collections:-

Mr. P. Doughty	Ulster Museums

Secretary to the Panel:-

Mr. M. D. Jones	Leicestershire Museums

The main work of this Panel will be to prepare:-

1. A list of all institutions in the UK containing important geological collections, with a brief resume of the principal components and some indication of the relative scientific merit of these collections.

2. A list of recommended "Centres of Excellence" designated according to the criteria outlined in our Memorandum of 25th May 1976, to the Standing Commission.

   Committee has instructed the Panel to invite general comment on its recommendations and to consult all museums concerned as and when appropriate. Accordingly notices will appear in this Newsletter and the Museums Association Bulletin, and all museums included in the Panels recommendations will be contacted direct.

<u>Museums Association</u>

On the 1st February 1977 the Chairman and Secretary attended a meeting in London called by a Working Party of the Association, to discuss a proposal for a Professional Services Committee.

The suggested terms of reference for this Committee were outlined in a letter from the Museums Association in October 1976 as being:- "to consider matters relating to professional policy; to consider the Associations policy in the areas of research, development and documentation; liaison with specialised groups within and without the Association; to consider methods and systems of museum practice; standards of provision and practice; and the status of museum employees in their professional work".

At the meeting the Working Parties recommendations regarding representation on the proposed Professional Services Committee and its relationship, vis a vis the Museums Association Council were outlined, the main points being:-

1. "That each common interest group shall appoint one member, who must be a member of the Museums Association, to this Committee".

2. "That a category of Affiliated Groups be set up conforming to the following:-

   a. that the group shall have a minimum membership of 30;

   b. that the group shall have a minimum Museums Association Membership of 50% of the total membership, or 30 people, whichever is the greater;

   c. that benefits would accrue to the Group in the form of improved channels of communication;

   d. that the Group shall have the formal right to organise and hold specialist meetings and sessions at the Association's Conference;

   e. that both the Group and the Association will have the right to terminate the affiliation".

3. "That two members of the Committee be co-opted to Council".

4. "That the Vice-President (President elect) act as Chairman of the Committee".

The general consensus of the meeting, which was attended by 17 delegates representing 10 Groups or disciplines, appeared (at least to your Chairman and Secretary) to be, that although the principle of providing greater and more effective disciplinary or curatorial representation in the Association Committee structure had a lot to commend it, a great deal more thought as to how this could best be achieved was needed. Accordingly it was agreed that a second meeting should be held to consider the matter further.

Subsequently a notice appeared in the March issue of the Museums Bulletin to the effect that "those attending were in favour of a Professional Services Committee to deal with matters of disciplinary interest and to provide liaison with specialist groups but it was agreed that further discussion was necessary before a system of representation could be approved".

We await further developments, but whatever transpires members can be assured that the Group will not be committed either way without an opportunity for everyone to contribute their views. Your Committee are very well aware that many members are not members of the Association, that the Group has obligations to the Geological Society and that freedom of action and expression is a major asset.

As indicated in the last Newsletter the Group was invited to comment on a suggestion that specialist groups should organise sessions as part of the Associations Annual Conference at Bradford. Committee decided that apart from the short notice and the necessity (which involvement would entail) of reorganising the years programme, there were serious practical problems associated with the Conference. Not only would this be of limited interest to a large proportion of our members who do not work in museums but it would also pose particular difficulties when members attempted to obtain leave of absence and expenses in order to attend. Accordingly Committee declined to involve the Group, at least for the current year.

Mike Jones
Hon. Secretary

DATA SECURITY IN SCIENTIFIC OBJECTS

This article grew out of some advice I offered to a local museum on the curation of their 'natural history' collections, which forced me to think hard about unquestioned assumptions and habits, and to ask what curation is really all about. Clearly, the many different answers to that question amount to more than just the preservation of the objects themselves and, it seemed to me, that, among the many problems of curation, that of Data Security must also rank very high. The most sophisticated system of electronic storage and retrieval of data is completely impotent if the essential link between the object and the data is lost. There is, however, a school of thought which believes that, having got data onto 80-column cards, one no longer needs the object. There is a certain logic in this view if one accepts the premise that data-manipulation is an end in itself. I reject the view and, having acknowledged it, will ignore it, and will continue at the basic level of objects and the data referring to them; for it is here that the idea of Data Security has its only useful application.

The idea of Data Security developed from the security of natural objects such as fossils, butterflies, and crystals; but, with a few modifications and a slight switch in value priorities, the results may as readily be applied to artifacts. For the problems of securing the information referring to Antelope skulls and ammonites are not far removed, in theory, from those of pots and paintings.

THE CONCEPT OF DATA SECURITY

A unique natural object, whether a rock, mineral, fossil, plant or animal, may exist by itself as an object of curiosity or admiration. But, in addition, it may also be related to certain factual statements concerning its origin in space and time, and its original relations with other objects. There are, on the one hand, objects and, on the other, data referring to objects.

Since the spoken word is ephemeral, data will consist of written factual statements about objects and, generally, but not always, exclude opinions. In some cases the data are unique to single objects, and in others they may apply to a number of nominally identical objects, or, equally to a number of different objects. In all cases, however, data ultimately refer to objects.

An object lacking data has little or no scientific significance, but an object associated with data is a potential source of knowledge about the world and is, thereby, an object of scientific significance. In scientific institutions objects of scientific significance have higher status than non-scientific ones and, it follows that data should be linked to scientific objects by the most secure means available. Methods of linking data to objects I call Data Security, and claim that the maintainance of data security should be one of the prime preoccupations of those responsible for scientific objects.

Data can be available with an object at three basic levels -

1) Stored Data are written in completely expanded form into note books, registers, or stored in some mechanical or electronic data-retrieval system. This category is <u>not</u> associated with the object.

2) Immediate Data are written, often in abbreviated form, onto a label which is associated with the object and is thereby 'immediately' available.

3) Direct Data are written on the object itself, and this will probably be in abbreviated or coded form. Abbreviated data are preferable to coded since they are potentially decipherable.

If an object has full Direct Data it is a self-contained unit requiring no more than proper storage. The addition of Immediate Data is not essential but provides a safeguard against data-loss through careless handling of the object. If data are abbreviated then they should also be present, fully expanded, as Immediate Data; but, if coded, then full expansion as Immediate Data is essential.

The association of an object with Immediate Data is the usual method of the amateur or private collector, but the dangers are obvious. Once the object is removed from its data for inspection it cannot always be reunited with them with certainty. However, if the label bearing the Immediate Data is linked to the object by a unique notation present on both, then the object has Data Security so long as the link remains unbroken. Thus, the object and its data can be separated, for examination or comparison with other objects, and be reunited with complete confidence by simply matching the unique notation present on both. This I call the 'double bond' system of Data Security. The 'bond' is 'double' since there is not a single link between object and data, but two identical notations present on both.

By adding Stored Data to a 'double bond' system a 'triple bond' system of Data Security is achieved. This is the method of most professionals and virtually all proper scientific institutions. In this, the unique direct notation appears on the object, on the label bearing Immediate Data, and in the register where full Stored Data is present. Nevertheless, 'triple bond' systems have a weakness for, if the unique direct notation is removed from the object, there is no way of certainly matching the label containing Immediate Data with the object, and neither is it certain that the Stored Data refers to the object. Therefore, for purposes of scientific research, the maximum security is achieved by writing, if possible, directly onto the object an abbreviated form of the <u>essential</u> parts of the Stored Data, and augmenting this with a 'triple bond' system.

Generally, if there are a lot of objects and little time then Direct Data by itself is sufficient. If time is not restricted, or objects few, then a 'double' or 'triple bond' system gives more security. But, for maximum security, that is for Type and Reference objects, then Direct Data combined with a 'triple bond' system unites maximum security with economy of effort.

In a 'triple bond' system the loss of a label is easily rectified by copying Stored Data onto a new label, and, so long as Immediate Data are associated with the object, the destruction, or loss, of the register containing Stored Data in no way detracts from the scientific status of the object. But removal of the unique notation from the object always completely destroys its scientific status unless Direct Data are present on the object itself. Therefore, Direct Data may be regarded as the last stronghold in Data Security for, once that is lost, the object is reduced to a level of "curiosity or admiration", even though it may still have instructive features.

DATA SECURITY IN PRACTICE

Hard-pressed curators, overwhelmed by the size of regional and national collections, will say, with absolute justification, "easier said than done"; but the theory of Data Security tells no curator what he ought to do. Its importance can only be emphasised in the context of powerful pressures for adopting electronic methods of data storage and retrieval. In many cases, time spent giving objects accesion numbers or committing Stored Data to an electronic retrieval system, might much better have been spent in forging strong links between objects and the data referring to them. In practice the curator must decide where his priorities lie, whether his attentions are best given to the Stored Data end of curation, or the other end where objects and data are often loosely associated, and where the problems of Data Security have their application.

