GEOLOGICAL CURATOR

Volume 9 Number 4

GEOLOGICAL CURATORS' GROUP

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

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

2010 COMMITTEE

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Cover: Ron Pickford, left, sharing thoughts with Bev Halstead over a fossil, on the morning of 30 April 1991. See paper by Hugh Torrens inside.

THE GEOLOGICAL CURATOR

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CONTENTS

EDITORIAL

The contents of this issue were supposed to be a thematic set of papers on Hugh Miller and his collections. Due to unforeseen difficulties that plan has been delayed and this issue contains a mix of papers. Some of these were intended to be in a subsequent ‘special’ of papers from the 3rd International Palaeontological Congress, held in London last July. GCG co-convened a session on palaeontological collections at that meeting with Sarah Long of the Natural History Museum in London. A future issue of this journal will include more contributions from that meeting, but given the very wide spectrum of topics which were presented, it does not detract from that prospect to include here those which have been through review and revision already. Accompanied by others submitted in the normal routine, this will hopefully be an interesting issue for most readers.

You may notice a difference in the binding of this issue. By switching to a digital printing machine and perfect binding, costs are considerably reduced over traditional printing methods. It may well allow the use of colour printing where contributions merit it, without undue extra costs. Please let us know through the GSCG JISC mail list, or any other means, what you think. Are you happy with the production quality of this issue over previous issues?

Matthew Parkes, December 2010.

CURATION OF COMPLEX PALAEONTOLOGICAL OBJECTS: A CASE STUDY OF DENSELY ENCRUSTED COBBLES FROM A JAPANESE PLEISTOCENE LOCALITY

by Diana Clements and Paul D. Taylor

Clements, D. and Taylor, P.D. 2010. Curation of complex palaeontological objects: a case study of densely encrusted cobbles from a Japanese Pleistocene locality. *The Geological Curator* 9 (4): 229-235.

Fossils most often consist of discrete objects, such as the shell of a brachiopod, or individual bones of a vertebrate skeleton. Cataloging and labelling these specimens is relatively straightforward. However, fossil hard substrates (shells and lithoclasts) with multiple encrustations and borings made by marine organisms can present a greater challenge, as exemplified by material recently collected from a remarkable locality in northern Japan. About 6.5 metres of marine gravels belonging to the Pleistocene Setana Formation, dated at about 1 million years old, are exposed at Kuromatsunai. The well-rounded lithic clasts and associated shells are densely encrusted by well preserved bryozoans and other sclerobionts on all surfaces. Up to 25 different bryozoan species can be found on a single cobble. Full curation of such cobbles is difficult: with little or no free space for affixing labels, how can individual encrusters be indicated and catalogued? Here we present the results of our evaluation of various imaging techniques (microphotography, macrophotography, SEM, 3-D laser scanning etc), and ways of incorporating annotated images into the specimen database (KE EMu) used at the Natural History Museum. A combination of macrophotography and SEM produced the best solution in providing high resolution digital images that could be annotated and uploaded into the KE EMu database.

Diana Clements and Paul D. Taylor, Department of Palaeontology, Natural History Museum, London SW7 5BD, UK. Email: d.clements@nhm.ac.uk; p.taylor@nhm.ac.uk

Introduction

A goal of most curators is to have all of the specimens in their care individually and uniquely numbered and comprehensively catalogued. In the case of fossils, numbering usually entails either gluing a label or painting a number onto the specimen, preferably on the matrix or some part of the specimen which can be covered without obscuring important scientific details (although smaller specimens may be contained in tubes or cavity slides). Such procedures are relatively straightforward in the case of specimens comprising a single individual, or parts of an individual (e.g. vertebrate bones). Difficulties arise when specimens (objects) consist of more than one individual or even multiple species. Good examples are provided by bedding plane assemblages, such as those from the Wenlock Limestone found in many museum collections in Britain. The usual solution to curating these complex specimens is either to employ labels with arrows to indicate particular species or individuals (Figure 1), or simply not to specify the locations of the different individuals or species on the specimen but just to list them on the label. Neither method is satisfactory. In the first case, arrows and labels may cover areas of interest and invariably detract from the visual appearance of the specimen. In the second case, those studying the specimen in the future may not know which individuals were considered by the cataloguer to be which. This problem is especially serious if, for example, the specimen includes the holotype of a species among other conspecific individuals.

A research collection of almost 1000 densely encrusted lithoclasts and bioclasts (shells) from a remarkable new Pleistocene locality in northern Japan presented a major curatorial challenge: how could individuals (or colonies) on each clast be uniquely numbered and specified in such a way that they could be relocated in the future? Gluing labels onto the surface of the specimens was particularly undesirable in this instance because the scarcity of free space on many of the clasts would have meant placing these labels directly onto the surfaces of the fossils themselves (Figure 2). The only practical

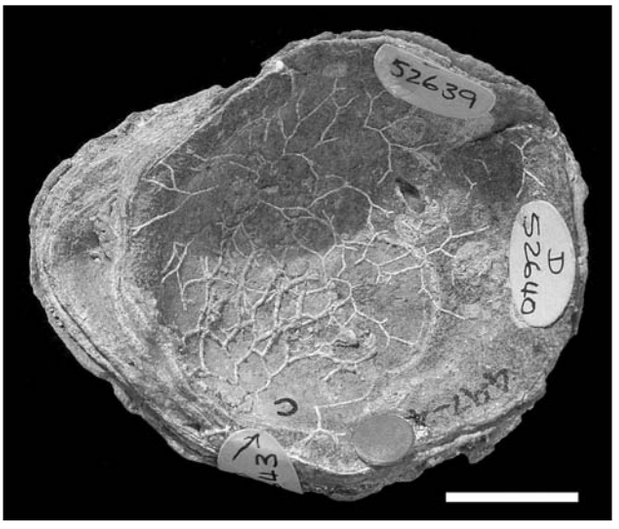

Figure 1. Example of multiple species and colonies of bryozoans identified on a bioclast (oyster) using labels and arrows.* Stomatopora *spp., NHM D54639-43, Jurassic, Bathonian, Gloucestershire. Scale bar = 1 cm.

solution to this problem appeared to be 360° imaging of the clast surfaces, coupled with annotation of the digital images. Accordingly, we undertook a project to evaluate various methods of imaging and how best the images could be annotated and incorporated into the NHM's specimen database. The results of our project, described in this paper, have broader significance with regard to the best methods for the curation of complex specimens in natural history.

Geological background

An outstanding site for fossil encrusting bryozoans and other inhabitants of hard substrates ('sclerobionts', see Taylor and Wilson 2003) was discovered in 2005 at Kuromatsunai on the island of Hokkaido, Japan. The Pleistocene Setana Formation exposed in a small quarry here comprises some 6.5 metres of marine gravels containing pebble- and cobble-sized clasts. The exact depositional environment is unclear; Takashima *et al.* (2008) interpreted it as a nearshore environment, whereas Taylor *et al.* (in press) favoured deposition in a deeper, subtidal channel. Because of the exceptional richness of bryozoans, the locality was nicknamed 'Kokemushi Paradise', kokemushi being the Japanese word for bryozoans (Dick *et al.* 2008).

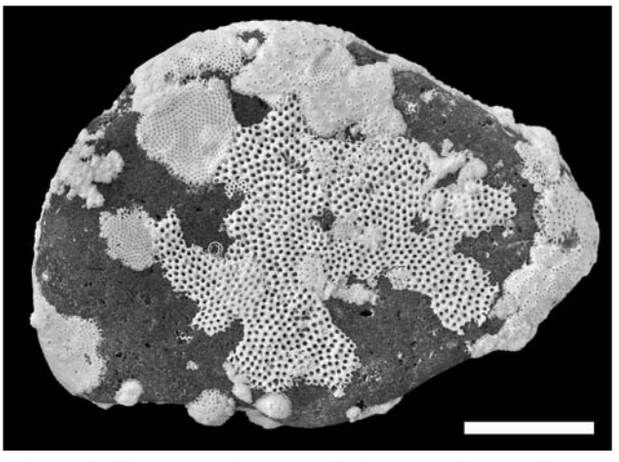

Figure 2. Lithoclast from the Pleistocene Setana Fm. of Kuromatsunai, northern Japan, profusely encrusted by bryozoans. NHM BZ 5560. Scale bar = 1 cm.

Almost all of the clasts at Kokemushi Paradise are densely encrusted by bryozoans, which are accompanied by subordinate stylasterid hydrocorals, barnacles, serpulid worms and foraminifera. Associated bioclasts formed by bivalve shells also support a rich encrusting biota. Over 100 encrusting bryozoan species have been identified. In most cases encrusters can be found on all surfaces of the clasts. Coverage varies but is often greater than 50% and some small clasts are totally enveloped by encrusters. Up to 25 bryozoan species can be found per clast, although individual clasts more commonly host fewer than a dozen species. Several colonies of single bryozoan species may occur on each clast. Most of the bryozoans are superficially similar and have sheet-like colonies. There is ample evidence that they competed actively for living space in the form of skeletal overgrowths.

Coarse sediments seldom contain such well-preserved fossil faunas - some of the Kuromatsunai bryozoans even preserve delicate spines in-situ. Therefore, Kokemushi Paradise offers great potential for palaeoecological research, including analysis of ecological succession, competitive hierarchies among species, and the effect of clast shape and size on diversity. In addition, the locality is important for understanding the climate and oceanography of the Japanese islands during the Pleistocene.

During two relatively brief collecting trips some 700 encrusted lithoclasts and over 200 bioclasts were obtained for the NHM collections. A subsample of 50 lithoclasts was employed in this study to evaluate methods for curating these complex fossils.

Sample preparation

The Kuromatsunai clasts were carefully cleaned prior to imaging. Most of the specimens had sediment grains adhering to at least one surface. Pressure solution effects are apparent and clearly contributed to the cementation of carbonate grains, including sand-sized fragments of echinoderms, molluscs, barnacles and bryozoans, to the surfaces of the encrusters. After washing the clasts in water to remove the finest material, the following methods were used for developing:

(1) Fixed needle. For specimens having only isolated grains of sediment adhering to them, a sharp mounted needle was usually effective in being the most time-effective and least damaging.
(2) Mechanical methods. Where specimens have areas encrusted with sediment, a compressed air pen proved effective. The Split-V Pen was also trialled. This ultrasonic tool has proved useful for preparation of soft, less well-cemented matrices (Doyle *et al.* 2004) and produces similar results to the compressed air tool. However, on occasions parts of the encrusting fauna were also disturbed and it was felt that the compressed air pen was the safer of the two methods. Mechanical cleaning proved to be a time-consuming process and with such a wealth of available material, specimens without appreciable sediment encrustation were favoured for further study.
(3) Ultrasonic bath. This method was insufficient to remove adherent sediment grains but it was used on pebbles prior to SEM imaging to remove dust particles.

Imaging

We experimented with several different imaging techniques and combinations of techniques. Below we describe these techniques and evaluate them in terms of time expenditure and quality of the results.

Digital 2-D photography using a conventional single lens reflex (SLR) camera:

Photographs were taken of each 'side' of the specimen so that the entire outer surface was imaged. This usually required 6 photographs per specimen. The photographs were taken by one of the NHM's professional photographers, Phil Crabb, using a Nikon D200 camera with a 60 mm macro lens. Specimens were lit predominantly from the top left using mirrors to illuminate the details. Individual image files (tiffs) were roughly 25-30 Mb in size, with a resolution of 240 dpi at a size of 30-35 cm wide. For each specimen it took on average about one hour to photograph, electronically excise the resulting images and paste them onto a black background with a scale to form a montage with other images of the same specimen (Figure 3).

Digital 2-D imaging using an AxioCam HRc:

The Zeiss AxioCam Hrc is a digital camera and associated software that enables merging of multi-image scans to produce a single, well-focused image of a non-flat specimen. The results obtained were, however, disappointing in comparison with the digital photographs taken by a professional photographer experienced in optimizing illumination etc. The increased depth of field possible with the AxioCam did not make up for the generally poorer appearance of the images.

Figure 3. Photomontage of 6 different views of a bryozoan-encrusted lithoclast from the Pleistocene Setana Fm. of Kuromatsunai, northern Japan. NHM BZ 5457. Scale bar = 1 cm.

3-D scanning using a Konica-Minolta VIVID 919 3D Laser Scanner:

Limited experiments were made using this system, which is a high-resolution laser digitizer capable of collecting large amounts of 3-D data quickly and accurately. It soon became apparent that the resolution of the instrument was insufficient for our needs and the images required considerable editing. In addition, annotation of these, and indeed any other, 3-D images would be far less straightforward than 2-D images. Therefore, no other 3-D imaging techniques were explored.

Dinolite and Veho Digital Microscopes:

These low-cost digital microscopes were considered to possess some potential, especially when the clasts were lit properly. However, our results were much inferior to those obtained by a professional photographer using a digital SLR camera. The Dinolite comes with a stand and results were considerably better than with the Veho where adjustment is very limited. With a correct set up, the advantage is that images can be taken very rapidly and are automatically transferred to a PC for immediate processing. Larger, more expensive digital microscopes were not tested but could prove satisfactory in the hands of an experienced user.

Low vacuum SEM:

Scanning electron microscopy employed a Leo 1455-VP, an instrument capable of operating in low vacuum mode to image large specimens without the need for coating with a conductive metal. Images were formed from backscattered electrons rather than the secondary electrons employed in most SEMs. In order to give the impression of relief, two of the four quadrants of the ring-shaped backscattered electron detector were turned off. Tests were undertaken taking multiple images for montaging from two sides of a relatively flat, small pebble (286 x 175 mm). In the first test the microscope stage was moved mechanically from one frame to the next, with 24-25 images taken on each side of the clast at a relatively low resolution (magnification x 54). Imaging of the entire clast took about two hours. In order for the illumination across the image to remain even, it was essential to have all four quadrants of the backscattered electron detector turned on, thus diminishing the relief effect. The digital images were montaged manually using Photoshop and also automatically using INCA software, taking about an hour in each case. Unfortunately, edge distortion of individual images produced problems when joining the images: the automatic montage had a stepped edge and, while the manual montage lacked these steps, this was at the expense of internal misalignments between adjoining images.

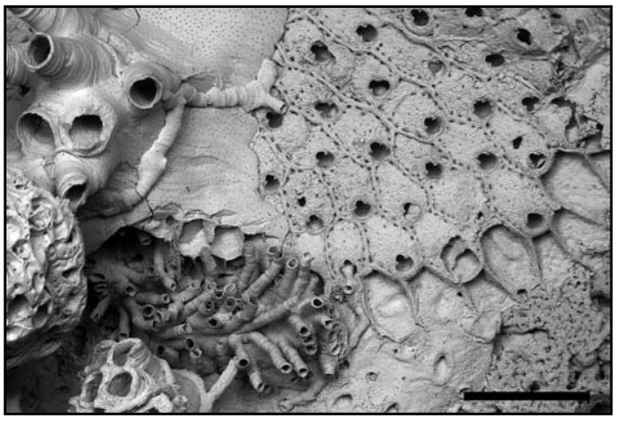

Figure 4. Scanning electron micrograph of part of the surface of a lithoclast from the Pleistocene Setana Fm. of Kuromatsunai, northern Japan, showing dense encrustation by well-preserved bryozoans belonging to several different species. Imaging was undertaken in a low-vacuum SEM using backscattered electrons. NHM BZ 5827. Scale bar = 1 mm.

A second test was run at a higher magnification (x 150), with the SEM set on auto imaging in which the stage was driven automatically from one frame to the next. This was a much speedier process that only took 35 minutes but problems with montaging remained. Nevertheless, for imaging of individual colonies, SEM is the best method as it alone captures clearly all of the small-scale morphological features necessary for species identification (Figure 4).

Comparative results using three methods - digital SLR, AxioCam and SEM montaging - on the same clast are depicted in Figure 5. In view of these results, a decision was made to take SLR photographs of the clasts in different orientations in order to image the entire surface, supplemented by SEM images of detailed features. In practice it was found that it was not always necessary to image all the way around the clast; most often images of the two flattest surfaces were enough to show all of the encrusters. Optimal lighting is of particular importance during photography. In our case the professional photographer lit the specimens using a continuous light source (Cyberlight) with tungsten and flash lighting when needed.

Image annotation

The most time-consuming aspects of registering all of the species present on any single clast are taxonomic identification and annotation of images to show species locations. A single imaged specimen

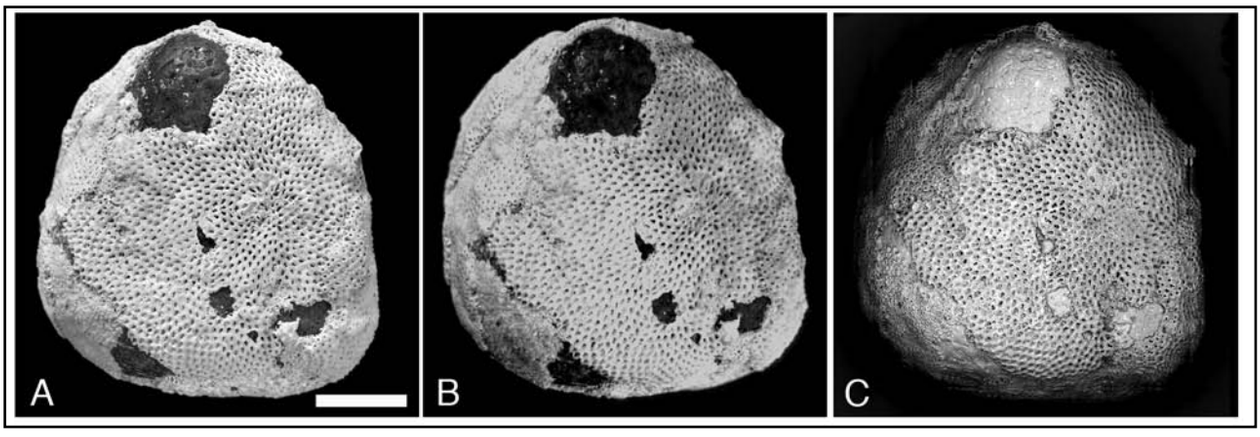

Figure 5. Lithoclast (NHM BZ 5482) from the Pleistocene Setana Fm. of Kuromatsunai, northern Japan, imaged using three different techniques: (A) digital SLR, (B) AxioCam multi-image scan, (C) SEM montage. Note that the dark lithoclast surface showing through in patches between the bryozoan colonies is less evident in the SEM image (C). Scale bar = 5 mm.

was chosen to test alternative methods of addressing the problem of annotation. All bryozoan colonies were outlined by hand on a printed image of the clast and each colony was identified to the lowest taxonomic level possible, preferably species. The next stage was to annotate electronic images with the names of the taxa present. This was done by first pasting the images into PowerPoint, a readily available, standard program allowing quick and easy image manipulation and labelling as well as conversion of annotated images into jpegs.

Labelling species using arrows

Arrows were drawn to the centres of each colony and labelled with the species name. While this method enables rapid image annotation, it became difficult for the precise position of small or overlapping colonies to be indicated and the method does not map the full extent of the different colonies or species. However, the method has the advantage of being quick and is particularly suitable in cases where only one colony of a particular species is present.

Labelling species using highlights

It is straightforward in PowerPoint to highlight the extent of an entire colony by tracing the outline using the freeform drawing tool, editing the positions of the points if necessary, and applying a fill colour set at an appropriate level of transparency to enable the colony to be seen through the colour overlay. Different species could be highlighted using different colours, with a key appended for identification. Problems arose when a large number of different species were identified on an individual clast, firstly because the range of distinguishing colours was limited when only a pale tint was required, and secondly because dense patchworks of colour became extremely bewildering. The method works best when a single species is identified represented by several different colonies on the clast. As individual species are registered separately in KE EMu, this is the method adopted, with each colony of the species highlighted. Where the colonies encrusted more than one side of the clast, two or more images were needed.

Each bryozoan colony was outlined using the 'autoshapes' function of PowerPoint. The outline was then adjusted using the 'edit points' option, dragging the outline to the appropriate position. A 'fill color' was then chosen and, under 'fill effects', a 'transparency' of 70% was specified. This level of transparency was found to be optimal in providing sufficient colour to differentiate between different colonies while allowing the surface details to remain visible. We chose to show the 'line color' for the outline as 'no line' but there is an option to show it in black or any other colour desired (Figure 6).

Incorporating images into the specimen database

The NHM's specimen database KE EMu allows images to be uploaded into its 'Multimedia' field (Sendino 2009). Images can then be displayed on the Internet and can be accessed by members of the public via the NHM website.

Each clast was registered using a unique number with the prefix bryozoan BZ. Within this number individual species were registered with the suffix numbers (1), (2), (3) etc. Where more than one colony of a single species is present, the colonies can then be differentiated using letters. So, for example, two different colonies belonging to species 2 would be (2A) and (2B).

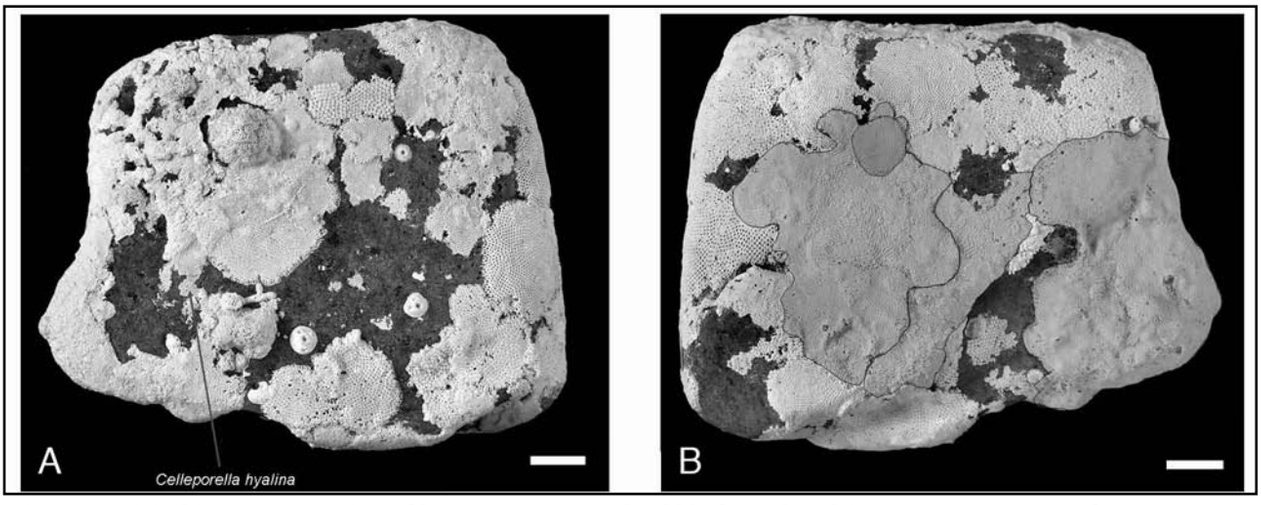

Figure 6. Digital image annotation of bryozoan-encrusted pebble from the Pleistocene Setana Fm. of Kuromatsunai, northern Japan, BZ 5457. (A) using an arrow to identify a single small colony of an individual species (*Celleporella hyalina*). (B) using highlights to identify a species (*Schizomavella *cf.* magniporata*) with multiple colonies. Scale bars = 1 cm.

As the highlighted clast images were created in PowerPoint, the initial experiment aimed to incorporate all of the processed SEM images of the species from the clast in question into the same PowerPoint file and to upload the completed file into the Multimedia field of KE EMu. This had the advantages of: (1) speed of entry as it was only necessary to label the initial page of the PowerPoint file with all the specimen details; and (2) ease of browsing the images as only one file needed to be opened to see all of the labelled images. However, as such PowerPoint files would only be available internally to researchers in the NHM and not over the Internet, it was considered more appropriate to convert each annotated PowerPoint slide into a jpeg and load these separately into the Multimedia field of KE EMu (Figure 7). There is an option to enter the images via a bulk import tool using Excel, incorporating appropriate labelling as required. Unfortunately, the web images are necessarily small in size and cannot be enlarged much without loss of resolution. A better option would be to upload both the complete PowerPoint file and the individual jpegs but this is very time consuming.

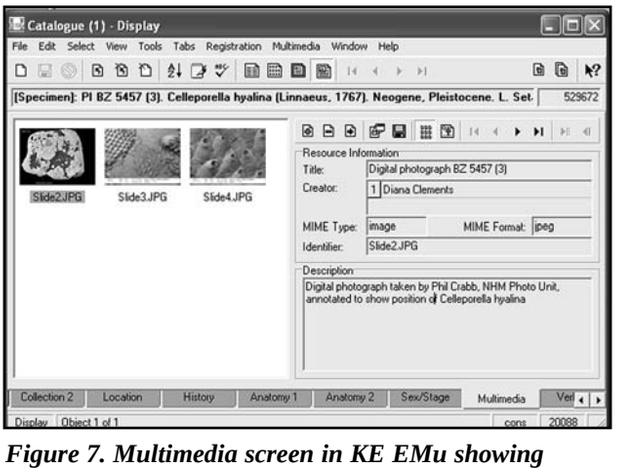

Figure 7. Multimedia screen in KE EMu showing annotated digital SLR and individual SEM images that are accessible from the Internet.

Physical curation

Individual clasts are housed in separate specimen trays of an appropriate size. This has the advantage of preventing the specimens from rubbing together and causing damage to the encrusting bryozoans, as well as isolating them for labelling purposes. Trays with acetate lids are employed, a label with the specimen number being glued to the lid and a printed paper label with the specimen details included in the tray. It would also be possible to include annotated photographs in the trays with the specimens should this be desired. However, the small size of the specimens would mean either using over-sized trays or printing the images at a very small size to fit within the trays. With respect to the SEM images, these are incorporated into a card index file for bryozoans in general, the images being printed onto labelled record cards (20.2 x 12.7 cm). Additional cards can be readily printed with the annotated images for filing elsewhere, or pages containing these images could be interleaved with normal pages in the paper register.

Conclusions

The curation of clasts of the complexity of those from Kokemushi Paradise inevitably takes considerably longer than for most fossils. The first task was to identify the species present. With nearly 1000 clasts and over 100 species (see Taylor *et al.* in press), compromises were made and not every single species was identified. Several clasts were selected

for complete cataloging and others were only partly catalogued. Where only one species was imaged using the SEM, then just that image was uploaded onto KE EMu. Where several species were imaged on the same clast, a digital photograph was taken and annotated using arrows for single colonies of species and highlighting for multiple colonies. Both the annotated digital image(s) and the SEM images were then uploaded onto the KE EMu database. It was only felt necessary to take digital photographs of the side of the clast that was used for the SEM images. In one instance, a clast was photographed on every side, all of the species were identified and the digital photographs were annotated accordingly. For each species a separate image was created in PowerPoint and uploaded onto KE EMu. Not every species was accompanied by SEM images. In an ideal world every species on every clast would be imagined using SEM but because of time constraints only the best specimens were selected for SEM imaging. Where necessary individual species were accompanied by annotated digital photographs and uploaded with the SEM images onto KE EMu. Other species on the same clast that had been identified would be registered separately but would not have Multimedia attached.

Appropriately annotated digital images provide a successful solution to curatorial problems posed by complex specimens. Rather than affixing labels to the specimens themselves, with consequent masking of parts of the specimen, labelling can be undertaken in a virtual environment. For the bryozoan-encrusted clasts from the Pleistocene of Kuromatsunai, Japan, a combination of conventional digital photography using an SLR camera and low vacuum scanning electron microscopy proved to be the best imaging option.

Acknowledgements

This study was supported by a grant from Natural History Museum Special Funds. We thank Phil Crabb of the Natural History Museum Photo Unit for digital photography; Lauren Howard for SEM montaging; Jonathan Krieger, Andy Henderson and Norman MacLeod for advice on various other imaging techniques; Adrian Doyle for his help and advice on the preparation of the specimens; Matt Dick and Dennis Gordon for assistance in identifying the bryozoan species; Consuelo Sendino and Giles Miller for advice on the KE EMu registration system; and the Japan Society for the Promotion of Science (JSPS) for funding a visit to Hokkaido. Patrick Wyse Jackson is thanked for his comments on the manuscript.

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LOST & FOUND

Enquiries and information, please to Matthew Parkes, (National Museum of Ireland - Natural History, Merrion Street, Dublin 2, Ireland; e-mail: mparkes@museum.ie). Include full personal and institutional names and addressess, full biographical details of publications mentioned, and credits for any illustrations submitted.

The index to 'Lost & Found' Volumes 1-4 was published in *The Geological Curator* 5(2), 79-85. The index for Volume 5 was published in *The Geological Curator* 6(4), 175-177.

Abbreviations:

CLEEVELY - Cleevely, R.J. 1983. *World Palaeontological Collections*. British Museum (Natural History() and Mansell Publishing Company, London.
GCG - *Newsletter of the Geological Curators' Group*, continued as *The Geological Curator*.
LF - 'Lost & Found' reference number in GCG.

266. Stolen Campo de Cielo meteorite and Solnhofen dragonfly

Dr Patrick N. Wyse Jackson, Curator, Geological Museum, Department of Geology, Trinity College, Dublin 2, IRELAND. Tel: 35318961477; email: wysjcknp@tcd.ie

Could you be on alert for specimens that have been stolen from our displays: a fist-sized piece of the Campo de Cielo meteorite and a Solnhofen dragonfly. If these are offered to you please could you let me know.

DARE TO PREPARE? THE VALUE OF PREPARING AND SAMPLING HISTORICALLY IMPORTANT MUSEUM COLLECTIONS

by Christian Baars

Baars, C. 2010. Dare to prepare? The value of preparing and sampling historically important museum collections. *The Geological Curator* 9(4): 237-242.