Direct Data methods, though highly recommended, are not always applicable in practice. One cannot write Direct Data on a beetle's wing, nor on each of a tube-full of small spiny gastropods. Then one retreats to Immediate Data, or achieves a compromise by sealing the essential data with the object into the time-honoured glass tube or self-sealing polythene bag. The dangers are obvious for, in a comparative study, one cannot remove the objects from their sealed containers for examination and then return them with the same confidence as one could if they had Direct Data or a unique notation in a 'triple bond' system. There is always the possibility that one of the objects may end up in the wrong container with data giving false reference to it. Here, Data Security can only point to the danger and leave its practical application to the individual curator or researcher. Sometimes a dot of ink or paint on a tiny object can, together with a written note, serve as an 'unique notation' in an improvised 'double bond' system.

There will, of course, be occasions when Direct Data are not even desirable. A fine Greek pot with a label stuck onto a scene depicting, say, the castration of Chronos is an outrage to curation no less than to Chronos. Neither should a fossil bivalve have a detailed label stuck onto impressions of adductor and pedal musculature. Some discretion is necessary but, when there are no obvious impediments, then the maxim that 'the best place for essential data is on the object itself' is worth keeping in mind; and perhaps the best place for applying it is in the field where primary data is being recorded.

Immediate Data too often consists in little more than a handwritten note or label drifting about in a cardboard tray, or held to the the object by an elastic band. This is courting operation of the well known 'scientific' law which says "In an experimental or critical situation, if something can go wrong it usually will". And it is not uncommon for this level of Data Security to exist in the context of an elaborate, expensive, and often ill-conceived scheme for electronic storage and retrieval of data; when the important question is whether the data referring to the object are as securely linked to it as they ought to be. Immediate Data without a 'double bond' system linking data to object are dangerous, and data-loss is just a matter of time.

Stored Data are where the current action is to be found, and wonderful systems exist for storing, retrieving, and combining data in new and informative ways so that, here, curation merges with research. This topic needs no comment from me except to say that, if Data Security at the level of the object is poor, then unique and original combinations of Stored Data become meaningless if it is not known to which object the Stored Data refer.

There exists the possibility of another category, Inferred Data, which say, by a process of inference, be drawn from existing data. A common example might be an important type or reference object associated with poor or no location data. The writing on the old handwritten label, matching that of a well known collector who lived say, in Folkestone, Kent and travelled widely in Brazil narrows down the locational possibilities considerably. If the object is a Brazilian butterfly or a Folkestone fossil the probable correctness of the Inferred Data rises impressively. But such detection work is only possible if the original labels are preserved.

Subsequent labels may also be informative: a note left by an expert, long since dead, may contain an observation which only an expert could have made. So that all data referring to an object should be conserved from loss or decay. Fading ink may be read in infra-red light and copied while it is still visible, and brittle labels stuck with flexible PVA emulsion onto new paper and Xeroxed. The demands of Data Security raise many problems to which the inspiration of the curator finds solutions. Any solution is preferable to data-loss.

An unfortunate consequence of Museum acquisition by donation is that much of the data accompanying acquisitions are at a level lower than that required for modern research. Collectors of objects for themselves are less likely to be concerned with the factual origins and history of them than researchers into whole classes of objects. Nevertheless, it is to museums that researchers into whole classes of objects come, since that is where the objects he is studying are most densely distributed. Therefore the existing data in any regional or national collection should not be allowed to diminish by even one 'unit of information'. Perhaps, next to the destruction or loss of an object, the greatest curatorial sin is to allow the loss or diminution of data.

However, though it may appear that the principal onus for maintaining Data Security rests with the museum curator, in fact its primary application is by the collector of objects. For, most regional and national collections are aggregates of amateur collections, and the amount of data available in the collections will depend on the methods of the collector himself.

Data Security is as much an attitude of mind as a technique for maintaining the scientific status of scientific objects. The needs for it are constant but the methods of achieving it many and various, and the responsibility for it rests with all who have charge of collections.

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Palaeontological Dept.
British Museum (Natural History)

COPPERICE AT BROWNSEA

"From thence by boate we went to a little Isle called Brownsea 3 or 4 leagues off, where there is much Copperice made, the stones being found about the Isle in the shore in great quantetyes, there is only one house there which is the Governors, besides little fishermens houses, they being all taken up about the Copperice (Copperas) workes; they gather the stones and place them on ground raised like the beds in gardens, rows one above the other, and are all shelving so that the raine disolves the stones and it draines down into trenches and pipes made to receive and convey it to the house; that is fitted with iron panns foursquare and of a pretty depth at least 12 yards over, they place iron spikes in the panns full of branches and so as the liquor boyles to a candy it hangs on those branches: I saw some taken up it look't like a vast bunch of grapes, the coullour of the Copperace not being much differing, it lookes cleare like suger-candy, so when the water is boyled to a candy they take it out and replenish the panns with more liquor; I do not remember they added anything to it only the stones of Copperice disolved by the raine into liquour as I mention'd at first; there are great furnaces under, that keepes all the panns boyling; it was a large room or building with severall of these large panns; they do add old iron and nailes to the Copperass Stones. This is a noted place for lobsters and crabs and shrimps, there I eate some very good."

This pyritic extract is from the Cresset Press edition 1949 (edited by C. Morris), of 'The Journeys of CELIA FIENNES'. This fascinating book describes journeys made in England between 1685-1703 by this lady born 1662, who died 1741. She was a non-conformist and viewed many aspects of life in those days in this light. She had a peculiarly accurate eye for the mineral wealth of this country as this extract shows, describing the collecting of Copperas (Pyrites), for the manufacture of sulphuric acid on Brownsea Island in Poole Harbour Dorset, from the Tertiary Bagshot and Bracklesham Beds of this area. It was from such Copperas collectors that Edward Jacob (on our front cover) acquired a large part of his Sheppey collections.

H. S. Torrens.

An Account of an uncommon Phænomenon in Dorfetſhire: *In a Letter from* John Stephens, *M. A. to* Emanuel Mendes da Coſta, *F. R. S.*

Read April 9, 1761

SIR, As no essay, however imperfect, which tends to illustrate the operations of nature, can be acceptable to the learned, I took the liberty to address myself to you, in setting forth the following short, but just account of a phaenomenon observed in our own country, and as far as I can recollect, not hitherto described.

In the month of August 1751, the air having been for some time remarkably hot and dry, was changed of a sudden by a heavy fall of rain, and a high south-west wind; the cliffs near Charmouth, in the western part of Dorsetshire, presently after this alteration of the atmosphere, began to smoke, and soon after they burned, with a visible though a subtil flame, for several days successively; and continued to smoke, and sometimes to burn, at intervals, till the approach of winter: nay, ever since that time, especially after any great fall of rain, thunder and lightning, or a high south-west wind (which drives the sea with great violence against the cliffs, and beats off large pieces of them), the cliffs continue to smoke, and sometimes to burn with a visible flame; which, during the summer months, is frequently observed in the night-time. On examining these cliffs, in the year 1759, I discovered a great quantity of pyrites, not in any regular strata, but interspersed in large masses through the earth, and which proved to be martial; of marcasites, which yielded near one tenth part of common sulphur; of cornua ammonis of different sizes, and other shells; but of the bivalve class, which were crusted over, and as it were mineralized, with the pyritical matter; of belemnites, also crusted over with the like substance: and the cliffs, for near two miles long, and from the surface, to 35 or 40 feet deep, even to the rocks at high-water mark, were one bed of a dark coloured loam, strongly charged with bitumen. Moreover, I found also a dark coloured substance, resembling coal-cinder- some of which being powdered, and washed in distilled rain-water, upon filtrating the water, and evaporating it slowly to a pellicule, its salts shoot into fine crystals, and appear to be no more than a martial vitriol: one ounce of this cinder-like substance yields one drachm of salt. I gathered up about one hundred pounds weight of the different kinds of those pyritae, marcasites, etc. which were laid in a heap, exposed to the air, and every day sprinkled with water: the consequence was, that, in about ten days time, they grew hot, soon after caught fire, burned for several hours, and fell into dust. Hence, therefore, it is imagined, that these martial and sulphurous fossils, by being exposed to the air and wet, by being agitated by the beating of the sea, and, if I may use the expression, by being electrified by the subtil flame of the lightning, take fire, which is favoured by the bituminous particles contained in the loam, and burn till all their phlogiston is consumed, and their iron, or martial earth, is dissolved in the acid of sulphur; which constitutes the martial vitriol, found to be near the one eighth part of this cinder-like matter.

When the cliffs were observed to burn in the night-time, the flame was plainly perceived by a spectator at a distance; but, when he drew near to the place, seemingly on fire, he could perceive a smoke, but no flame. In the day-time, nothing but a smoke was perceived, except the sun shined, when the cliffs appeared, at a distance, as if they were covered with pieces of glass, which reflected the sun's meridional rays; but, upon drawing near to the places, where these luminous appearances were perceived, they disappeared, and the cliffs seemed to be covered with smoke, which stunk of a bituminous and sulphureous matter.

I have also been an eye-witness of the same kind of flame arising from the Lodes in Cornwall, especially such, as contained a great quantity of mundic and martial pyrites. Three times I have seen this flame arise from the earth in the night, and once in the middle of the day. In the night, a person, standing at a little distance, would imagine, that the place was all on fire, and even on drawing near the same, he perceives himself surrounded with flame, but is not hurt; and in four or five minutes time, he perceives this flame to decrease, and fall into the earth. In the day-time, the flame is of different colour, and not much unlike the flame, which arises from a furnace. There are several mines discovered in this county by these mineral fires, where there were no symptoms of such mines before: but it is generally observed, that they abound with marcasite and pyrites. Morevoer, these mineral flames, arising from ignited pyrites, are frequently discovered in the bottom of mines and coal-pits; and are often detrimental, and sometimes destructive, to the miners; which made the late learned Dr. Woodward, and others, imagine, that they were vapours arising from an abyss.

From what has been said therefore, we may, in my humble opinion, draw the following conclusions.

1. That all subterraneous fires, even those of Hecla, Vesuvius, and Etna, together with those observed in the mines and coal-pits, are caused by the heat and fixing of pyrites and marcasites.

2. That the waters of our hot baths derive their heat from passing over a bed of ignited pyrites. Indeed the solid contents of those waters do evidently prove this assertion being nothing more than such particles of the pyrites as are soluble in water.

3. That these mineral flames will be more or less subtil, according to the minuteness of the particles of the combustible matter, and the quantity of phlogiston, which they contain.

4. That the convulsive motions and tremblings of the earth are caused by the heat of the burning pyrites expanding the air contained in its bowels. This is clearly proved, by their causing, immediately after, an eruption of the earth, which generally discharges a dark coloured cinder-like and frothy matter. And,

5. That those places, where the earth contains the greatest quantity of pyrites and marcasites, will be most liable to these convulsive motions and tremblings, no other natural cause contradictory.

However, I shall, with great respect, submit these observations to the consideration of the President and Fellows of the Royal Society, to whom, Sir, if you will be so kind as to communicate them, you will greatly oblige,

S I R,

Your very humble servant, etc.

John Stephens.

from

Phil. Trans. Roy. Soc. 52. 1762.

Submitted by H.S.Torrens.

COLLECTIONS AND INFORMATION LOST AND FOUND

A. COLLECTIONS SOUGHT

23. WILLIAM DAVID VARNEY (fl.1917-fl.1923).

Varney seems to have become interested in Geology about 1917 when he joined the Geologists Association. In 1918 he published a paper in the Geol. Mag. (p. 471) on the "Occurrence of Coal-balls". In 1920 he was living at 48, London Road, PETERBOROUGH. By 1923 he was listed as an M.Sc. of South View, Burton Street, PETERBOROUGH. By 1933 he no longer appears as a member of the Geologists Association.

He published in Vol. 32, 1921 of Proc. Geol. Assoc. (pp. 189-205) a paper on the "Geological History of the Pewsey Vale" in which he acknowledges help from Prof. H.H. Swinnerton and Dr. A.E. Trueman suggesting he may have been a student under them at Nottingham University. His collection of ammonites is referred to by Swinnerton and Trueman in their "On the Morphology of the Ammonite Septum". Quart. Jl. Geol. Soc. Vol. 73, p. 53 (Lias of Old Dalby, Leicestershire). News of its present whereabouts would be welcome.

24. ELIAS HALL (1764-1853) of Castleton

We are anxious to trace the whereabouts of any of the geological models, maps and pamphlets produced by Elias Hall. He was born at Castleton in 1764 and is mentioned by John Farey in his 'General View of the Agriculture of Derbyshire 1811 p xx as "Elias Hall, Fossilist of Castleton, near Tideswell. Mineral Collector and Models of Strata", and more specifically in the Introduction to Vol. 2, pp. x-xi with reference to the geological models of Derbyshire he was then constructing. Farey elsewhere speaks of him as a true pioneer in Derbyshire geology "a plain unlettered individual", and he received considerable encouragement from Farey, who was much assisted by him.

Most of our knowledge of him comes from James Croston (1868, 1889) who mentions the encouragement he received from Sir Joseph Banks.

Apart from Farey and Banks he was in contact also with Wm. Smith and G.B. Greenough and thus a figure of considerable importance. Croston also claims Hall accompanied Fanjas de St. Fond when he visited Peak's Hole Cavern (to give it its most polite name!). This was in 1784, and in the 1907 ed. of de st. Fond's travels, vol. II, pp. 315-330 his description of his visit to Castleton and the magnificent Devil's Bottom cavern is very graphic. He was shown round by "an inhabitant who gains a subsistence by conducting strangers into the interior" called J. Hall, who impressed St. Fond, as did "some very pretty girls" he also came across! In view of the different initial and the fact that Elias would only have been 20 at the time, the guide is probably someone else but he might well have been Elias' father. This needs local investigation.

Hall produced a number of maps of coalfields one of which (A Mineralogical and Geological Map of the Lancashire coalfield with adjacent parts of Yorkshire, Cheshire and the Peak in Derbyshire, first published 1833) has recently come into my (T.D.F.'s) hands. He also printed in Manchester an "Introduction to this Map in 1836 by Elias Hall, Mineral Surveyor Castleton, Derbyshire with 21 pages of text and eight detailed stratigraphic sections and a key. This (of which H.S.T. possesses a copy) advertises the third edition of his map. This introduction is also accompanied by pages 22-28 a list of the "Organic Remains and where found" by Francis Looney which explains the stratigraphic distribution of the fossils in the area, covered by the map. A second edition of this introduction appeared in 1850. These used the William Smith style of cartography in that the outcrop edge of each stratum is coloured with the colour fading off down-dip into the area concerned. Other maps included the Midland Coalfields and the Lake District, and he also published sections based on Farey's unpublished sections across parts of England.

In particular Elias Hall is noted for having made ingenious models of various parts of the country; Croston (1868, p. 37 and 1889, p.28) referred to

> "several carefully executed models of parts of the Earth's surface including the Peak of Derbyshire and the Lake District in which with the aid of colour the stratification and other geological details are indicated with admirable clearness and accuracy. Two of these models were, at the instance of the late Sir Joseph Banks , purchased by the Trustees of the British Museum and are now deposited in the geological gallery of that institution; another, a model of the district around Manchester is preserved in the Museum of the Natural History Society of that city."

Enquiries about these models have so far drawn a blank. If anyone knows of any of them, or of his maps other than Lancashire, or of his pamphlets or manuscripts would they please contact the first named. He is rarely mentioned in histories of geology today and we would like to restore him to his rightful place. He is buried in Castleton churchyard where a gravestone erected by friends in Manchester which can still be seen records his devotion to geology for 70 years, suggesting his interest in the subject started in the 1780's. He died 30.12.1853.

H.S. Torrens
Geology Department
University of Keele and

Trevor D. Ford
Geology Department
University of Leicester

Ref. Crôston, J. 1868. On foot through the Peak. Heywood, Manchester,(1st ed.) 9th Edition, 1889.

25. <u>SPENCER GEORGE PERCEVAL</u> (1838-1922)

A.G. Pollard, 2 Chestnut Mews, Feniton, Honiton, Devon is working on the minerals of West Somerset. He wishes to locate the mineral collections made in this area during the years 1852-1863 by Spencer George PERCEVAL, who published a list of Somerset minerals in Geol. Mag. <u>10</u>, p. 166. Mr. Pollard reports that a considerable number of Perceval's minerals are deposited in the Somerset County Museum at Taunton, and belong to the Somerset Nat. Hist. and Arch. Soc. Many more are listed in Perceval's own catalogue entitled "Collection of minerals in the Taunton Museum from the Brendon Hills and other localities in West Somerset". It is possible the missing ones or similar ones may now be in the collections of other Museums - Mr. Pollard knows of others in the BM(NH), IGS, and Exeter Museums. The specimens are chiefly minerals or ores of copper, Iron and Manganese with quartz and some celestite and gypsum from the Lias exposures on the coast. The ores all come from the old Brendon Hill and Quantock Hill mines.

Any minerals from these localities and especially any belonging to S.G. Perceval's collection would be of interest and Mr. Pollard solicits information of them.

See also no. 25 under the Found section (p 455).