The Museums Association defines museums as places to '…enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens which they hold in trust for society' (Museums Association 2002). Associated with this is the obligation to maximize the value of each object for future use. This applies not only to the data associated with objects, but also to the physical and chemical integrity of each object. It is therefore critical that the demands placed on natural history objects for current research and educational uses are balanced with the need for preservation of the objects for potential future uses. In order to maximize the research potential of museum collections, in some circumstances it may be appropriate to remove samples, conduct invasive tests, or otherwise impact the chemical or physical integrity of objects. Decisions regarding the appropriateness of such requests must balance the legitimate needs of the scientific community with the long-term preservation of the collections for future needs - including future research needs - that might be constrained by current sampling or invasive preparation.

Baars, C. Department of Geology, National Museum Wales, Cathays Park, Cardiff, CF10 3NP, Wales, UK. email: Christian.Baars@museumwales.ac.uk.

Value

Requests to prepare and sample objects in the care of museum collections for research purposes often lead to enormous ethical dilemmas. Preparation may be for analysis or identification, and can be invasive or even destructive in that following preparation and sampling the object may not be in its original state. Before any destructive treatment is carried out we therefore need to ask a series of questions. Is the object irreplaceable, or can similar objects be collected again? What is the value of the object? Will sampling enhance its value, albeit being invasive or even destructive?

Value is a multifaceted concept. When we talk about value many people will immediately think of monetary significance, although objects - particularly those in museum collections - can have different types of value. There is obviously the resell value of, for instance, a painting; these are the kind of objects that raise public discussions if their disposal by sale is proposed (cf. Heal 2006). But objects also have properties that can be ascribed didactic, aesthetic, cultural, heritage, or entertainment value. It is not easy, however, to determine the value of an object because some aspects of valuation are subjective and context sensitive, and may depend on the purpose of the valuation and the perspective and level of knowledge and expertise of the valuer (Jeram 1997).

Scientific value

What scientists are most interested in is, naturally, the scientific value of objects. This immediately highlights an important bias: people with different backgrounds will regard the same object in different ways. An artist will look at a Turner painting and admire the aesthetic characteristics of the painter's technique; a scientist will look at the same object and admire the eye for detail, the potential of the painting as a recording of a moment in time in that landscape's evolution, and, if they know the landscape, will analyse whether it has changed in the time since the snapshot of the creation of the painting. A landscape painting might document that, at the time of painting, say, 200 years ago, there was a row of trees along a river, which has now disappeared - maybe an indication of the intensification of agriculture which led to a decline in biodiversity. In that sense, many art objects have a natural history value. Likewise, an object regarded as having great scientific value may have no value at all outside the context of science.

The scientific value of an object constitutes a link between the scientific process and material evidence. What does the object tell about the processes that operate in the natural world? And, what does the object tell me about the method of doing science itself? The importance of scientific value cannot be understated. Were it not for museum collections our knowledge of evolutionary changes would be more restricted, and we would know less about environmental changes and biodiversity. Natural history collections are a snapshot of the past, and therefore a sort of record book. While most types of value are subjective and context sensitive, and therefore difficult to assess, it ought to be possible to determine the scientific value of an object fairly objectively due to the objectivity of science. This was attempted by Jeram (1997), who suggested two categories of objects: scientifically important material - objects which are integrated into the fabric of science - and material of value to science - objects which facilitate scientific work. The former includes type, figured and cited specimens; the latter incorporates material that is kept to establish and preserve a standard in scientific investigations, and objects with potential for being scientifically important (Jeram 1997). Jeram concluded that, while establishing the type of value of objects can be straight forward, quantifying the scientific value of collections still contains an element of context sensitivity and, hence, subjectivity which cannot be avoided.

Historical value

But collections, including natural history collections, also have a historical, even cultural, value. An important part of an object's history is the value of seeing how this object was perceived at the time it became part of the museum's collection. An object may also be important simply because it constitutes part of the compilation of a famous collector. Many collections reflect aspects of the scientific process of different times in history, and therefore offer a magnificent window into the history of science. The collector may have made important contributions to science, and the sheer presence of a collection by this person serves as a constant reminder of their work. For instance, Charles Darwin's work on barnacles was groundbreaking. The Zoology Museum in Cambridge holds a collection of barnacle slides prepared by Darwin, using tar to glue the cover slips onto the slides. Over the years, this tar has seeped towards the centre of the slides, obscuring the barnacle samples and rendering them almost useless for further taxonomic study. However, it appears highly unlikely that anyone would suggest cleaning the slides to preserve the barnacles because this process would permanently eliminate - with all its imperfections - the fact that the objects were prepared by Darwin himself. The presence of the tar encroaching on the barnacles creates a historical aspect that constitutes a link between the object and the collector.

Future value

Museum collections are ever expanding, but it is hard to find curators arguing lightly for the disposal of natural history collections, not even of objects that so far have not demonstrated their full scientific importance. Only because an object has not yet proved important does not mean that with changing interpretations due to, for instance, new scientific discoveries, this object might not acquire enormous importance at some future time. Objects should be curated on the premise that the collector probably did not perceive the full extent of the scientific value of the object. The scientific literature is full of examples of 'overlooked' objects or specimens that were rediscovered in the light of new scientific expertise. For instance, DNA recovery and reconstitution were completely unanticipated by collectors or curators prior to the 1980s, but it now forms one of the most important instruments in genetics, and, as such, also in taxonomy. In this sense, even 'old dead rats are valuable' (Diamond 1990). Similarly, the discovery in 1983 of the conodont animal in Geological Survey collections in Scotland 50 years after its collection is a striking example of the potentially enormous scientific importance of 'ordinary' collections (Briggs *et al.* 1983, Knell 1991). Natural science objects contain complex information, and there is always the potential that more scientific data can be extracted from an object. For this reason, objects are kept in preference to data.

Similarly, only because an item has reached a certain age does not mean that it is worthless, in all the non-monetary senses of the word. On the contrary, increasing age may make an item more valuable and collectable, maybe because it is increasingly rare, or because it is no longer possible to collect similar material because, for instance, the quarry where the object came from has been used as a landfill site. There are important ethical, legal, cultural, historical and scientific reasons why old collections should be continued to be kept. But new collection space is always needed - collecting never stops and stores are ever growing. And if there is no room to grow there is always somebody at hand who will suggest the dreaded D word - disposal, aptly discussed by Heal (2006). This is a contentious issue, hotly debated in museum circles; there may be circumstances under which disposal can act as a useful collections man-

agement tool (cf. Merriman 2006), for example when preserving a number of objects has the potential to damage science by acting as a drain on finite resources. However, there is no way back once a decision to dispose of an object has been taken. As a consequence, and rightly so, even under the most severe pressures for new collection space, museum policies, procedures and ethical considerations make it very difficult indeed to dispose of existing collections.

Preparation and sampling

Preparation and sampling are often necessary to move science forward, and add value to museum objects. For example, accurate species identification is at the heart of natural science collections. The purpose of modern natural science collections is to form a huge library of information about what organisms have lived and are living on Earth, which forms the basis for many sciences and, ultimately, our society and culture. Accurate identification of natural science objects is as vitally important information as are data on when, where and by whom they were collected. Not always is it straightforward to extract these data from an object. Carbon dating in archaeology involves the destructive processing of small amounts of the object. Biological samples can often only be identified correctly using modern methods of DNA analysis. Many insects need to be dissected to study details of their genitalia before they can be identified. Similarly, many fossil specimens require preparation prior to correct identification. This preparation is often invasive, even destructive: the original object has to be sampled in a way that alters its appearance irretrievably.

In the case of some fossils, discussed in great detail by Scrutton (1979) using the example of corals, species can only be identified by making sections of the fossil at different intervals. This is, in effect, a destructive process; although information is gained about the animal's identification, anatomy and sometimes environmental conditions, the original fossil is irretrievably altered. The sections, of course, can be kept with the remains of the fossil and are even sometimes accessioned separately, but the prepared object can no longer be used for display as a beautifully formed example of this particular species. Any researcher who intends to sample an object invasively or destructively should therefore provide evidence that the information gained by the proposed sampling cannot be gained by any other means (Anon. 1994).

Newly collected fossil corals are often routinely sectioned for identification prior to accessioning. But what to do with an old, historical collection that has never been identified? Scientific study of the collection - and with that, information about the locality the specimens originated from, and their (palaeo-) environment and ecosystem - is only possible if the objects are correctly identified. Identification absolutely requires sectioning as there is currently no technique that allows this information to be gained non-invasively. How does this interfere with the historical value of the collection?

This is an ethical question of collection management. It may be argued that a collection of unidentified objects has no scientific value at all. The ultimate prerequisite for any biological and palaeontological study is accurate species identification. If the object cannot be prepared it cannot be studied; if it cannot be studied it is in danger of becoming a memento - well looked after in acid-free boxes in a tightly environment-controlled store, but pretty much useless to science. Questions such as "What was the environment and climate like in which these organisms lived?" or "What was their geological and geographical range?" become purely academic. The only value left is that of potential for being scientifically important. This puts it into the most subjective of Jeram's (1997) categories, and the one that puts it most at risk of being disposed of should resource pressures force a review of the collections with a view of retaining only material with proven value. It is conceivable that in such a scenario the object may only be saved if it has a known historical, or potential scientific, value; both these factors assume the presence of adequate knowledge, expertise and consideration by the curator responsible. Every case therefore has to be treated on its own merits, and expertise may have to be sought externally before coming to a decision.

Research value

Research enhances the value of collections, and many institutions have, in recent years, established procedures to formalise the preparation, invasive sampling and analysis of natural history objects. This was aided by the Society for the Preservation of Natural History Collections' "Documentation Guidelines for the Preparation and Conservation of Paleontological and Geological Objects" (Fitzgerald 1988), and the Museums, Libraries and Archives Council's (previously: Museums and Galleries Commission) "Standards in the museum Care of Geological Collections" (Anon. 2004a; first edition published in 1992). The intention of such policies and procedures is primarily to minimize the impact of invasive procedures on objects. In the UK, this

was accelerated by the Human Tissue Act 2004 (Anon 2004b), although many institutions started implementing sampling procedures from the 1980s onwards, particularly in molecular biology and archaeology (Cato 1993).

Policies and procedures help to make an unbiased decision on whether requests should be granted or not. National Museum Wales has had a sampling procedure for over ten years, which, particularly in the Department of Archaeology and Numismatics, is frequently applied as a result of requests for sampling (Elizabeth Walker 2010 *pers. comm*.). Experiences are generally positive, even though some researchers may find the approach taken by museums bureaucratic and tedious. But scientists must bear in mind that the legitimate needs of the scientific community need to be balanced with the long-term preservation of the collections for future needs. Sampling, by its very nature, results in the partial or complete destruction or alteration of the original object, thereby sometimes making further analysis of the object difficult or impossible. While the research requirements need to be balanced with preservation, the intention of policies and procedures is not to prevent research but to minimise the damage to the object and its potential for future use.

It also needs to be taken into consideration that analytical techniques develop at a fast rate. It is now possible to undertake computer tomography scanning of fossils, opening a window of opportunity to avoid the preparation of sections of fossilised corals. This non-invasive technique can enhance the knowledge about the collection while at the same time preserving the objects for future use. Its use is, however, limited to the relative attenuation due to the mineral composition of the fossil and rock.

Even the best policy on object preparation, sampling and analysis does not absolve the collections manager from having to make a decision based on all the information presented by the policies, procedures and the researcher's application and the merits of each particular case. While procedures are an attempt to emphasise objectivity, in the end any decision on whether or not to allow preparation will have an inherent element of subjectivity. Weighing up the pros and cons can be a tricky business, which may be facilitated by the availability of further documents.

Pros and Cons

For instance, any documentation associated with the collection might give further clues. The Museum Association's Code of Ethics reminds us to 'recognise the interests of people who (…) gave items in the collections'. When Thomas Franklin Sibly, an important fossil coral worker of the early part of the 20th century, donated his collection of fossil rugose corals to the National Museum of Wales in 1918, he did so in a letter to the then museum director William Evans Hoyle specifically unconditionally. This is an ideal scenario; knowing that Sibly was a man dedicated to his science and that he was fully aware of what it meant to work with rugose corals, it can be inferred that he would not object to the subsequent preparation of his collection. This, surely, must make it easier to come to a decision about whether or not to prepare objects from this historical collection.

Or does it? What about the historical value of Sibly's collection? Sibly learned from and worked with Arthur Vaughan, one of the founding fathers of the discipline of stratigraphy. He utilised the principles established by Vaughan when working extensively on the geology of the Carboniferous Limestone, and later became vice-chancellor of the University of Reading and a leading figure in British university administration. Maybe he was not on a par with Darwin, but nevertheless he was of undeniable importance to the history of geology. This gives specimens collected by Sibly a historical dimension.

Even more complicated is the request to prepare type specimens, especially if these are also of interest to the history of science. When Semenoff-Tian-Chansky and Nudds re-discovered the missing type specimens of *Siphonodendron martini* and *Lithostrotion maccoyanum* in the Oxford University Museum and the Museum National d'Histoire Naturelle (Paris), respectively, a decision was taken to section these fossil corals (Semenoff-Tian-Chansky and Nudds 1979). The original collectors, Henri Milne Edwards and Jules Haime, had defined the species on external morphological characteristics only. Without sectioning, there would have been no way of ever properly defining the species by using the type specimens. The gains to science therefore overrode the usual practice of leaving type specimens in their original condition.

Whether or not a request to prepare Sibly's, or Milne Edwards and Haime's, specimens gets accepted or denied also depends, of course, on the knowledge and expertise of the relevant curator. They would have to be aware of the historical aspects surrounding the collector, as well as the actual present and potential future scientific value of the specimens. The curator's expertise is invaluable when deciding on requests for invasive sampling.

Other disciplines experience the same problem at different scales. In petrology, laser ablation analysis of zircons on polished sections of diorites is destructive, in that the same spot cannot be analysed again. However, there are a number of zircons on each section, which leaves the opportunity for further future research on the same object (Richard Bevins 2010 *pers. comm*.). In archaeology, however, samples are more finite. Carbon dating is often employed to determine the age of artefacts. The technique constantly improves, which sometimes requires repeated analysis of the same object. Following three successive samples taken from one tooth for carbon dating the tooth is now hollow, prohibiting any further requests for invasive analysis (Walker 2011). If analysis meant the complete loss of an object, any further analysis would be impossible, even if technologies moved on and it was possible in future to analyse the object non-invasively. With the loss of the object also comes loss of all the other values the object stands for, which is particularly tragic because in many sciences some material evidence is absolutely essential; it forms part of the very fabric of science itself.

The big question to the decision-maker then is: how do you weigh up the scientific value gained versus the historical (or other) value potentially lost? In fact, would any historical value be lost, or would preparation add to and enhance the historical aspect of the collection? One potential position may be to consider the relative age of fossil collections in particular. For instance, objects were collected, say, 100 years ago and access to the site as well as the collection of fresh material is still possible today. An 'old' collection would be one from that site that has been in a museum for 100 years; a 'new' collection stems from today. From a research point of view, there is little difference between 'new' objects that were left unstudied in the ground, and 'old' objects that were left unstudied in a museum cabinet. It does not help science to leave the latter unstudied in the cabinet for another 100 years, particularly if access to the original sampling site was no longer possible and no 'new' material can be collected. Similarly, in archaeology, if objects cannot be examined or identified there seems little use in having stored those objects in the first place (Robins 1988).