7. <u>CAPTAIN R.B. BENNETT</u> (fl. 1850-1880)

This is one collector who has remained 'lost' as far as information is concerned. The specimen of Bennett's collecting located by P. Doughty (G.C.G. 2 p.68) was one of <u>Pernopecten sowerbyi</u> McCoy originally figured by Bailey 1875 from Kildare, Eire. More material of this same species from this locality was figured by R.B. Newton Proc. Malacological Soc. <u>7</u>, 288-289 pl. 24 fig. 11 in 1907 using material in the BM(NH), Reg. nos. 30346 and 30355.

Probably one of these specimens (30346) is that refigured photographically in the Treatise on Invertebrate Paleontology, Vol. N1 Mollusca 6 1969 page N70 fig 58/4. Enquiries at the BM(NH) would perhaps yield further information on Bennett who seems to have been the original collector of this important material.

19. In GCG 6 we sought on behalf of Mike Ashton any ammonites from the Lincolnshire Limestone. We are now repeating this appeal with one particular ammonite in mind.

It is an ammonite identified as Hyperlioceras found in 1968 by A. Ludford of Luton College of Technology jointly with Prof. F.W. Shotton, F.R.S., then of the Geology Department, University of Birmingham. It is correctly cited in Proc. Yorks. Geol. Soc. Vol.39 (3) page 323, 1973 as having been found at the Clipsham Quarry (SK 982156) of Soil Improvement Ltd. and presented to the Geology Department, University of Birmingham and also that it was then unavailable for study. The same ammonite is also cited by Sir Peter Kent in Trans. Lincoln. Nat. Union 17, no. 3, part 1, page iv, 1970 as having in fact been found by Birmingham students during this field trip. Sir Peter has given further details in a letter recently which show this ammonite to be of crucial stratigraphic importance, apparently coming from a higher stratigraphic horizon than any other known Lincolnshire Limestone ammonite.

It went to the British Museum for identification and was then returned to Birmingham. There is NO apparent sign of it there today. It seems likely that it might have been then returned to the original student discoverer. It is hoped this second appeal may reach someone who recalls this ammonite and its fate and will report it.

This specimen is the only one known from this horizon and is the only one found in 100 years of hunting. It is obviously better for science that it is located than we wait another 100 years for another to be found.

M. Ashton
Department of Geology
University of Newcastle.

and C. F. Parsons
78 Runnells Lane
Liverpool 23

B. COLLECTIONS FOUND

13 David Christopher DAVIES

The sorry tale of this collection (GCG 7 346, 8 428-429) continues to emerge. N.R. Dove, Curator of Hereford City Museum kindly writes (13.12.76):-

"Amongst my acquaintances is an inhabitant of Oswestry, and when I raised the matter of the fate of the museum and its collections, my informant returned to Oswestry and enquired into the affair. It would appear from these investigations that for many years the museum had been in a state of neglect, though under control of the library, and that when the library moved to a new building, much of the material from the museum was consigned to the local rubbish dump, including "the old and dusty fossils".

Unfortunately, it appears that there is no one who actually saw this take place, but there is no reason to suppose that it did not, as the library no longer possessess the collection."

In one of D.C. Davies letters cited in GCG 7 346 he records writing an anonymous article on "How I became a geologist". This can be found in the magazine The Youths Playhour and Boys Journal vol. 3, pages 161-165 1872 (copy in British Library); it provides useful biographical material.

20 Creswell Crags Collections

William Ely - Keeper of Natural History, Rotherham Museum, has kindly provided details of his Museum's collections of Creswell Crags material which comprise Gifts of A.L. Armstrong 1931, Ethbert Brand 1932 and Miss E. Gibson 1932. These have been passed on to the Creswell Crags Interpretative Centre. Further returns would be welcomed.

22 R. C. WALSH

Dr. R. L. Atkinson, Curator of the Camborne School of Mines wrote to point out that Mr. Walsh whose collections were reported in part at Leicester Museum has also sent material to them. He concludes his letter (2.2.77):-

"As Mr. Walsh is still an avid collector with a great interest in Geology I am sure he would be most interested in hearing from anyone with news of his former collection. The most recent address I have is:

68 Cullingworth Road,
Sherwood,
DURBAN, 4001."

25 S. G. PERCEVAL

Spencer George PERCEVAL was a man deeply committed to the welfare of musuems. He was born in 1838 and died in 1922 and an obituary notice can be found in Min.Mag. 20 267-268. He was an avid collector not only of minerals but also fossils, scientific manuscripts and books. He was extremely generous and,thankfully,organised as to their dispersal. His final bequest of his manuscript collections went to the Fitzwilliam Museum, Cambridge where the final process of indexing is completed. This bequest contains two bound volumes listing all his donations (mainly geological) to various museums. These will surely contain full details of his Somerset mineral collections. His personal correspondence is at the British Library Additional MSS 41494-96 again in bound volumes and may provide further details.

PLYMOUTH CITY MUSEUM Minerals (GCG 3 132)

Following on from our article on these collections it seems worth recording the following information. On June 2, 1976 I received a copy of a letter from Mike Bishop, Curator of the Dick Institute, Kilmarnock who had long ago owned a copy of Wm. Babington's book "A New System of Mineralogy etc." 1799. This had an interesting inscription signed by A or H Deck on the reverse of the title page. On May 6th of the same year I had seen this same book on the shelves of the London Antiquarian booksellers Quaritch. The inscription read:-

"Sr John St. Aubyn afterwards purchased the whole of Dr. Babington's collection of which this catalogue is the basis and for which he paid £3000. In 1834 I had the arrangement of Sir John's whole collection of which I formed 2 complete small collections; one for Lady St. Aubyn and another for Mrs. Parnell his daughter. A very beautiful and extensive collection I formed for the Museum at Devonport and the duplicates were brought to the hammer most of which I purchased.

Signed A or H. Deck "

In this same article (p 134) the statement that none of the original catalogues of the Sir John St. Aubyn collection survived at Plymouth should also now be corrected. The catalogue was referred to by A.H. Church 1876 Min. Mag. vol. 1 p 48-49 and has recently been relocated at Plymouth. It is hoped the inscribed copy of Babington's book may have joined it by now to improve the vital documentation of this early collection.

Information about A. or H. Deck would be welcomed.

BOLTON MUSEUM (GCG 7 328-329)

We concluded our discussion of the P.B. Mason collection here with a record that the remains of these collections went after the deaths of both Dr. and Mrs. Mason to Burton-on-Trent Museum. It was thought these included only British birds, some echinoderms and a portion of the Herbarium. News comes of the existence at Burton-on-Trent Museum today of cases of geological material "apparently showing no sign of having been opened at all recently". Investigations are continuing into the source and importance of these and if they have any connection with the P.B. Mason collections.

Trevor Ford (Department of Geology, Leicester University) writes to add to our account of Rooke Pennington (GCG 7 330-332). He points out that the Museum building by Pennington in Castleton still exists on the way to Peak Cavern. It is a tall (2½ storey) cottage which was modified by Pennington and Tym by adding an extra tall room above a single storey cottage. The Museum was this upstairs room. The building is easily recognisable by a high arched window (which makes visitors think it was once a chapel); this was deliberately designed to house Tym's Blue John window which is now in Stockport Museum. The Museum has long been a private house.

Details of Rooke Pennington's archaeological activities are given in a recent book by B.M. Marsden. "The Early Barrow-diggers", Shire Publications 1974 pp 42, 78-80.

It is important that all information regarding this column should be sent not only to the enquirer but also to Hugh Torrens. If any previous enquirers have received information not so far reported would they please pass it on.

This section compiled by
H. S. Torrens.

PYRITE AND CONSERVATION PART 1: HISTORICAL ASPECTS

1. Introduction

The deterioration of pyritic specimens is without doubt the most widespread and serious cause of trouble in collections of geological material. The problem has attracted the attention of curators, conservators and others for at least the past 200 years. Many ideas as to the cause or causes of pyrite 'decay' have been put forward and several types of treatment proposed. However all, probably without exception, have failed at one time or another and large numbers of valuable specimens have been irretrievably damaged.

Before considering possible preventative measures it is necessary to state the general cause of the deterioration. Many mineral specimens and fossils are liable to deteriorate in storage through the oxidation of contained pyrite or marcasite. The chief oxidation products are sulphuric acid and various hydrated sulphates, mainly of iron. These sulphates (usually in evidence as efflorescent growths on the surface of affected material) can cause total disintegration by rapid growth within the interstices of specimens. The acid liberated frequently destroys labels and boxes, and can severely damage wooden storage cabinets. Furthermore, in the case of fossils, the acid will destroy associated shell or bone structures, and in mineralogical specimens phases other than pyrite. Fig. 1 shows typically extensive damage to specimens, labels and boxes caused by the oxidation of pyrite in Gault ammonites. Fig. 2 shows the growth of efflorescent sulphates on a sample of pyrite from the Nenagh Silver Mine, Co. Tipperary.

The extent of deterioration appears to depend on several factors, mainly the type and amount of pyrite undergoing oxidation and the prevailing storage environment. In fossil material generally and many mineralogical specimens, deterioration is by extensive conversion of pyrite to iron sulphates; in other specimens, often large, and seeminglywell crystallized pyrites, deterioration may be confined to surface tarnish or a whitish bloom. The bloom is probably caused by limited growth of iron sulphates, but the cause of tarnishing is, as yet, unknown.

Considerable efforts by museum workers to find relatively simple, effective, methods for the prevention and treatment of deterioration have been hindered because the mechanisms for the oxidation of pyrite have for long been in question. At the present time two major hypotheses prevail. The first and older theory maintains that purely chemical mechanisms are responsible, and that prevention of deterioration can be affected by the exclusion of air from specimens. The second theory, which has recently gained fairly wide acceptance, is that certain microorganisms, notably thiobacteria, are either wholly, or at least in part, responsible; this theory leads to the use of bactericides as a palliative, without the exclusion of air.

In order to place the problem of the oxidation of pyrite in stored specimens in perspective, it is informative first to consider the historical approaches to the general phenomenon of pyrite oxidation, and then briefly review the measures for its prevention and treatment.

The word pyrite is derived from the Greek for fire and refers to its ability to emit sparks when struck. Up to about 1500 AD and even later 'pyrites' was a general term for all brassy yellow or white sulphides including chalcopyrite, true pyrite, arsenopyrite, pyrrhotine, and marcasite. The word marcasite (or marchasite) is probably of Spanish or Arabic origin and was used from Mediaeval times up to the end of the 18th century to

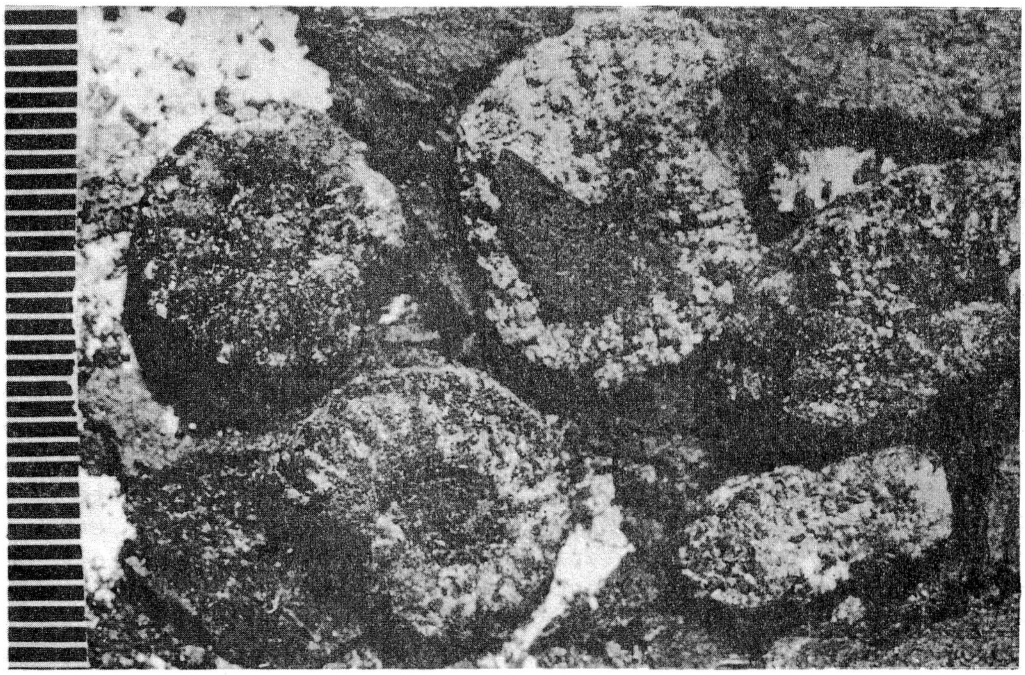

Fig. 1 Decayed Gault ammonites with remnants of cardboard tray and labels (Scale in mm.)

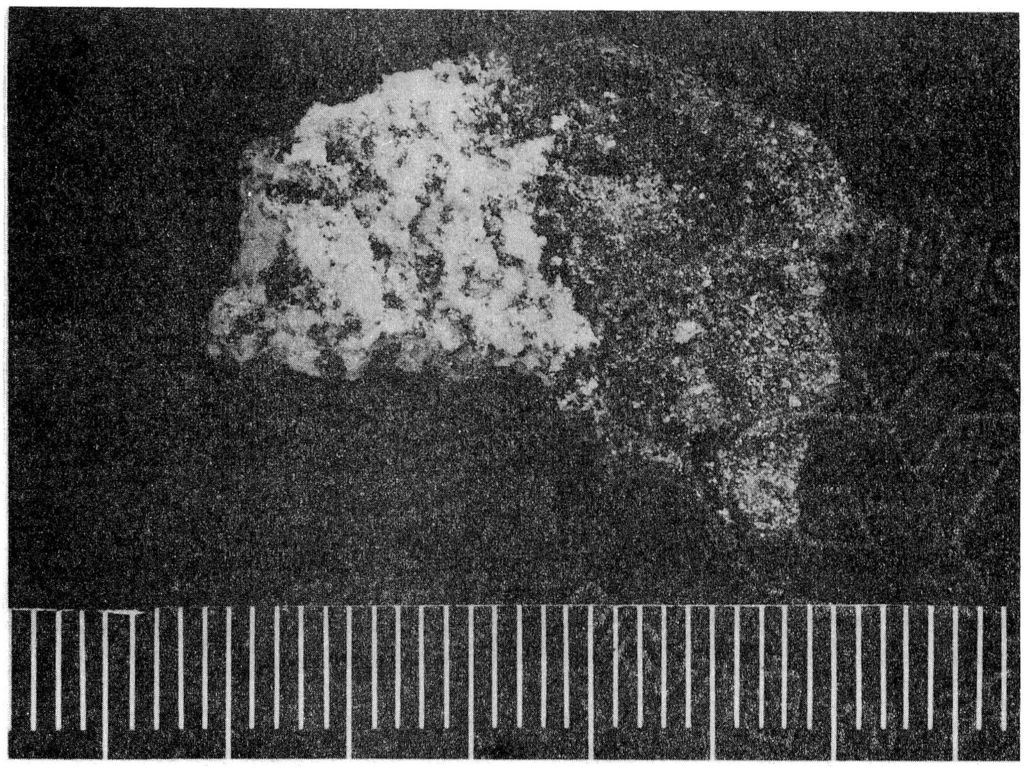

Fig. 2 White efflorescent decay products on pyrite sample from Nenagh (Scale in mm.)

describe well crystallized 'pyrites'. During the same period nodular varieties were termed 'pyrites' and the softer white or brown varieties were termed 'wasserkies'. This last group probably included true marcasite, pyrrhotine and some forms of pyrite. Dana (1892) records 'wasserkies' as having been translated by Cronstedt as 'pyrites aquosus', possibly alluding to tendencies for some specimens to become moist with deterioration. Wallerius (1735), however, includes 'p. aquosus' with 'vatenkies' and 'pyrites fuscus' as terms applied to white, arsenic rich pyrites. Hill (1771) mentions that 'p. aquosus' was ascribed to Linnaeus, and Cronstedt does not appear to mention the term at all later (1788). 'Wasserkies' has also been regarded as a corruption of weisserkies (white iron pyrites; ie marcasite). It seems very likely that nomenclatural confusion led to the term marcasite being used extensively during the late 18th and 19th centuries to describe easily oxidizable iron disulphides. This connotation still lingers on today, Davies (1961) and Shepherd (1972) both describing pyritized fossils and nodules as 'marcasitic' because they decayed in air.

Today the terms marcasite and pyrite are used only for the orthorhombic and cubic dimorphs respectively of iron disulphide. The final arbiters in doubtful or perplexing cases are X-ray diffraction, see for example Bannister (1932), or the study of polished sections in reflected polarised light.

2. Historical Review of Pyrite Oxidation

It had been realized from ancient times that pyrites and other sulphide ores were natural sources for vitriols and vitriolic acid, ie metallic sulphates and sulphuric acid, but possible the earliest mention of the oxidation of iron disulphides exposed to air is Mayow (1674). He noted that 'marcasite' formed vitriol by the combination of 'nitro-aerial spirit' (ie oxygen) with the sulphur portion of the ore, forming acid substances which in turn combined with the iron portion. Boyle (1674) also observed that some aerial substance was added to 'marcasite' as it vitriolized in air, causing the mineral to increase in weight. Lavoisier (1777) conducted some experiments which confirmed the earlier observations of Mayow, and used his findings to help refute the Phlogiston Theory of Combustion.