The procedures need not stop at the decision-making stage. Once it has been determined that sampling is to go ahead, preparation can be undertaken in an agreed and standardised manner. For certain fossils, Scrutton (1979) suggested a procedure which has been adopted pretty much in its original format by both the Natural History Museum and National Museum Wales (for the latter see Walker 2011). Scrutton's procedure suggests, prior to sectioning of fossil corals, the photographic documentation as well as fabrication of casts of the original object. Preparation is then undertaken along three clearly defined growth stages and axes. The extent and methods of preparation and sampling, as well as any analytical procedures used, are thoroughly documented.

Agreement appears to exist across sciences and subject areas on what should happen after sampling. It is of concern that any information gained from sampling and analysis might not become available to other researchers and institutions. Therefore, both the original object and the data resulting from sampling and analysis should be returned to the institution that provided the sample; combined, these will then become part of the object's permanent record (Bohnert and Surovik-Bohnert 1991, Cato 1993). Benefits of this approach include not only accessibility to data associated with the object, but also a reduction in the need to re-sample the same object using the same techniques.

Summary

Museum objects and objects in natural history collections have different layers of values. Some of these values can be unlocked by studying the objects, others come with the association to the collector. There is no merit in keeping collections of unidentified objects for all eternity; objects were collected to be used. But studying these objects often requires invasive preparation, which, with a view to maintaining objects for future uses that may not be immediately apparent, should not be undertaken without considering the potential implications. The museum has a responsibility to preserve objects. Policies and procedures should be developed within the framework of the museum's collections policy to help make a decision about whether or not to prepare and sample, and to guide through the preparation process. Of course, preparation does not forbid display. Prepared objects are often beautiful examples of the internal anatomy of, for instance, sectioned and polished ammonites and, of course, corals; they can also be used to demonstrate scientific methods and practices. However, for the purpose of exhibiting well formed and preserved objects one might have to accept that not all can be identified.

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UNCURATED CURATORS, NO. 3. RONALD FREDERICK PICKFORD (1920-2010): BATH CURATOR, A TRIBUTE

by Hugh Torrens

Torrens, H. 2010. Uncurated Curators, No. 3. Ronald Frederick Pickford (1920-2010): Bath curator, a Tribute. *The Geological Curator* 9(4): 243-254.

Ron Pickford (1920-2010) was given GCG 's first ever award in 1985, and then the Geologists' Association's sad first Halstead medal in 1991. He had been responsible (single-handed) for the rescue, and safe-guarding, of the important Museum collections (containing much vital geology - both of types and historical material) at the long-defunct Bath Royal Literary and Scientific Institution, from 1960 until his retirement in 1985. By then the Group, and others, had caused enough of a stir to ensure that the Area Museum Service for the South West had taken over some control, and initiated a series of reports, and then a curator post.

But Ron's career was a most unusual one; from very humble and troubled beginnings in Bath, he had been stimulated in the 1930s by these very collections, to take a serious, if both unqualified and unpaid, interest in geology. Then, soon after he was appointed to a post as "cleaner/custodian" in the Victoria Art Gallery and Library service in Bath, he saw the depredations which these collections were now suffering, and decided to try, unasked, to secure their future. As a woodworking craftsman, he could create or restore display cases, and, as a sensible and competent person, he could equally ensure that all possible documentation survived as well. He now deserves to be as carefully curated as the materials he rescued, and this paper is intended to record his life and origins, his service in the Royal Navy in WW2, and to provide a tribute to his memory, and record what lessons we can learn from what he, and his fine sense of humour, achieved in Bath.

Hugh Torrens, Lower Mill Cottage, Furnace Lane, Madeley, Crewe, CW3 9EU, UK. Email: gga10@keele.ac.uk..

Introduction

Ron died peacefully on 18 September 2010 in his flat high above Batheaston, within sight of the home of the first Honorary Curator of the Bath Literary and Scientific Institution (hereafter BLSI or, after 1837, BRLSI); William Lonsdale (1794-1871 - see 2004, *Oxford Dictionary of National Biography* - hereafter *ODNB* & Mitchell 1872). This intertwining of two important curatorial careers in the World Heritage city of Bath, provides a fitting start to this tribute. As early as 1826, Bath had been named "the Cradle of English Geology" (Torrens 2005, pp. 154-155) and so its large museum collections in this field were of vital importance, both scientifically and historically. Ron's role was crucial to their survival.

Biography

Ron was born on 14 November 1920 at Albert Terrace, Widcombe, Bath. He was the only son of Frederick Pickford (c. 1890-?), a Roundabout Labourer on fairgrounds, then of 10 Somerset Street, Bath, and his wife Wilhelmina ('Minnie') Alice Wheeler (born Bath, 19 October 1896 - who died in 1988, aged 92), then of 11, next door. When they married on 18 December 1918, weeks after the end of WW1, at the local Register Office, Frederick was 28, the illiterate son of William Pickford (deceased), Showman, and she was 22, a temporary general domestic in the Women's Royal Air Force, and daughter of George Ebenezer Wheeler, of Bath (1868-1947), described in the 1911 Census as a Mason's labourer. His own father's work gave Ron a lifelong fascination with steam fairs and traction engines. A fine photo of young Ron, but with only his mother, survives from the 1920s. This helps remind us how, in 1921, when Ron was one, his father had walked out on his family. Why, Ron could never discover as his mother stayed silent.

So Ron's origins were clearly both humble and troubled. He first attended Lyncombe Council Infants' school 1924-1928, of which a fine class photo in 1924 survives. Here his ill-health did not help him,

his 1926 school report noting only that he was "backward owing to absence, but tries hard with his work". Then to Bathwick Juniors' school 1928-1931, where he made progress, and another fine school photo, with him again in the front row, survives (reproduced in *Bath Star*, 11 July 1990, p. 6) and finally to Weymouth House Seniors' school 1931-1935, where he did better and played rugby. But his final report noted he was "a nice willing lad, but easily distracted from his work and inclined to be talkative"! How to damn with faint praise...

In 1935 Ron was granted exemption from further school attendance, aged fourteen, to become employed, first as an errand boy from 3 January, to the Bristol-based provisioners Messrs Spear Bros and Clark Ltd, with their two shops in Bath, as well as a slaughter-house in New Orchard Street, see (www.flickr.com/photos/brizzlebornandbred/42586661555/), and then from 7 March, with Messrs Sanders Bros Ltd, 26 Westgate Street, Bath still running errands. But all the coins Ron earned running them still had to be handed over to his mother.

Soon, his father having disappeared so long since, his mother was able to remarry, on 3 May 1939, William ('Curly') Martin, a General Labourer, who also worked on the local fairgrounds.

When Minnie first met Curly, soon after her first husband disappeared, he worked the traction engine which operated the small fair held each year on Broad Quay in Bath. He moved in with her, in Widcombe, when Ron was about three. and she soon started to call herself "Mrs Martin". Pamela Ridewood tells me they had two children, a son, William J. P. ('Billy') whose birth was registered twice in December 1924 and March 1925, when Ron was four, but who soon died of pneumonia, and a daughter Margaret G., whose birth was registered in December 1927, when Ron was seven, and who survived and was later much spoiled by both parents (so unlike Ron). Why did Ron's mother have such a penchant for fairground workers, or was she merely seeking news of her absent husband? Ron could never discover Minnie's motives. Even worse for Ron, he only discovered fully what had happened in his sixties; his mother having been placed in a nursing home, her house was cleared and her second marriage certificate came to light. By 1939, they could be sure that Ron's father was dead.

For Ron, this second relationship, and eventual marriage, proved a complete disaster, as Mr Martin took an instant dislike to his unwanted step-son and terrified Ron, who had to face much mental and physical cruelty from him. But Ron showed his fine humanity by already appreciating that this man had taken on total responsibility for another man's son and had had to feed, clothe and house him, during the terrible days of the 1930s depression.

Ron was finally able to find decent work with Jacob Long and Sons, local builders and contractors, of Railway Road, Bath, who now trained him as a joiner, and woodwork machinist.

War-time hunting U-boats

It was while working at Long's that war was declared and Ron immediately tried to fulfil his secret ambition to join the Navy, but initially could not get released from his now reserved occupation as a craftsman, by the district Man-Power Board. The home atmosphere, in which Ron was being raised, made his escape from there all the more vital. Ron was finally released into naval service, and allowed in Bristol, to join *HMS Raleigh* from 12 August 1942, "until the end of the period of the present emergency".

HMS Raleigh and *HMS Drake*, to which Ron moved, were shore-based naval training bases at Torpoint, Cornwall and Plymouth, Devon (see Lavery 2004), not serving warships, as is shown by the word Graves on the clearly land-locked sheds shown behind them (Figure 1).

Ron's Service Record registers his entire service, as Ordinary Seaman, on *HMS Raleigh*, August to November 1942, then on *HMS Drake* November 1942 to March 1943, then, at sea, on *HMS Hesperus* from March 1943 (with promotion to Able Seaman from August 1943) until June 1945. Then post war, he was back on *Drake* from June 1945 to 15 May 1946, when he was discharged, having proved of a "Very Good Character" throughout, whether as seaman, lookout or gunner. Ron has recorded on the back of a photo of *HMS Hesperus* that she was "a specialized anti-Submarine Destroyer with 8 depth charge throwers and torpedoes", and "his favourite ship, and [its then], Commander [Captain] Donald G[eorge] F[rederick Wyville] Macintyre, good captain - very good, D.S.C. and Bar". Macintyre (1904-1981 - see *ODNB*) was one of the most famous British naval commanders of WW2. He won the DSO, and two bars, as well as the DSC, between May 1941 and September 1944 as a Destroyer Captain, hunting the U-Boats who were attacking Allied convoys, during Churchill's Battle of the Atlantic. The most detailed history of the U-Boat war

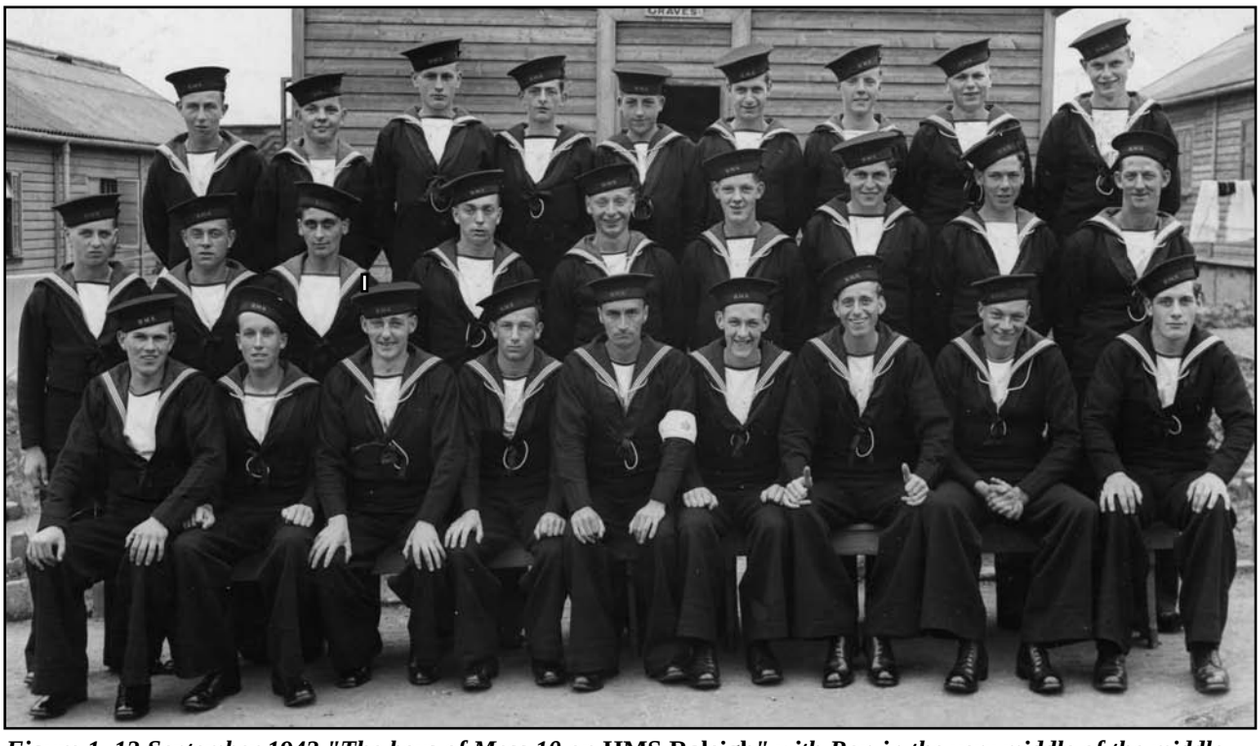

Figure 1. 13 September 1942 "The boys of Mess 10 on* HMS Raleigh*" with Ron in the very middle of the middle row.

is by Blair (1997 & 1999). These volumes could use both the revelations of what the workers such as Alan Turing at Bletchley Park had been up to at naval code-breaking, as well as the long-secret archives which had by then been released on all sides. Blair rightly characterised the period from August 1939 to August 1942 as one in which the Allied convoys and their escorts were "the hunted", while the period afterwards, when Ron served on *Hesperus*, now "Leader of Escort Group B two", from September 1942 to 1945, was as "the hunters". An earlier fine history is by Dan Van der Vat (1988). Both authors deal with the service of Macintyre's ships. Macintyre, who became a noted naval historian, wrote his own famous account *U-Boat Killer* (Macintyre 1956) and others about his experiences. Ron served with him after MacIntyre's most famous exploit, the capture of the most successful German U-Boat ace, Captain Otto Kretschmer (1912-1998) whose submarines had by then sunk Allied ships weighing 274,418 tons (see http://uboat.net/men/kretschmer.htm and Van der Vat 1988, pp. 148-170).

Figure 2.* HMS Hesperus *in September 1942.

Ron had clearly 'enjoyed' the camaraderie and whatever horrors the War had brought him, on convoy and attack duties, in the North Atlantic. On 11 July 1944, Ron served as part of the Guard of Honour at the Liverpool burial at sea of Captain Frederick John Walker (1896-1944 - see *ODNB*; *Times* 11 July 1944, p. 6 and Van der Vat 1988, pp. 369-376) the most outstanding of British U-Boat killers. Seven photos of this ceremony survive in Ron's archive, in three of which Ron has identified his own positions. A film of the entire ceremony was available from the Mersey Ferries shop on the Pier Head in Liverpool. Ron said often, that this period was really the best time of his life, and at the end of the War he was still in two minds as to whether to sign on again.

Marriage

But Ron had met a girl in his home port of Liverpool and decided to marry her, return to Bath and try to settle in 'civvy street'. So, on 15 June 1946, Ron married Olive Patricia Till at Bootle, near Liverpool. But sadly, after 10 years of marriage, Mrs Pickford became mentally unstable and very difficult to live with. As one example, she sold whatever medals Ron had been awarded for his wartime service. There had been no children but Ron had had to stay married until August 1975, when the divorce laws were changed, and he was able to divorce his wife, but only after another 20 years of what he later described as "pure hell". But to save him, Ron had met Pamela Ridewood, in 1951, when they became neighbours. They were able, from the 1960s, to share their lives together for the rest of Ron's life.