Henckel (1725) records that dampness is a necessary factor in vitriolization, and it is he who also pointed out that a notable characteristic of iron disulphides is their variation in susceptibility towards oxidation. He comments that nodular and radiating 'pyrites' are less stable than crystalline and laminated varieties. He maintained that the less stable forms were of lower density, more granular and were richer in copper or arsenic than the more stable. Shortly afterwards Werner (see Julien 1887) blamed especially arsenic, and Berzelius (see Julien, 1887) suggested manganese enrichment as a cause of instability. Observations on the progress of oxidation are rare but Hausmann (1813) observed that certain pyrites deteriorated by first tarnishing, followed by surface 'rusting', and finally vitriolization; and Borlase (1758), whilst observing that well-crystallized pyrites were more stable than other varieties, states that 'the latter will divide and fall to pieces in any moist place, and shoot forth vitriolic salts into white wool-like threads'. He also comments that pyrites were better known among naturalists of the time by the name marcasite.

At the turn of the 18th Century Hatchett performed some of the earliest chemical analyses of iron sulphides (1804), and with his data refuted an earlier view of Proust (1801), who advocated sulphur deficiency in pyrite as the prime cause of instability. Hatchett suggested instead that partial oxidation of pyritic sulphur at the time of formation could facilitate the later further addition of oxygen. Meinecke (see Julien 1887) suggested that white pyrites, possibly marcasite, was unstable because it contained iron and sulphur in looser combination than in stable pyrites.

Berzelius (1829) published the results of a series of experiments performed between 1819 and 1829 based on analyses of pyrite oxidation products. He concluded that unstable pyrites were mixtures of stable iron disulphide, the crystalline portion, and unstable iron monosulphide cement. He proposed that the oxidation mechanism was of an electrochemical nature, where cells were set up between the two sulphides when exposed to damp air. Kohler (1828) suggested that Berzelius' theory might be suspect as many analyses, including those of Berzelius himself, showed that pyrites and marcasite contained only FeS_2. Even so, Berzelius' theory was accepted until the latter part of the 19th Century.

Nicol (1849) refuted this idea and suggested instead that some peculiarity of the state of aggregation was responsible for instability. Senft (1868) put forward the idea that well formed stable pyrite crystals had smooth faces which offered few possible sites for the attack of oxidizing agencies, although in the same paper he mentions the instability of perfect octahedral pyrites from certain localities. The possibility of peculiarities of crystal structure in iron disulphides was considered by Kimball (1880) who suggested that marcasite decomposed more readily than pyrite because the former mineral occurred in several states of crystallization and aggregation that were favourable to oxidizing influences, whereas the latter mainly occurred as a compost mineral. This view was extended by Julien (1887) who concluded that all specimens of oxidizable pyrite were not pure, but were mixtures of pyrite and marcasite, probably in the most minute, even molecular, conditions. He argued that specimens containing the highest proportion of marcasite often had granular textures and were the most unstable. The proportion of marcasite, he demonstrated, could be measured by careful density determinations and microscopic examination of polished mounts. He noted however that large well formed crystals of marcasite were as stable as similarly formed crystals of pyrite, and that when these stable crystals were crushed to powder oxidation rapidly ensued after exposure to air. He further suggested that the amount of moisture in the air was probably a critical factor.

Advancing knowledge of chemical and physical principles, and improved observational techniques have not substantiated many of the earlier theories, but the basic observation of Henckel, subsequently extended by Julien, ie. that a link between grain size, or texture, and stability exists, has been demonstrated time and again by investigators over the past seventy five years.

The beginning of the present century saw considerable advances in the understanding of the chemistry of metallic sulphides generally. Stokes (1907) described a test to distinguish between pyrite and marcasite, based on the rapid dissolution of iron from marcasite when immersed in an acidified ferric sulphate solution; pyrite had a much slower reaction. This test was subsequently improved by Allen and Crenshaw (1914), who claimed that the iron in marcasite was more rapidly oxidized by ferric sulphate than that in pyrite, but that the sulphur in marcasite was oxidized more slowly than in pyrite; subsequent work by Bannister (1932), however, throws doubt on their findings. Gottschalk and Buehler (1907) and Winchell (1907) described various possible reaction sequences involved in the aqueous oxidation of pyrite and other metallic sulphides. Allen and Crenshaw (1914) also demonstrated that the passage of aerated water over crushed pyrite increased the rate of oxidation substantially.

Because pyrite oxidation in mines (especially coal mines) had been strongly suspected as the major cause of fires and explosion, investigations into the behaviour of pyrite and marcasite in air were carried out by Winmill (1916), Li (1926) and others. Winmill showed that powdered pyrite could absorb oxygen equivalent to between 40 and 60 times its own volume, at temperatures around 20°C, within about 100 hours. The heat produced (calorimetrically determined) was about 18 joules per cubic centimetre of oxygen absorbed. He also found that the rate of oxidation decreased with time of exposure, due to the coating of the particles with iron sulphate; removal of the sulphate restored the initial rate of oxidation. Increases in temperature, oxygen pressure and pyrite surface area also increased the oxidation rate. He calculated that for every 10°C rise in temperature the rate doubled. Li showed that the presence of moisture was necessary for rapid oxidation of crushed pyrite, suggesting, on his experimental evidence, that moisture absorption rather than wetting might be a critical factor in the kinetics of the oxidation. Pyrite oxidation, although capable of causing mine and mine dump fires, was ruled out as the main cause in coal mines; the oxidation of coal itself was considered the major cause.

Later work has largely been concerned with the behaviour of pyrite under aqueous conditions, both industrially and in the laboratory. This is mainly because of the application of pyrite oxidation to the processes of extractive metallurgy and its role in the production of acid streams and mine waters. Nelson (1933) showed that percolating aerated water oxidized pyrite at a rate inversely proportional to particle size, whereas Powell and Parr (1919) stated that the rate-controlling factors for pyrite oxidation in coals were time and bacteria.

It was not, however, until the late 1940's that bacteria were definitely implicated in the production of acid mine waters. Leathen et al (1949) isolated a microorganism from acid streams that could oxidize ferrous iron to ferric. Extensive culture of this strain, originally called *Ferrobacillus ferro-oxidans*, led to laboratory demonstrations that it could accelerate the aqueous oxidation of certain forms of crushed pyrite (Bryner and Anderson 1957). Silverman and Erlich (1964) stated that particle size and, possibly, pyrite crystal structure were important factors affecting the rate of oxidation by bacteria. Temple and Delchamps (1953) produced evidence that incomplete oxidation of the sulphide moiety resulted in the formation of elemental sulphur, which could then be oxidized to sulphuric acid by *Thiobacillus thio-oxidans*. Kelly and Tuovinen (1972) demonstrated that *F. ferro-oxidans* was, in fact, a thiobacillus and proposed the name *Thiobacillus ferro-oxidans*, which was internationally accepted.

Intensive research into the microbiological aspects of sulphide oxidation has been undertaken over the past two decades, but the fundamental questions of the mechanism of bacterial attack on sulphide ores have not been conclusively answered. Two hypotheses purport to explain the mechanism. The first maintains that thiobacteria catalyse the slow chemical oxidation reactions of pyrite, utilizing the oxidation of ferrous to ferric sulphate as their energy source, whereas the second suggests that thiobacteria can attack solid pyrite directly, see Silverman (1967). It is generally believed that pyrite, in aqueous media, can be rapidly oxidized in the presence of *T. ferro-oxidans* at temperatures between 10°C and 40°C at pH's between 2 and 6.

Stenhouse and Armstrong (1952) showed that pyrite could be oxidized in alkaline solutions at temperatures between 100°C and 200°C. Crushed pyrite was oxidized in sodium hydroxide solution to hydrated iron oxides with complete loss of the sulphide moiety, which was oxidized to sulphate. Under acid conditions at similar temperatures McKay and Halpern (1958) demonstrated that the oxidation of pyrite was dependent upon oxygen pressure, particle size and temperature; the products were iron sulphates and sulphuric acid. The alkaline oxidation of Stenhouse and Armstrong suggests a possible mechanism for the common natural formation of goethite or limonite pseudomorphs after pyrite crystals, nodules or fossils.

Amongst recent ideas on the variation in susceptibility to oxidation are those of Schopf (1965), who suggests that intimate association of carbonaceous material with microcrystalline sedimentary pyrite is a contributor; Carrucio (1972) who suggests that framboidal pyrites are less stable due to the presence of silver; and Khawaja (1975) who suggests that the larger the pyrite unit cell size, the higher the oxidation rate.

3. History of Conservation

There appears to be little recorded information on the conservation of pyritic specimens before the end of the 19th century. Bowerbank and other early collectors, according to Richardson (1842), recognised the need to protect pyritized fossils from air, and this they achieved by boiling and storage in linseed oil, or storage under water. Later paraffin oil was probably used, and , by the mid 19th century some mineral collectors, e.g. Newberry, recommended coating specimens with shellac. Other materials undoubtedly used included fish and animal glues, and various waxes. Schuchert (1895) and Bather (1908) recorded that most earlier treatments had failed, suggesting that the acidic decay products needed removal prior to further treatment. They advocated neutralization by washing specimens in sodium carbonate or hydroxide solutions, followed by water washes, drying and impregnation with thin solutions of dope or shellac. As an alternative to linseed oil storage, Bather suggested the use of carbon tetrachloride.

An early attempt at assessing the efficiency of various coating materials was carried out by Radley (1929). He exposed several specimens of pyrite, marcasite and pyritized fossils impregnated with various lacquers and waxes to moist and acidic atmosphered for varying durations. He concluded that dope (nitro-cellulose) was the best coating material then available. Bannister (1934), basically interested in the preservation of mineral specimens, improved upon Bather's and Schuchert's methods by the use of ammonia, either as vapour, or dissolved in water or alcohol, followed by oven drying and impregnation with vinyl acetate dissolved in toluene. Later developments in plastics technology led to the replacement of vinyl acetate by bakelite, polyvinyl acetate and polybutyl methacrylate (Bedacryl). The use of the latter, either by vacuum impregnation, or by immersion of heated specimens in its solution in toluene, led to considerably greater success in the treatment of both minerals and fossils. See Instructions for Collectors [BM(NH)] (1955). For certain applications Rixon (1961) suggested the use of a dilute alcoholic solution of the amine morpholine as a replacement for ammoniated alcohol. For a detailed review of the more successful treatments recently employed in the conservation of fossil material see Rixon (1976).

For the liquid storage of small pyritized fossils Reid and Chandler (1933) recommended glycerin. This method widely replaced linseed and paraffin oils, but its use was later seen to result in the deterioration of specimens. Glycerin is hygroscopic, an oxygen solvent and probably combines with pyritic iron. The experimental use of silicone fluids to replace glycerin was commenced at the BM(NH) in the early 1960's. Silicone fluids are extremely inert and almost totally impermeable to air or water vapour. Their use to date has been very successful.

The majority of the other methods used in conservation of fossils and minerals are based upon the bacterial oxidation theory, and mostly date from the mid-1950's. There is however one method not based on either bactericides, liquid storage or lacquer impregnation. Gordon (1947) recommended a method for the preservation of very pure pyrite and marcasite based on short immersions of specimens in concentrated hydrochloric acid, with subsequent drying in ether. This method, he claimed, did not necessitate any further use of lacquers, etc.

Slightly earlier Oehnichen (1944) proposed the use of hydroquinone as an antiseptic and antioxidant, suggesting that bacteria might be responsible for the decay. Shortly after the discovery of the possible role of bacteria in pyrite oxidation, several workers at the BM(NH) strongly suspected that these might play a part in the deterioration of museum specimens. A series of microbiological screening tests for the presence of sulphide oxidizing and iron oxidizing bacteria on decaying museum specimens were carried by Postgate and Butlin (1955) at the Chemical Research Laboratory, Teddington. Their results indicated that bacteria were present on some specimens, but these were neither identified, nor definitely implicated in the decay process. These results however prompted the use, on Postgate's suggestion, of a cationic bactericide. The washing of both mineral and fossil specimens in aqueous Savlon, and later in alcoholic solutions of Cetrimide B.P. (the active base of Savlon) became routine.

Apparent short term success was achieved with some difficult specimens, but others were not stabilized at all. In the Palaeontology department at the BM(NH) the method recommended from about 1970 consisted of neutralization of acid decay products in ammonia vapour or with 5% alcoholic morpholine, desiccator or oven drying, impregnation using a 0.1 to 0.2% solution of Cetrimide dissolved in isopropanol, followed by the application of a thin solution of Butvar B98 in isopropanol. It was stressed that this method was experimental and specimens would probably need retreatment at two yearly intervals (this was considered to be the 'active' life of Cetrimide). In the Mineralogy department at the BM(NH) the method used consists of washing or swabbing specimens with a very dilute methanolic solution of Cetrimide.

Booth and Sefton (1970) showed that thiobacteria could be effectively controlled using the vapour phase inhibitor 4,chloro-m-cresol, and its use as a potential preservative for pyritic specimens was suggested. This substance is however extremely toxic, not controllably applicable to any but the smallest specimens, and its use, like Cetrimide, presupposes considerable bacterial complicity in the deterioration.

4. Summary

Bacteria can clearly play a part in the oxidation of pyrite in aqueous environments. The extent of their complicity depends on several factors, including availability of oxygen, total pyrite surface area available and temperature. It has also been established that pyrite can be chemically oxidized in aqueous environments under conditions hostile to bacteria. Their complicity in the oxidation of pyrite in air is no more than a possibility.

Curators and research workers in both the mineralogical and palaeontological fields are concerned to find effective treatments which neither contaminate nor visibly detract from the appearance of specimens. None of the methods in use at present are entirely satisfactory. This is, I believe, because insufficient notice has been paid to the environmental aspects of the problem.

As a relatively large literature on pyrite oxidation obviously exists, the review undertaken is necessarily incomplete and I would be most grateful for any information, especially on published accounts of early conservational treatments.

I shall give an account of research in progress, and some preliminary observations, in part II of this paper.

Francis M. P. Howie
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British Museum (Natural History)

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PROBLEMS WITH RESIN AT BOLTON

Some time ago, it crossed my mind that many of the resins now in common usage for the repair and conservation of geological material might be viewed with far less enthusiasm by future generations of curators. The useful properties of epoxy adhesives and polyester resins in general are widely known, hence their popularity. However, I wondered how their durability and resistance to solvents would be viewed if it became necessary to try and undo any of the good work. Recently in Bolton this problem manifested itself on three occasions and a simple yet relatively effective solution was found. The first contender was a small slab of polished limestone, showing nice sections of Orthocones and Goniatites. It had been sent to a Bolton monumental mason as a 'free sample' along with a consignment of stone from North Africa. Unfortunately the limestone would not take a good polish, being very impure, so a layer of epoxy resin had been applied as a varnish. This had become damaged and complete removal of the 2mm thick layer of epoxy seemed the only way of rendering the specimen presentable.

The solvents at our disposal proved useless - as expected, and we reasoned that any substance virulent enough to attack the resin would probably damage the specimen and the operator as well. Mechanical removal would have been easy with a surface grinding machine, but hand grinding produced such slow results that other methods were sought. The brittle nature of the resin was assaulted with a vibro-tool but it proved impossible to avoid bruise-marks on the limestone beneath and wherever the resin had penetrated the stone surface, damage was unavoidable.

Desperation suggested heat and some odd idea of differential rates of expansion, so the slab was heated in an oven to around 90°C. This led to the discovery that the film was slightly thermo-plastic and could be peeled off after heating, without too much difficulty.

A similar application of heat un-mended a badly repaired femur of *Bos primigenius*. Removal of the various unsightly exudations of epoxy adhesives caused only minor surface flaking of the bone material and the femur has now been properly repaired.

Our third application of this technique concerns the remounting of a fossil Plesiosaur which will have to be undertaken at some future date. Hopefully, this is not the 'fine Plesiosaur' mentioned in the Rooke-Pennington sale catalogue - (see Torrens, GCG 7 331) but it appears that it may be so. Unfortunately the fossil has been (presumably) re-mounted into a slab of resin about 1" thick. This is crudely shaped to resemble the body outline of the living animal. Unfortunately the resin has become very badly yellowed with age and the whole thing has been broken in several places. It appeared a dismal end for what must have once been a fine specimen. However, an application of heat on the broken-off tail section secured the release of the vertebrae with relative ease.

Clearly the technique would be unsuitable for material which might be adversly affected by heat, though a relatively small percentage of geological material would come into this category. The cured resins did not appear to give off any noxious fumes when heated, so the chief operator hazards are burnt fingers!

A. C. Howell.
Bolton Museum

MUTUAL AID

APPEAL FROM THE WEST INDIES

Recently a few schools in Trinidad have been attempting to offer a course in Geology to students at 'A' level. This subject is sadly neglected in the Caribbean to the extent that there are only about five schools in the region that have it on their curriculum and even then the numbers of students are very small.

We, at this Department in the University have the responsibility of providing the various samples for the practical teaching and the examinations. However, much as we would like to encourage the growth of geology in schools and the University, we find that we are greatly handicapped when it comes to providing the students with a decent teaching collection of all the relevant samples. One natural handicap exists because of the fact that our geological environment is such that many fossils and minerals are totally absent; therefore we have to procure these from elsewhere for teaching purposes.

It is in this context that I seek your help in improving our teaching collection. I would be exceedingly grateful if, through your good offices you are able in any way, to organise for us a collection, of any size, of samples suitable for teaching. Any addition to our collection in quantity or quality will be greatly appreciated. There may be members in this group who have collections or know where some samples can be had, who may be willing to donate or sell them to us.