Postwar life proved no more easy than prewar had been. Ron first tried to get his old job with Long's back, but there were no vacancies, and so he eventually found work with Caisley & Son, Furniture Manufacturers at nearby Bitton, and returned to work as a wood machinist. But as soon as one contract was finished, Ron would find himself laid off and had to start all over again. He next worked as a horticulturist for a short time, but was again laid off. But he had had a most significant employer.

The BRLSI

1958 was when the future of the long moth-balled, and WW2 Admiralty occupied, BRLSI, was starting to be decided. The *Bristol Evening News*, and a Bath newspaper of the same date, 1 May 1958, announced that the Bath Libraries Committee, under its new Director of Libraries, Peter Pagan (1922-1998 - see Plumridge 1999), was hoping to take over the premises of the BRLSI in Queen Square, Bath. "A meeting was to be called... to discuss the winding up of the society [sic]... whose premises would be suitable as a possible reading room and reference library". An immediate, and negative, response (undated Bath news cutting), from the Bath resident Roland Lanham only pointed out the bibliographic obstacles of the remoteness of Queen Square from the existing library in Bridge street.

Then on 3 September 1958, Pagan put this advertisement into a Bath newspaper (Figure 3). Little could he, or Ron, know what was to lie ahead!


Wednesday, September 3rd 1958

CLEANER/Custodian (male) required in the Victoria Art Gallery, Bath. Wages £6/9/6 per week. Superannuation scheme. Uniform provided. Consideration could be given to registered disabled persons.—Applications, stating age and full particulars, to Director, Victoria Art Gallery, by Sept. 6, 1958.

Figure 3. The Bath newspaper advert which changed Ron's life.

Next, on 8 October 1958, it was announced that Bath City Council had approved the take over of the BRLSI in principle, and now authorised their Library and Art Gallery Committee to negotiate with the BRLSI Trustees (cutting in RP archive). Next came a claim that "Bath needed an Arts Council to keep the City Beautiful" (cutting dated 27 January 1959), with the news that the BRSLI was to be taken over at the end of March 1959. Then on 25 February 1959 came news that "increased spending at Bath foreshadows Rate Rise" (*Bath Evening Chronicle*, 25 February 1959). One reason was the need for an "extra £6,500 for more wages, books and bookbinding, consequent on taking over the BRLSI building". The same paper (27 February 1959) announced that the BRLSI was now to be dissolved and its assets handed over to the Mayor and Corporation of Bath from 31 March 1959 "for the promotion and advancement of literature, science and art in Bath". Note the lack of notice of, or interest in, any museum content held in these buildings!

The advert of September 1958 for a cleaner/custodian at Bath's Victoria Art Gallery (Figure 3) seems not yet to have been filled, so on 24 May 1959, Celia Brunel Noble (1871-1962), the grand-daughter of engineer Isambard Kingdom Brunel (1806-1859) and author of the 1938 book *The Brunels: Father and Son* (see Burke's *Peerage and Baronetage* 1970, sub Noble, pp. 1972-1973) had written to Peter Pagan, from 22 Royal Crescent (Lowndes 1981, p. 70), stating how Ron

> has worked for me for 6 years as gardener once a week, and has shown himself experienced, intelligent and most interested in his work. He also comes into the house as handy man, and gives every possible satisfaction. He is honest and reliable, and an extremely nice man to have about the house. He is also interested in reading, in matters of artistic and literary concerns to the community and has acquired a great deal of knowledge for himself by reading at home.

Her later letter of 1 July 1959 re-endorsed all this and added that Ron was now

> resident at Royal Crescent (my staff being rather short [in number, not stature...]) and that she had a great admiration for the way in which he has acquired knowledge and information on subjects of interest (Japanese prints, Oriental Ceramics and their marbles etc...). His character is excellent in every way.

With references like these, Ron could now move on to the most important, museological, part of his life, even if he was at times to enjoy it much less than his time in the Navy. Pagan wrote to him on 9th July 1959 to inform him he had now

> been appointed a Cleaner/Custodian at the Municipal Libraries and Victoria Art Gallery with effect from 13 July, for a probationary period of not less than three months, at a wage of £9 6s 6d a week... Protective clothing will be available, but no uniform will be provided until an appointment on the permanent staff is confirmed.

Ron's hours were 8 to 5, Mondays to Fridays, with an hour and a quarter lunch break and 8 to 1 on Saturdays.

Pagan's obituarist, Keith Lloyd Plumridge (1930-2008) [1], later noted that Pagan had taken "the unpopular decision to accept the librarian post at Bath in 1954, which had been black-listed by the profession". But Plumridge failed to tell his readers either why this decision was unpopular, or why the post had been black-listed, or by whom. The Library situation at Bath had long been infamous, as a result of Bath's long tradition of relying, not on the rates to pay for the city's services, but only on the income generated by tourists. As Kelly (1973, pp. 25 & 161) noted, "up to 1886, the record for [public library] intransigence was held by the City of Bath, where the proposal for any public library had already been four times brought forward and as often rejected". And when, in 1898, such a library had finally opened full-time, it was as

a) only a reference library and

b) one supported by only a halfpenny rate, unlike most others which operated on at least twice as much.

This same penny-pinching was to affect both the BRLSI Museum and its fine Library in future. The Bath City Council Minutes of 2 November 1959 recorded that the BRLSI's Queen Square premises were now to be "utilised for library, art gallery and museum purposes". The next meeting of their Finances, Staffing and general purposes Sub-Committee ominously

> recommended a) that R.M.W. Wright [the previous City Librarian] be paid an honorarium, to be paid out of the proceeds of the sale of the surplus RLSI books and b) that, in due course, offers be invited, by advertisement, to purchase from the Corporation the surplus books in question.

Money had to be found, and, on 5 October 1960, it was announced that £2,000 had been made by the sale of these supposedly "surplus books" (Bath news cutting). Bath-born Reginald Wilberforce Mills Wright (1889-1963 - see obituary in *Bath Weekly Chronicle*, 17 April 1963) had been appointed Bath's Librarian and Art Gallery Director in 1919, and served that City with distinction, until his retirement in 1954 (tribute in *Bath Chronicle*, 27 January 1954, p. 7). He had then worked on for Bath Corporation, producing an inventory of all the books then in the BRLSI collections. For this he had to be paid an Honorarium, from a small part of this sale of claimed 'duplicates', many of which were actually unique presentation copies given to the BRLSI by their authors.

Ron's rescue of the BRLSI Museum Collections 1960-1975

Better news came on 4 February 1960, when the same Sub-Committee recommended that

> Mr P.J. McGrath and Mr R.F. Pickford, cleaners and custodians, both of whom have satisfactorily passed the necessary medical examination, be placed on the established staff as from the 12th February 1960.

[1] Somerset County Assistant Librarian, based at Yeovil and who, ominously (in view of the later sales of 'surplus' BRLSI books at Bath), then became a bookseller at Wisbech (*Lynn News* 16 April 2008 & http://announce.jpress.co.uk/624435).

Ron now had a permanent job. It was during this time that the Admiralty vacated the Queen Square building. Pagan reporting that

> many of the old screens erected to preserve items from the BRLSI collections [those which had remained there, unlike the majority of the geological material stored away in Bristol] had been removed. We have found immense blocks of carved stone, a Norman arch, a remarkable and depressing [if only to a librarian!] collection. There are large packing cases literally crammed with stuffed birds... We have opened a corridor which had been sealed off, and found it stacked from floor to ceiling with cases. There is at least 12 months work there (Bath news cutting, 19 March 1960).

From 3 June 1960 Ron was promoted to the post of 'Senior Custodian (Unskilled Handyman)', with a weekly pay rise of 1 shilling and 4d.

In the only bit of autobiography Ron ever published he recorded how his long 'amateur' interest in geology had been first aroused.

> It is strange to think that it was the Moore Collection which [he] remembers seeing in the RLSI premises at Terrace Walk during the early 1930s which aroused in him the great interest in geology which led, eventually, to his being able to play a part in its re-establishment (Pickford 1975, pp. 121-122).

Ron produced reviews of his time at the Library in Pickford (1971) covering 1959-1970, and in his GCG article (Pickford 1975) covering 1959-1975. What was to happen in the next fifteen years can however best be introduced by recording Ron's application, on 19 February 1975, to become a Fellow of the Geological Society of London (in GSL Archives).

> Amateur geologist, until in 1960 became associated with the Charles Moore Collection (formerly property of Bath Royal Literary and Scientific Institution) when it had been in store at Bristol since 1939. Was put in charge of the Collection, unpacked it, and curated the Collection, dealt with all inquiries for type specimens and also with scientific workers at home and abroad. Created a museum from 'scratch', made facilities for local schools to borrow specimens and to bring classes to the museum. Put on exhibitions, such as one for William Smith's bi-centenary [1969]. Author of two small booklets (on sale at the Library), one on William Smith's work in the Bath area [Pickford 1969, published March 1969, eight pages, reprinted 1977], and one as a brief history of Charles Moore and his Collection [published 1971, 16 pages, also reprinted - both reprints omit Pagan's introductions]. Have attended courses run by Bristol University on Geology [in 1966]. Helped create a local Geological Society [from 1970] of which I am a Committee Member. Instigated the move to make an up to date catalogue of the Type Specimens which is now in process of being done (most of this work undertaken by a staff member of Keele University, who I am working in close conjunction with) [this was Charles James Thomas Copp (1949-2009), Keele graduate, who was appointed assistant curator of natural history at Bristol City Museum in 1976 - see Harding 2010].

One of the first to appreciate Ron's unfunded geological efforts, from October 1960, was Dr. Robert Milson Appleby (1922-2004) of the University College of South Wales, Cardiff, who was working on ichthyosaurs (see Baker 2004). Appleby duly acknowledged this collaboration, when he later established a new genus and two new species based on the Bath collections, in 1979 (Appleby 1979) [2]. Ron later wrote this annotation to his 1975 paper (on p. 118):

> The Appleby reptile specimens, removed to Cardiff in 1963, [were] all taken down from the walls by R.P. and one large (but strong in the arm, and thick in the head) Porter/Custodian. Timber was purchased and R.P. made crates for each one and Pickfords (no relation) transported them to Cardiff.

In November 1961, Pagan asked Ron to clear the floor area of the basement at number 18 Queen Square, by "the transfer of material not worth salvaging... prior to disposal as rubbish" [having also asked] "Mr Owen to examine and clear the wine cellar under no. 18 [Queen Square] which contains the

[2] It needs emphasis that these Bath ichthyosaur specimens do not all comprise Somerset, or even only Charles Moore, specimens. The very large head, later registered M 3577a at Cardiff, is the Lyme Regis head donated by the engineer and Kennet and Avon Canal agent, William Henry Eastwick (1780-1854), to the BLSI in 1825 (Torrens 2008, p. 21). It is associated with a later label reading "Ichthyosaur, [or] Great Fish-Lizard. 30 feet from Lyme Regis. Mesozoic. Donor. Eastwich [sic]. 1825". There is also at least one large original Mary Anning specimen, from the same locality, among these supposed Moore ichthyosaurs, now in Cardiff. This, now registered M 3570 as having "no history", carries a label reading "*Ichthyosaurus communis*, presented by J. Templeman" who had purchased it there from her by 1828.

Mineralogy collections" (letter to Pickford, 18 November 1961). In more annotations to his 1975 article (on pp. 117-118) re these minerals in the early 1960s, Ron wrote,

> here is a typical example of a so-called EXPERT!.. for [Owen] was given the job of clearing the shelter - in short - he stood one end and simply shoved the specimens and tablets into a packing case at the other end. R.P. was MOST ANGRY at this vandalism. This was Mike Owen. I could have ----- [murdered?] him!

Michael Owen was then the paid curator of the Roman Baths Museum in Bath, until he resigned in 1977.

On 22 March 1967, the *Bath Chronicle* (p. 4) noted that the Moore collection stored at Bath Reference Library will remain in packing cases for the present. At the last meeting of the City Council many were against the proposal that the scientific side of the collection should go to Bristol. Last night the Library Committee decided to await
a) a valuer's report on the collection and
b) to take advice from experts.

These were dangerous times for these collections. There were too many ideas and 'experts' afloat. One was that the Moore collection should go to a local school. Here the local methodist Kingswood School was the front runner. Its fine Headmaster, Alfred Barrett Sackett (1895-1977 - see www.sackettfamily.info/p105989.htm) was an informed geologist and a committed teacher of geology there (see Walsh 1979, pp. 75 & 86-89). Another was that the collections should go to Bristol. It was surely during a Bristol-based Extra-Mural course held in Bath, on "Bath and Geology", which Ron attended, on 9 March 1968, that the incident occurred when Ron was "firmly put in his place" as "he was just a pawn in the game" (see Pickford 1975, p. 118). This comment was, according to Ron's later annotation, made by Robert, 'Bob', Savage (1927-1998), Professor of Vertebrate Palaeontology at Bristol University, who had then lectured on Charles Moore, and who was another active in trying to resolve the appalling situation of the BRLSI's Museum collections.

The *Bath Chronicle* next carried the long, and famous, article by Robert Senior headed "Do we really want to keep these fossils", which included a photo of Ron holding up a Mammoth thigh-bone found at Box (part of this cutting featured on the rear cover of the Bath *GCG Newsletter* issue, no. 3, in April 1975). All references to these Bath materials wrongly still claimed that all geological materials here comprised only the Charles Moore collection. This news article noted how Peter Pagan thought the cost to Bath ratepayers of keeping the collection there would be considerable [and so recommended it go to Bristol. He ended] it is up to the ratepayers to decide whether they want something bigger, curator and all, limited in interest mainly to scientists. [The article then recorded how] the crated boxes receive day-to-day care from Mr R.F. Pickford, the libraries' technical assistant, [who] also traces items in the boxes for specialists who wish to examine them.

Note how Bath's infamous 'non-rate payers' feature again. There was an instant response from interested local parties, including a reply from Peter Pagan himself (*Bath Chronicle*, 28 March 1967) and one from Robert Whitaker F.G.S. with, on the next day, more contributions from "an old Fossil", and Jeremy Lavin. Pagan had now had his mind changed, and wanted to keep the RLSI treasures in Bath to form a local museum. So Ron was finally made Curatorial Assistant in 1968 and Robert Whitaker became an Honorary Advisor. Pickford, however, later noted (1975 annotation) that all "the various 'Geological Advisors' and 'Honorary Curators', appointed by the Director of Libraries [Pagan], were all against R.P.'s advice and RESISTANCE". But many of these people did later come together to create the Bath Geological Society, between February and September 1970 (*G.A. Circular*, no. 909, April 1995. p. 15). They then played a significant local role in the growing national clamour that something be done to safeguard Bath's important geological collections, which Ron had been rescuing.

It must have been during this period that Ron constructed, for a geological exhibition he then put on, [3]

> the model of the world showing the interior... from scrap materials, at no cost to Bath, and no money for R.P. either, even the Cork letters were scrounged. [Ron's note ends] Reader ye know not the true story; nor will ye, for too many are living off [my] struggles and hard work, but I bear no man/woman ill will at all. [MSS annotation to Pickford 1975].

[3] This may have been the pioneering exhibition, opened in May 1975, on Bath Stone, for which he and Gill Huggins produced a fine booklet (Huggins & Pickford 1975).

The period 1975-1985

Ron's new 1968 title, as he often pointed out, wrongly implied there was at least one other person around to help him. But, alone in the un-welcoming atmosphere of a Reference Library, Ron pressed on alone, all the time unpacking from the crates, making discoveries, conserving all labels, listing specimens, and curating the ever more uncovered BRLSI collections. Sometimes the horde of others trying to help, which included this author, clearly got to Ron, especially when the collection was being publicly portrayed as under serious threat or risk (which was of course true, if only in terms of its long term future). Ron was right to point out that, under his care, the Bath collections were now in a much better condition (see Copp *et al*. 2000, p. 18) than were many of the other collections which GCG, founded in 1974, was now bringing to sadly frequent attention (Howells 2007).

By 1974 the Collection had come under the care of Avon County Libraries, who later (1983-1986) became a major contributor to the cost of setting up a new post of Geological-Preparator for the Area Museum Council for the South West, which was held by Dr Michael A. Taylor (see Taylor 1985). In his article Taylor paid tribute to how

> Ron... has been able to restore considerable order to the collections and their documentation. Although much work remains to be done, it must be stressed that the present condition of the collections in now much better than one might expect from reading the various articles.

Mike Taylor recalls (email dated 17/12/2010) "Ron had initially been a bit narked at having had another outsider parachuted in to help him, in the form of yours truly, as if he [Ron] had done damn all. But he soon perked up and it proved great fun to work with Ron thereafter". Charlie Copp had helped by explained to Ron how the reports Mike was writing on the geological collections, with Bryan Cooper's (of Torquay Museum) on the minerals, 1ate in 1983 were really more about the long term future of the collection than any reflection on his work.

In 1985, Ron reached retirement age and his official date was fixed for 13 November 1985. He was now to replaced by Diana Smith, another Keele graduate, in a funded and properly titled curator position. The GCG had seen Ron's retirement coming and already, on 12 June, had invited him to attend their next AGM, at Dudley, on 6 December 1985, as their guest. This was the day that Charles Copp and I submitted our earlier tribute to him (Copp and Torrens 1986). He had inspired us all, especially by his unmasking, in 1984, of the fossil thief John Thomas Whitehouse (see Cross 1985 and Steward 1986 - on which last Ron left this annotation).

> Although not recorded in this article, it was R.P. who caught this man, Whitehouse, out. It was also R.P. who went with two detectives from Bath to Birmingham and who had to go through Whitehouse's home, in which, after a great deal of time and trouble, I found, and identified, the stolen specimens. I left home that morning at 6.00 am - arrived home after midnight.

and this from Pickford (1975, p. 122)

> The Birmingham Fossil Nicker, caught out by R.P. - A 'one man' band, whereas the "proper"! Museums had lost specimens to him - *before* he stole from Bath's Collection, and yet, [it was] I [who] had to go to Birmingham with Police - and search his home - I found my specimens after hours of searching - other people's specimens turned up [only] *after* his solicitor contacted the Bath police! R.P. may not have a degree but - Ha!

A fine letter from Allen Rushton, one of the Bath detectives involved, dated 30 March 1987, also survives. It notes "it would have been interesting to see the dear man's face if he [Whitehouse] had been with you that morning, when we entered that house, or rather 'Geology Museum annexe', in order to identify 6 of his stolen fossils". Ron has noted that this letter

> was from Detective Sergeant Rushton who, with Detective Constable Paul Thomas, were the Police investigating the theft of fossils from Queen Square Museum, I was with them and had to go through the thief's haul, where I eventually identified the stolen specimens - we had a wonderful night out in the local policeman's pub - it was like a wartime run ashore!

In retirement 1985-2010

At their December 1985 AGM, GCG made Ron an Honorary Member and awarded him its first ever award, a fine agate mounted on a circular block of wood, carrying a brass plaque noting it was "for services to Bath's Geological Collections". It then quoted the four lines from Alfred Tennyson's poem *In Memoriam*, published in 1850, and which we had reprinted in the first GCG newsletter (p. 12 - September 1974). These geological lines poignantly ended "a thousand types are gone, I care for nothing, all shall go", having been written in 1833, after Tennyson had been inspired by reading Charles Lyell's *Principles of Geology* (1830-1833).

By 1987 there were new complications. Many were now worried about a possible "change of trusteeship, which would entail the transfer of the present trusteeship exercised by Avon County Council, to Bath City Council, and the sale or lease of the Queen Square building". Five interested parties wrote, on 5 August 1987, to the Charity Commissioners pleading that all options be properly explored first (Greenslade et al. 1987). Ron's contribution was duly pointed out.

> Only the happy chance that a member of the Bath Library staff, Mr R. Pickford, was (unknown to his employers) a dedicated and resourceful amateur [i.e un-qualified] geologist, together with energetic action by the newly- formed Bath Geological Society, [has] brought this historic collection 'back from the brink' (to use the words of a Bristol Museum geologist)" (Greenslade *et al.* 1987 p.5).

A news cutting of this time records how uncertain the future of this vast collection was to become. It reported Avon's Director of Community Leisure, Ron's last employer, David W. Liddle, as noting that the "dispersal of the [BRLSI] collections, may be the eventual solution" (Anon. 1990). Liddle had recently become infamous for his attitude to rare book collections. At a British Library seminar in 1987, Liddle had asked whether the retention of rare book collections was even "necessary, desirable or economic" and he had revealed that Avon had started the sale of their rare books to fund computerisation. These were attitudes completely opposed by the Librarian of the Bodleian Library in Oxford, to which such newly deprived Avon readers would now have to resort (West 1991, pp. 27, 41, 48). One wonders how this librarian would have treated unique museum objects?

In February 1991 the Geologists' Association (hereafter GA), under its new president Beverly Halstead (1933-1991 - see *ODNB* & Sarjeant 1995, pp. 2-58) announced that it proposed to award a new GA Medal to "honour any one Council deemed worthy" (*GA Circular*, 884, February 1991, p. 3). Bev had moved to Bath a few years before and in October 1990 he had tackled the "scandal of the BRLSI" in print (*GA Circular*, 882, October 1990, p. 23), noting the Geology museum was now closed and its collections at risk of dispersal. Bev had become well aware of what a remarkable contribution Ron had made earlier. So, on 6th February 1991, the GA wrote to Ron telling him he was to be their first recipient of this Medal, and asked him to attend the presentation at their AGM in London on 3 May 1991 (Pickford archives). In April the GA also announced they were reviving the tradition of an annual dinner, on the same day at the Athenaeum (*GA Circular*, 885, April 1991, pp. 6-7).

Then followed one of the most appalling weeks in British geology. On the evening of 30 April, Beverly was killed in a car crash returning to Bath from Reading. Earlier that same day he had spent time with Ron discussing the forthcoming AGM event and had arranged for a photo to be taken by a photographer from the *Bath Chronicle* (Figure 4).

This was to appear with a half page spread on Ron's work, in the next day's *Chronicle*. But Bev's tragedy pushed that story from the pages of the *Chronicle*. But the GA still held its AGM. Helen Haste, Bev's Bath partner, bravely decided that it should proceed as planned (and duly sat next to Ron at the dinner to put him at ease). It had now been agreed that the GA Medal should be renamed the Halstead Medal in Bev's memory (*GA Circular*, 886, June 1991, pp. 3-4). It was noted when presenting the medal how

> the Acting President [Eric Robinson] was able to confirm that while our [the GA's] general campaign to save the Bath Museum had been dragging on at a very impersonal level, Bev had always had in mind the one individual who had been there fighting against the damp, the dust, and the civic indifference, which has been so much associated with the case. As usual, Bev recognised the human thread and the honest endeavour which we all saw in Ron that evening.

Ron then joined the GA, with which he remained until his death, although he had resigned his Fellowship of the Geological Society on his retirement.

In 1999 the Chairman of the Trustees of the re-established BRLSI, Professor Ian Wallace, arranged for a special 'Pickford Lecture' to be given there, on 4 November, by Professor David Dineley, another Trustee, as their own mark of appreciation. They then offered Ron Life Membership of the Institution. Next, on 7 June 2003, Ron was present at the launch of the BRLSI's first book publication, the reprint of William Smith's *Memoirs*, published in 1844 by John Phillips. This gave us an opportunity to photograph the previous Bath 'curatorial assistant' and the two curators who followed him.

In a letter to me dated 26 April 2006, Ron wrote of how he had been

> happy to [have] been able to hold the [BRLSI Collections] together, and improve on the shambles I [had] found, so as who ever came after

Figure 4. Ron, left, sharing thoughts with Bev Halstead over a fossil, on the morning of 30 April 1991.

would have the foundations - as it was/is now. [At the next, 2005, BRLSI Jenyns] book launch, I was presented with a copy of it by Ian Wallace... On the fly leaf Wallace had written: "For Ron Pickford - without whom the BRLSI as we know it and this book - would not have been possible. 24 September 2005", and in the Preface were "thanks to Ron Pickford, who rescued so much of immense value in the Institution's collections at a time when they were under very real threat".

Figure 5. Three BRLSI "curators": Ron Pickford (centre) from 1960-1985, Diana Smith (left) 1986 to 1988 and Roger Vaughan (right) from 1988 to 1990 (photo by Tom Sharpe).

Ron was delighted that some at least, of those who followed him there, now realised the extent of their debt to him.

The last time I saw Ron was on 7 May 2009, when I lectured at the BRLSI on "Bath and Bristol as a Cradle of Geology 1750-1850" and was able to point out the vital legacies of the twin scientific institutions in Bath (founded 1823) and Bristol (founded 1820) and the importance of their collections. Ron was there, thanks to Pamela, and in fine form, with his wonderful, mischievous, sense of humour to the fore. He was delighted to be again among friends, on what proved to be his last outing.

Luckily for Ron, and now for us, from the early 1960s, Ron had started to share his life with Pamela Ridewood, who would remain his partner for the rest of his life and who nursed him devotedly towards its end. It is only thanks to her that it has been possible to write these notes, using Ron's papers which she so carefully preserved. We both feel that so devoted a curator as Ron, did indeed deserve to be lovingly curated himself in his turn.

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PALAEONTOLOGICAL COLLECTIONS OF THE SENCKENBERG MUSEUM (FRANKFURT AM MAIN, GERMANY): NEW INITIATIVES

by Ulrich Jansen and Michael Türkay

Jansen, U. and Türkay, M. 2010. Palaeontological collections of the Senckenberg Museum (Frankfurt am Main, Germany): new initiatives. *The Geological Curator* 9(4): 255-260.

In the framework of a German Research Foundation Grant (DFG-LIS), the Hunsrueck Slate and Fossil Brachiopod collections of the Senckenberg Museum are the subject of a curatorial upgrade, including electronic cataloguing and imaging in the web-based Senckenberg Collection Management System (SeSam). One of the main objectives is to make object data and images available to researchers worldwide. The famous Hunsrueck Slate Collection comprises more than 1,500 excellently preserved fossils from the Lower Devonian of Germany. It is supplemented by an x-ray collection consisting of almost 7,600 negatives mainly of Hunsrueck Slate fossils. All object data, images of the Hunsrueck Slate fossils and x-ray negatives have been made available on the internet. With about 900,000 fossil brachiopod specimens, the Senckenberg collection is one of the largest of its kind. Voucher specimens from this collection are also recorded in SeSam. By these concrete examples, the properties of this web-based collection management system are briefly described.

Ulrich Jansen, Senckenberg Research Institute and Museum, Department of Palaeontology and Historical Geology, Senckenberganlage 25, D-60325 Frankfurt am Main, e-mail: ulrich.jansen@senckenberg.de; Michael Türkay, Senckenberg Research Institute and Museum, Department of Marine Zoology, Senckenberganlage 25, D-60325 Frankfurt am Main, e-mail: michael.tuerkay@senckenberg.de..

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Introduction

Palaeontological collections contain valuable, irreplaceable evidence of early life, reflecting the biodiversity of fossil life and representing the foundation of numerous geo- and bioscientific studies, also with respect to contemporary questions of climate and environmental research. Palaeontology has become a modern discipline as a historical link between earth and life sciences. Almost every palaeontological study requires the fossils stored in the large research collections of museums of natural history, university institutes and geological authorities. To be available to the scientific community, these collections should be well-organized, curated and recorded in online-databases. The last comprehensive data acquisition covering the palaeontological collections of Germany (Jansen and Steininger 2002) revealed serious personnel, financial and curatorial problems at many locations, and the situation has become worse in the meantime. Several institutions and smaller museums have been closed during the past 10 years. A few bigger natural history museums such as the Senckenberg Museum in Frankfurt am Main have had to absorb the negative effects by taking over the collections of these closed sites. An increased responsibility therefore comes to these collection centres.

Palaeontologists work on a global scale and take profit from the communication via internet and web-based databases. To face the challenges of the future, Senckenberg has developed in cooperation with the IT company *com*2, Bad Homburg (www.senckenberg.de/sesam; Menner and Allspach 2005, Brandis *et al.* 2007) the Senckenberg Collection Management System (SeSam) for all collections of the Senckenberg research institutes and museums. Senckenberg is a Leibniz institution that consists of three natural history museums and five research institutes with affiliated research stations in Germany. Various geo- and bioscientific disciplines are represented, including palaeobotany, palaeozoology, palaeoanthropology, historical geology, marine and terrestrial zoology, botany and meteorite research. Respective collections with approximately 35 million specimens are stored in the affiliates in Frankfurt am Main (headquarters), Wilhelmshaven, Weimar, Dresden, Görlitz and Müncheberg.

The Department of Palaeontology and Historical Geology in Frankfurt am Main houses large collections of fossils. With generous financial support from the German Research Foundation (DFG), the Hunsrueck Slate Collection, the collection of X-ray negatives and parts of the Fossil Brachiopod Collection are currently subjected to a curatorial upgrade in order to make object data and images of these collections available on the internet.

Figure 1. View of the Hunsrueck Slate collection.

The Hunsrueck Slate Collection

1,500 excellently preserved fossils are housed in this collection (Figure 1). The fossil biota of the Hunsrueck Slate can be regarded as unique on a worldwide scale, because nowhere else is it possible to gain comparably deep insights into an Early Devonian marine ecosystem. The Early Emsian age Hunsrueck Slate is distributed in southwestern parts of the Rhenish Massif (Germany), where it is exposed in a SW-NE striking belt of c. 140 km length and 10 to 25 km width in the Hunsrueck and Taunus regions. Actually, fossils are relatively rare in the dark, bituminous shales reflecting a deep subtidal palaeoenvironment. Largely thanks to the activity of the miners who collected the fossils during more than 100 years it was possible to gather large collections. Because many outcrops have disappeared and mining has almost completely stopped nowadays, new material is rare and the old collections irreplaceable.