Yours sincerely,

St. Augustine,
TRINIDAD, W1.

Keith Rowley
University of the West Indies,
Seismic Research Unit.

Members may wish to help Dr. Rowley individually. Alternatively arrangements can be made through the Editor.

BOOKS WANTED:

Tyrrell, G.W., 1928, The Geology of Arran. Mem.Geol.Surv. Scotland.
Information to:
Dr. C.S. Exley, Department of Geology, University of Keele, Keele, Staffordshire, ST5 5BG.

In 1957 a book (paperback) on "The Warrington Academy" by William Turner with an introduction by G.A. Carter was published. This was issued jointly by the Public Library and Museum Committee of Warrington. If anyone has a spare copy Hugh Torrens, Géology Department, University of Keele, Keele, Staffs. is trying to obtain one and would much appreciate any offers.

NOTICES

THE ASSOCIATION OF TEACHERS OF GEOLOGY

The ATG is a growing body of teachers from all types of institutions with a common interest in the promotion of geology as a subject of considerable social, scientific and educational relevance. With a rapidly expanding membership (already over 1100) the organisation, which was founded in 1968, is well placed to influence the teaching of the subject at different levels as well as to develop a whole range of services for those teachers having limited resources available to them;

Amongst the aims of the Association are:

1. The encouragement of a wider acceptance within schools of geology as a defined element in the curriculum.
2. The promotion of geology nationally as a subject of fundamental significance in the education of all members of the community.
3. To encourage links between geology and other subjects in order to promote the idea that science is a strongly integrated body of knowledge.
4. The development of responsible attitudes on the part of both pupils and teachers towards the environment.

The Association holds an Annual Course and Conference in September to provide teachers with up to date information on the science of geology and methods of teaching it. A series of teaching aids are under development, and already cheap colour slide sets are available at £1.20 for a set of 24 photographs. The Association publishes a quarterly journal, 'GEOLOGY teaching', which contains a variety of 'academic' and pedagogic articles, plus news and reviews of new developments and publications relevant to the profession. The annual subscription is £3.

The Association would be most grateful for any publicity museum staff can give, and will be happy to provide further copies of its publicity leaflet for distribution to geology, geography and science teachers visiting museums.

Secretary: David S. Scott
Crewe & Alsager College of Higher Education
Crewe Road, CREWE, CW1 1DU.

February, 1977.

BIOLOGY CURATORS GROUP, GEOLOGICAL CURATORS GROUP AND SYSTEMATICS ASSOCIATION LIVERPOOL CONFERENCE, 22nd - 23rd September, 1977.

THE FUNCTION OF LOCAL NATURAL HISTORY COLLECTIONS

The conference will be held at the University of Liverpool Halls of Residence, Thursday 22nd September - Friday 23rd September. Full board also includes dinner and accommodation on the night of Wednesday 21st September.

In this country there is a wealth of botanical, zoological and palaeontological material held by varied provincial institutions. The purpose of this meeting is to assess the relevance of such collections to the solution of scientific and environmental problems and to stimulate co-operation nationally. Speakers will include those involved professionally in organising collections and a wide variety of users.

The programme will consist of the following topics:-

Wednesday 21st.	Registration 5.00p.m. on and dinner.
Thursday 22nd.	Origins of natural history collections. Index to natural history collections. Museum collections in North West England. Living collections and conservation of rare plants. Type specimens a. For retention in provincial museums. b. Against retention in provincial museums. Local collections and their taxonomic value. Reception at Merseyside County Museums.
Friday 23rd.	The detective role in locating 'missing' collections. Problems with the dispersal of collections. Historical/biographical studies arising from the use of local collections. Natural History collections and distribution maps. Centralising data storage and retrieval. The future - general discussion. Conclduing remarks.

For details of costs please contact:

E. F. Greenwood,
Assistant Director,
Merseyside County Museums,
William Brown Street,
LIVERPOOL.

Closing date for applications - 10th August, 1977.

AGATE EXHIBITION AT SHEFFIELD MUSEUMS

A temporary exhibition of agates from the Peter Rodgers' collection will be staged at the City Museum, Weston Park, Sheffield, from April 2nd to May 8th 1977.

Peter Rodgers, a Sheffield lapidary enthusiast, has made a special study of British agates and is author of a recent book on the subject.

The exhibition is expected to contain sections on the composition and formation of agates, and on the use of agates in lapidary work. Agates from the principal British localities will be featured.

Tim Riley
Sheffield City Museums

THE PALAEONTOLOGICAL ASSOCIATION
CONSERVATION FUND FOR 1977

This fund is available for the purchase or long-lease of geological sites of palaeontological importance. Up to £100 annually can be awarded at the discretion of Council. Organisations concerned with conservation are now invited to submit applications for grants from the fund for 1977. Applications should contain all the relevant details of the site and conditions of its purchase or long-lease, and should be addressed to the Secretary of the Palaeontological Association:

Dr. C. T. Scrutton,
Department of Geology,
The University,
Newcastle-upon-Tyne, NE1 7RU.

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HUNTERIAN MUSEUM

THE UNIVERSITY GLASGOW G12 8QQ telephone: 041-339 8855 ext. 288

TRAVELLING EXHIBITIONS IN THE NATURAL SCIENCES

The Hunterian Museum has started a project under the Job Creation Programme to prepare travelling exhibitions in the natural sciences because there is a dearth of these. Our idea is to produce three or four small exhibitions suitable for circulation by the Council for Museums and Galleries in Scotland. We wish to cater for the needs which are already felt by Scottish Museums, schools, and other potential users, and would like to have comments on the following topics which we are considering, or suggestions for others, as soon as possible:-

Jaws and Fans (Adaptations for Feeding)
Dating the Past
Domestication of Plants and Animals
The Loch Ness Monster
Puffins
North Sea Oil
Animal Locomotion

TRAVELLING EXHIBITION UNIT

Jane Newton, Naturalist
Stuart Paterson, Designer, 3D
Graham Cooper, Designer, Graphics

Jane Newton.

JANE NEWTON

Lapmaster

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

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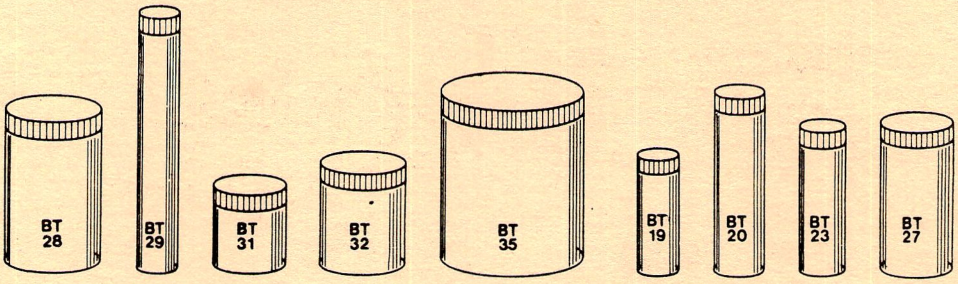
'Alexapack' Specimen Containers

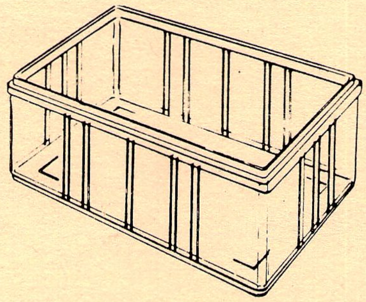


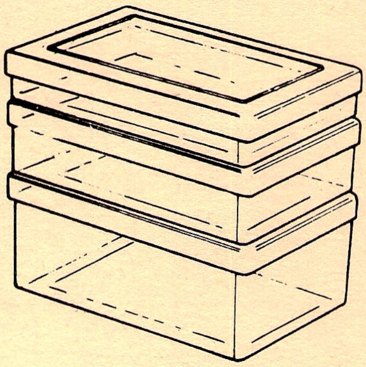
Cat. No.	Approximate		
	Diameter	Height	Capacity
BT-19	15 mm	40 mm	5 ml
BT-20	18 mm	62 mm	13 ml
BT-23	16 mm	50 mm	7 ml
BT-27	26 mm	50 mm	20 ml
BT-28	34 mm	52 mm	40 ml
BT-29	15 mm	89 mm	10 ml
BT-31	26 mm	26 mm	11 ml
BT-32	30 mm	34 mm	15 ml
BT-35	51 mm	57 mm	100 ml

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

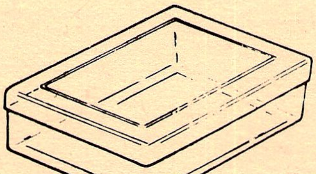
'Dines' Rectangular Boxes

Cat.No. A6-60





Cat.No. 128



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

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

* Available with partititons, if required.

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