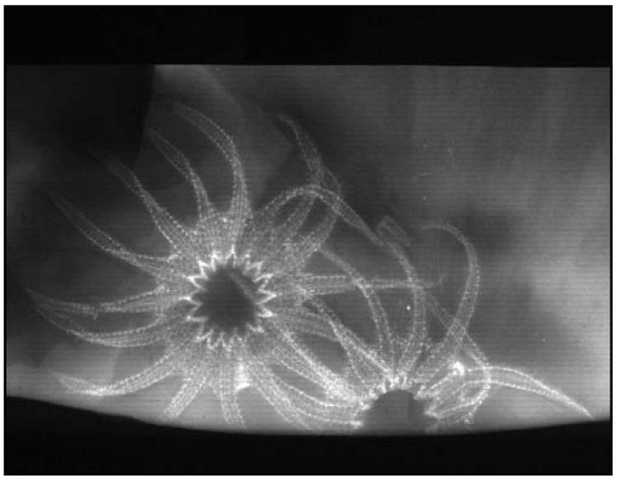

Figure 2. X-ray negative of* Medusaster rhenanus *Stuertz, an exceptionally preserved ophiuroid from the Hunsrueck Slate of Bundenbach (diameter of left specimen 9 cm).

The fossil content of the world-famous conservation lagerstaette includes a broad spectrum of echinoderms, e.g. complete crinoids with arms and well-preserved ophiuroids (Figure 2), representatives of different arthropod groups with appendages preserved in minute details (Figures 3, 4), early vertebrates, linguloid brachiopods with pedicles and even annelid worms in soft-body preservation. Unique fossils such as the best-preserved one of five specimens of *Weinbergina opitzi* (Figure 4) represent highlights of our collection. The fossils have been described scientifically in numerous articles, the excellent preservation allowing detailed morphological reconstructions and palaeobiological interpretations (e. g. Rud. and E. Richter 1929, W. E. Schmidt 1934, Lehmann 1957, Stuermer *et al.* 1980, Bartels *et al.* 1998, 2002). Voucher specimens referred to in these works are stored in the Senckenberg collection. New research projects including the application of new techniques, for example CT-scanning of fossils, are still being launched.

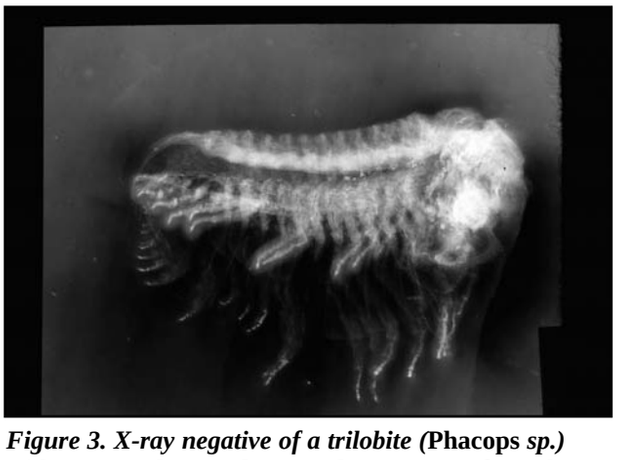

Figure 3. X-ray negative of a trilobite (*Phacops *sp.) with preserved appendages and gut content from the Hunsrueck Slate of Bundenbach (length 6 cm).

Figure 4. X-ray negative of* Weinbergina opitzi *R. and E. Richter, a very rare xiphosurid from the Hunsrueck Slate of Bundenbach with appendages preserved (length 10 cm).

As the collection represents a self-contained unit, a separate database "Hunsrueck Slate" has been incorporated in SeSam. In the current collection project, all object data of the Hunsrueck Slate fossils have been recorded, the fossils digitally photographed and the images uploaded, so that they are now available on the internet.

The collection of x-ray negatives

The x-ray negative collection ("Stuermer-Roentgenbild-Archiv") contains about 7,600 images mainly of Hunsrueck Slate fossils made by Prof. Wilhelm Stuermer who was the former director of medical research at the Siemens Corporation (Erlangen, Germany). As the morphological structures of the fossils are commonly replaced by pyrite, they can be well visualized by x-ray techniques (Figures 2-4). In the course of the project, the negatives have been transferred from old plastic envelopes into transparent, breathable glassine jackets which are stored in stable, light-proof cardboard boxes with ring binders (Figure 5) manufactured by the Hans Schroeder company (Karlsdorf-Neuthard, Germany). The images have large rectangular formats from 10 x 14 to 35 x 50 cms. All these high-resolution x-ray negatives have been digitized using a common Leica repro-camera and a light table, and were subsequently uploaded in a separate database within SeSam.

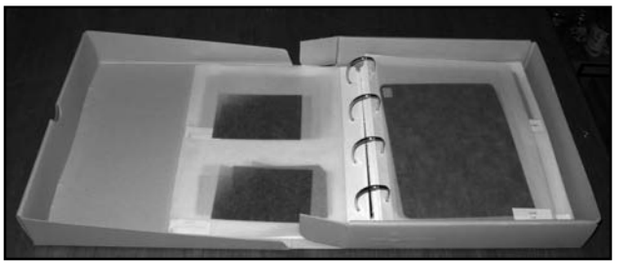

Figure 5. The x-ray negatives are stored in breathable glassine jackets and cardboard boxes.

The Fossil Brachiopod Collection

This collection contains approximately 900,000 specimens. It is regularly consulted by specialists from many countries. Only a small part of the collection, mostly older voucher specimens, is recorded in hand-written catalogues, and even fewer specimens in SeSam. The focus of the collection lies in Devonian brachiopods from Germany (Figure 6). The studied materials from numerous publications are stored in the Senckenberg collections, for example, R. and E. Richter (1920), Herta Schmidt (1941), Solle (1953, 1971), Mauz (1935), Struve (1964), Boucot *et al.* (1966), Plodowski (1970), Carls (1974) and Jansen (2001), Jansen *et al.* (2007). Apart from these works with a morphological, palaeobiological or stratigraphical focus, stable isotopes of oxygen, strontium and carbon from brachiopod shells were investigated to reconstruct Devonian environmental changes, such as climate fluctuations (van Geldern *et al.* 2006).

Many specimens come from old outcrops that do not exist any longer. Recently, a number of old boxes with numerous highly interesting Devonian brachiopod specimens from old outcrops were found in a remote cellar, evacuated from the museum during the Second World War. After deciphering old hand-written labels (Figure 7a), this material is being arranged in a better way and recorded in SeSam. The Günther Fuchs Collection, to give another example, comprises c. 100,000 specimens from Siegenian to Early Emsian successions of the southern and central Eifel region, collected from defined horizons and exactly indicated localities. It is therefore especially well-suited for detailed biostratigraphical and palaeoecological studies. The collection is continuously being enlarged by the acquisition of new materials from closed university faculties, from private collections, and it is supplemented by personal collections. For the ongoing revision of the highly diverse Early Devonian brachiopod faunas from the Rhenish Massif (Jansen, in prep.), the immense amount of material housed at the Senckenberg Museum is of great value. The specimens under study are immedi-

Figure 6. Box (19.5 cm x 24.0 cm) with specimens of the brachiopod* Euryspirifer dunensis *(Kayser) from Early Devonian deposits of the Rhenish Slate Mountains (Germany); Senckenberg Brachiopod Collection.

ately recorded in SeSam. As time permits, all older voucher specimens of the brachiopod collection are added as well (end of 2010: 2,200 specimens).

The Senckenberg Collection Management System (SeSam)

The collection management system SeSam (www.senckenberg.de/sesam; for further information see Brandis *et al.* 2007) is a powerful web based tool for managing all kinds of natural history collections, living or fossil, marine or terrestrial. Palaeontological, geological, mineralogical, zoological and botanical objects can thus be managed with this system, and even the collection of x-ray negatives. It is a great advantage that SeSam is a database for all collections, which are recorded in a joint data-pool, so that collection-spanning queries can be made. The advanced search allows us to meet very specific needs and questions. A sophisticated system manages the rights of access in different categories for each collection: curator and technical assistant (manager), typist (data entry and view) and user (view only). Anonymous visitors through the internet are assigned "guest" status and can only see the published information. The common data-pool includes hierarchically organised information on biosystematics, geography (provenance), stratigraphy, literature and persons. The data can be captured very rapidly, because information already included can be accessed and used; typing errors are minimized by this method. The taxonomic thesaurus is initially provided by specialists and is self-updating, when new taxon names are inserted systematic categories from phylum to subspecies level can be included. The SeSam Collection Management System enables detailed searches in one or more collections with one or more key-words. The output for each specimen recorded is subdivided into the following sheets: taxonomy, locality, stratigraphy and supplementary fields, publications, general data, history of determination and, finally, a summary with essential information at a glance.

SeSam allows one or more photographs to be attached to each dataset. In the current project, 1,500 digital photographs of all Hunsrueck Slate fossils and their original labels have been uploaded in internet resolution, and also 6,800 x-ray negatives, so that they are available for everyone through the internet. A small picture is shown on the datasheet - it can be enlarged by clicking on it (Figure 8). Scientists from all over the world can quickly get access to morphological information. If they need more detailed information on the large-sized x-ray negatives or the materials, however, they still must contact the curator. As SeSam allows collection-spanning searches, it is easily possible to find a certain Hunsrueck Slate specimen including its photograph and corresponding x-ray negative(s). Hunsrueck Slate and Fossil Brachiopod collections are quite often consulted by scientists, and loan information is also stored in the database.

The Fossil Brachiopod Collection includes numerous older voucher specimens described since the 19th century. Taxonomic affiliation of a species has commonly changed since that time. SeSam allows the whole history of determination as well as the splitting of larger samples into subunits to be recorded and gives reference to the relevant literature concerning the catalogued object. Finally, labels for each specimen can be directly extracted from SeSam and printed (Figure 7b).

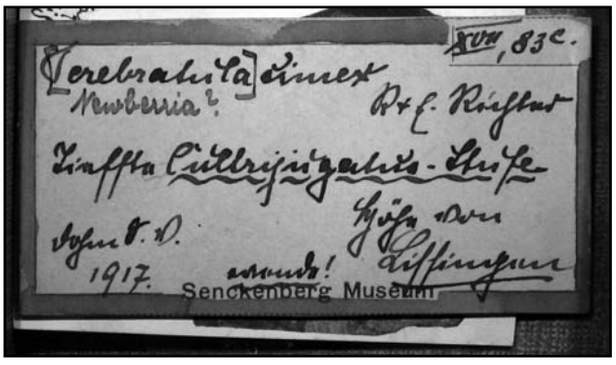

Figure 7. Old hand written label of brachiopod (7a) and a label directly printed from a SeSam dataset (7b).

Results and future tasks

The current collection project is a complete success. Generous financial support from the German Research Foundation (DFG) covers material expenses and salaries of three technical assistants who are doing an outstanding job. Hunsrueck Slate and parts of the Fossil Brachiopod collections are subjected to a curatorial update, so that they are better available to scientists outside. Brachiopod collections were moved from provisional boxes in regular drawers, 10,000 X-ray negatives moved from unsuitable old envelopes to much better glassine jackets and cardboard boxes. SeSam has turned out in every respect to be an excellent tool to manage the palaeontological collections. In particular, information on the respective collections and images of objects are now available on the internet and will be expanded in the future. The functions of SeSam are being steadily optimized. In the near future, the collections will be better presented on the Senckenberg website (www.senckenberg.de) in order to improve the visibility of the collections to the public.

Acknowledgements

Our thanks go to colleagues of the Senckenberg Research Institute and Museum, Frankfurt am Main whose assistance made this project possible. Technical assistants Erika Scheller-Wagner, Claudia Groth, Gunnar Riedel and Alexander Horn have done most of the curatorial work, digitizing x-ray negatives and cataloging the specimens. The project benefited greatly from extensive preliminary works of preparator Olaf Vogel who had arranged the Hunsrueck Slate Collection in a proper order in ear-

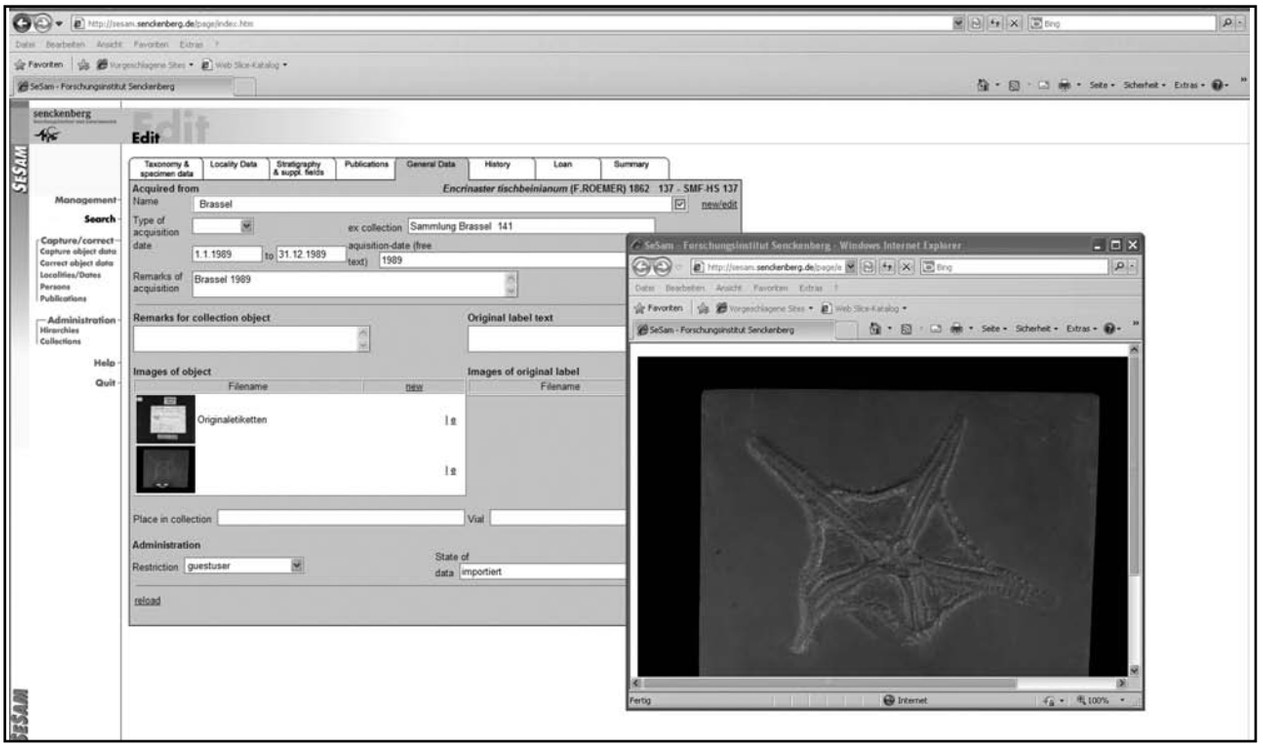

Figure 8. Photos can be downloaded by the internet user of SeSam. A small icon is linked to a larger photo in internet resolution (screenshot).

lier years and established a first catalogue that was a great help in the realization of this project. Andreas Allspach, collection manager, and Lothar Menner, head of the Senckenberg IT department, helped in many technical questions concerning the SeSam database. Gesine Kliesch, Maren Smiatek, Janina Franz and Lea Arnold, students of the Senckenberg School, and the trainee Lukas Hartmann assisted in the curatorial work. We thank Prof. Alan Lord for improving the English of the manuscript. Finally, thanks are due to the German Research Foundation (DFG) for generous financial support (project INST 21964/1-1).

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A SHORT NOTE ON MODIFICATIONS TO NINETEENTH CENTURY PTEROSAUR SPECIMENS HELD IN THE NATIONAL MUSEUM OF IRELAND - NATURAL HISTORY, DUBLIN

by David W. E. Hone

Hone, D. W. E. 2010. A short note on modifications to Nineteenth Century pterosaur specimens held in the National Museum of Ireland - Natural History, Dublin. *The Geological Curator* 9(4): 261-265.

Examination of two pterosaur specimens in the collections of the National Museum of Ireland purchased in 1898 show several modifications to the slabs on which they lie. While the actual elements of the skeletons do not show any changes, the surrounding matrix has often been modified, obscuring details in places through the overlaying of plaster and polishing of the surface to change the relief. Curators and researchers should be aware of these changes that may be present on other specimens in wider collections.

School of Biology and Environmental Sciences, University College Dublin, Dublin, Ireland. email: dwe_hone@yahoo.com

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Introduction

The Solnhofen limestone beds of southern Germany are famous for the quality of their Jurassic age fossils. Pterosaurs are relatively common and have been excavated there since their discovery in the late seventeen hundreds (Wellnhofer 1991). Initially, specimens were often sold and exchanged between fossil collectors, fossil dealers, and between museums (a practice that has continued e.g. Ostrom and Wellnhofer 1986). Solnhofen pterosaur material was, and still is, widely traded and specimens are now housed in collections around the world including the USA, the UK, Ireland, the Netherlands, Austria and Japan (pers. obs.).

Fossil dealers, angling for the best price for their material, are known to have modified specimens on occasion (a practice still ongoing as seen with the Chinese '*Archaeoraptor*', Zhou *et al.* 2002). While the bones and soft-tissues were typically not damaged or modified in the German specimens, the surface matrix may have been altered to cover cracks and present a clean, smooth surface.

Here, I comment on two specimens from the collections in the National Museum of Ireland - Natural History, Dublin (NMI). Several modifications have been made to the specimens and are worthy of discussion. These specimens (a part and counterpart of a complete *Rhamphorhynchus muensteri* and the counterplate to the holotype of *Germanodactylus cristatus*) will be described in forthcoming papers. From the records held at Dublin both specimens are known to have been purchased from Dr F. Krantz in 1898, a well-known fossil dealer who sold a number of specimens to the NMI (Figure 1).

Institutional Abbreviations

NMING, National Museum of Ireland - Natural History, Dublin, Ireland.
BSPG, Bayerische Staatssammlung fur Palaontologie und historische Geologie, Munich, Germany.

Descriptions

NMING:F19172 (Figure 2) represents the plate and counterplate of a complete subadult *Rhamphorhynchus muensteri* skeleton mounted in a single casing, while NMING:F15005 comprises the

Figure 1. Label in Krantz's handwriting describing the material (here the* Germanodactylus cristatus *counterplate [F 15005], but labelled as sold under '*Pterodactylus crassirostris*').

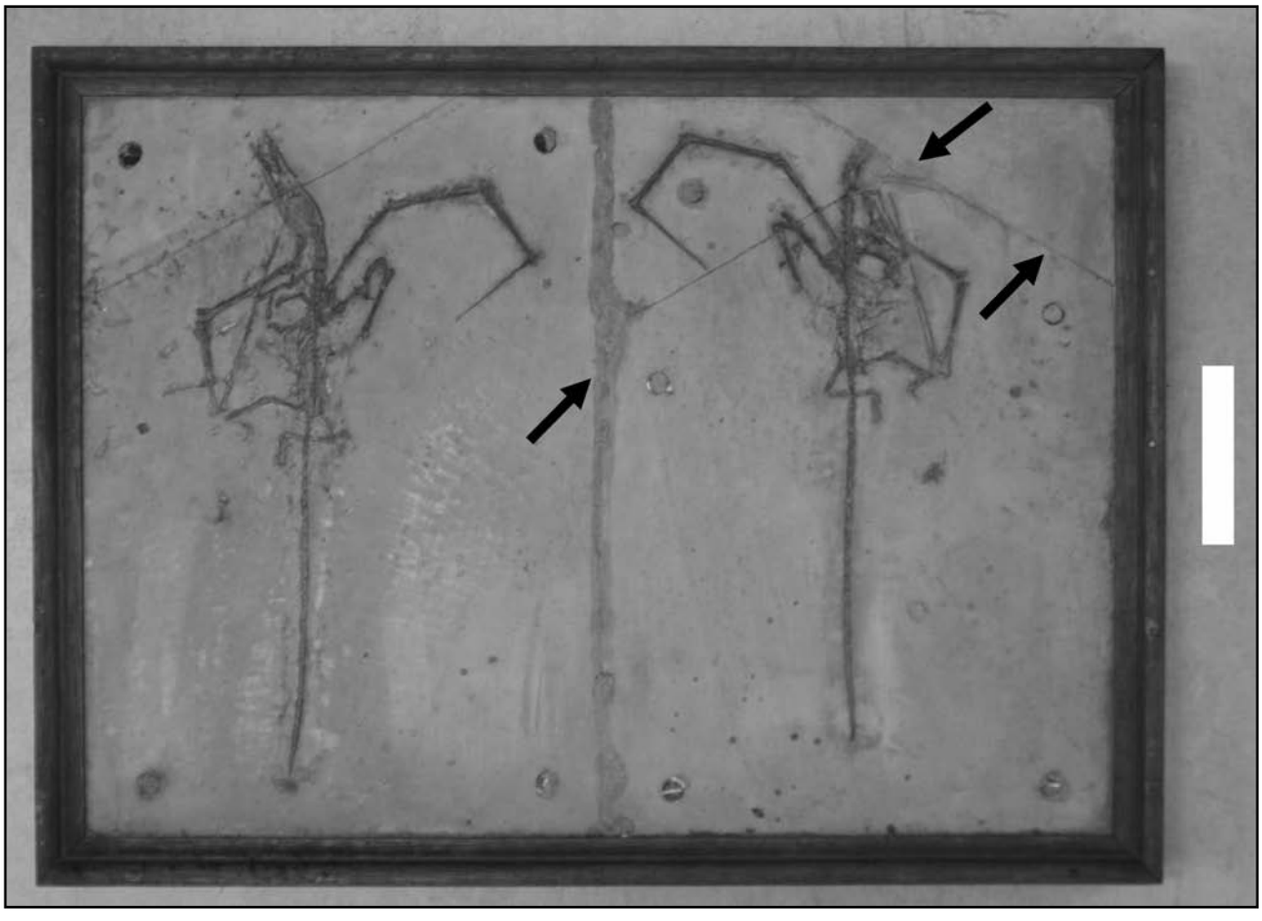

Figure 2. Specimen of* Rhamphorhynchus muensteri *NMING:F10172, with the plate to the left and counterplate to the right. Major areas of plastering are indicated by black arrows and the screw heads are clearly visible. Scalebar at 10 cm.

counterplate to the holotype of *Germanodactylus cristatus* (Figure 3). This consists mostly of impressions, though some bones are present (for a description of the *G. cristatus* holotype see Wellnhofer, 1970, Figure 4 of this paper for an illustration). Both specimens are mounted in stout wooden frames. On the back of each are labels in Krantz's own handwriting (N. Monaghan, *Pers. comm.*) though these latter labels were likely attached by the Dublin staff on arrival to keep them with the specimens.

The cases are similar and are both constructed of a heavy and strong dark wood. They are similar in size with the *Rhamphorhynchus* case being 61 x 45 x 5.5 cm and the *Germanodactylus* counterplate measuring 45 x 36 x 6.5 cm. In both cases, part of the total height of the cases (1.5 cm of the former and 1 cm of the latter) is made up by batten-like strips that overlap the top (i.e. the side on which the specimen is exposed) by 2.5 cm. The *Rhamphorhynchus* case also has additional spars of wood attached to the underside to form 'runners'. Both cases are notably quite deep, much more so than the typical depth of platy Solnhofen limestone slabs, suggesting that the bases of the box are filled with plaster or a similar material.

In both specimens, several large screws (with heads around 1 cm in diameter) have been sunk through the matrix (some distance from the bones) presumably into a layer of plaster below the specimen and possibly the base of the wooden frame (see figure 2). These screws were subsequently covered in plaster (as revealed by some being partially covered and most having plaster in the screw head slot). The heads of these screws are now heavily rusted.

In the case of the *Rhamphorhynchus* specimen, plaster was also applied to the space between the plate and counterplate. A large section of plaster was also added to the area above the skull region of the counterplate, along with the hollow of the skull in the same slab. The skull is completely preserved and significantly raised on the part specimen, suggesting that this plaster infill occupies a significant hollow on the counterplate. In every case, the plaster now has a different texture and colour to the surrounding pale, matrix and can be easily identified. Much of the plaster has a pattern comparable to the desiccation cracks seen in sun-dried clays, and the joins between plaster and matrix are very clear. The *Rhamphorhynchus* may also have been polished to a certain degree: bones on both components are raised

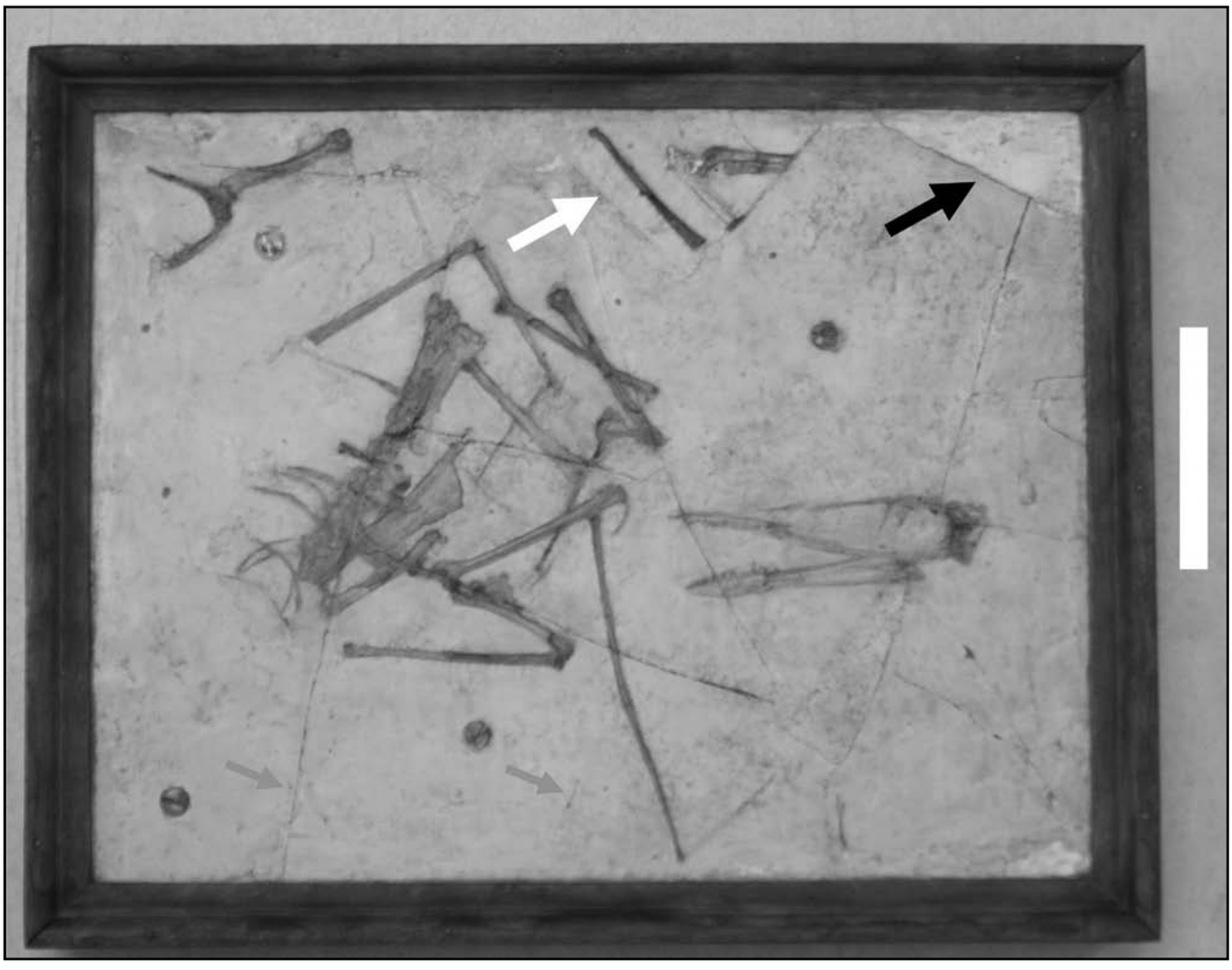

Figure 3. Counterplate of* Germanodactylus cristatus*, NMING:F15005. Screw heads are clearly visible, and a major area of plastering is indicated by a black arrow. Note the two subtle impressions where a manual ungual and phalanx and pedal ungual and phalanx lie (grey arrows). Above the skull, a triangle of matrix containing a radius and ulna and a femur has been added in (white arrow). Scalebar at 10 cm.

above the surface of the matrix to imply either formal preparation or polishing of the surface around them.

The *Germanodactylus* counterplate has undergone greater modification. Again, heavy screws secure the slab to its casing (see figure 3). The counterplate shows numerous large cracks on the surface that have been repaired and covered with plaster. Such cracks are not present on the part of the slab (see figure 4) and suggest that the counterpart was broken at some point, perhaps during collection. A portion of the specimen has been relocated to lay above the skull (see figure 3): comparison with the plate piece in Munich (BSPG 1892 IV 1) shows that this section represents matrix and bony impressions that once lay far from the main collection of elements (see figure 4). In the Dublin specimen, these have been excised and then inserted close to the skull, presumably to dramatically shrink the size of the specimen. Comparison between the plate and counterplate also suggests that the surface of the Dublin piece has been polished: the Munich plate has a notably stippled surface, quite unlike the very smooth surface of the Dublin specimen. Furthermore, some of the impressions in the counterplate are much shallower than would be expected, with clearly preserved elements on the part specimen (e.g. the manus and pedes) all but absent on the counterpart (see figure 4). This suggests that the counterpart surface was polished to the extent where some specimen relief was lost, although some Solnhofen specimens can have rather different plate and counterplate surface textures.

Discussion

The modifications described here were presumably done by Krantz's workshop before sale. It seems most unlikely that workers in Dublin added screws to secure the specimens when they were already framed, and the reorganisation of the *Germanodactylus* counterpart must have occurred before the frame was added since the edge of the relocated fragment is overlapped by the edges of the frame.

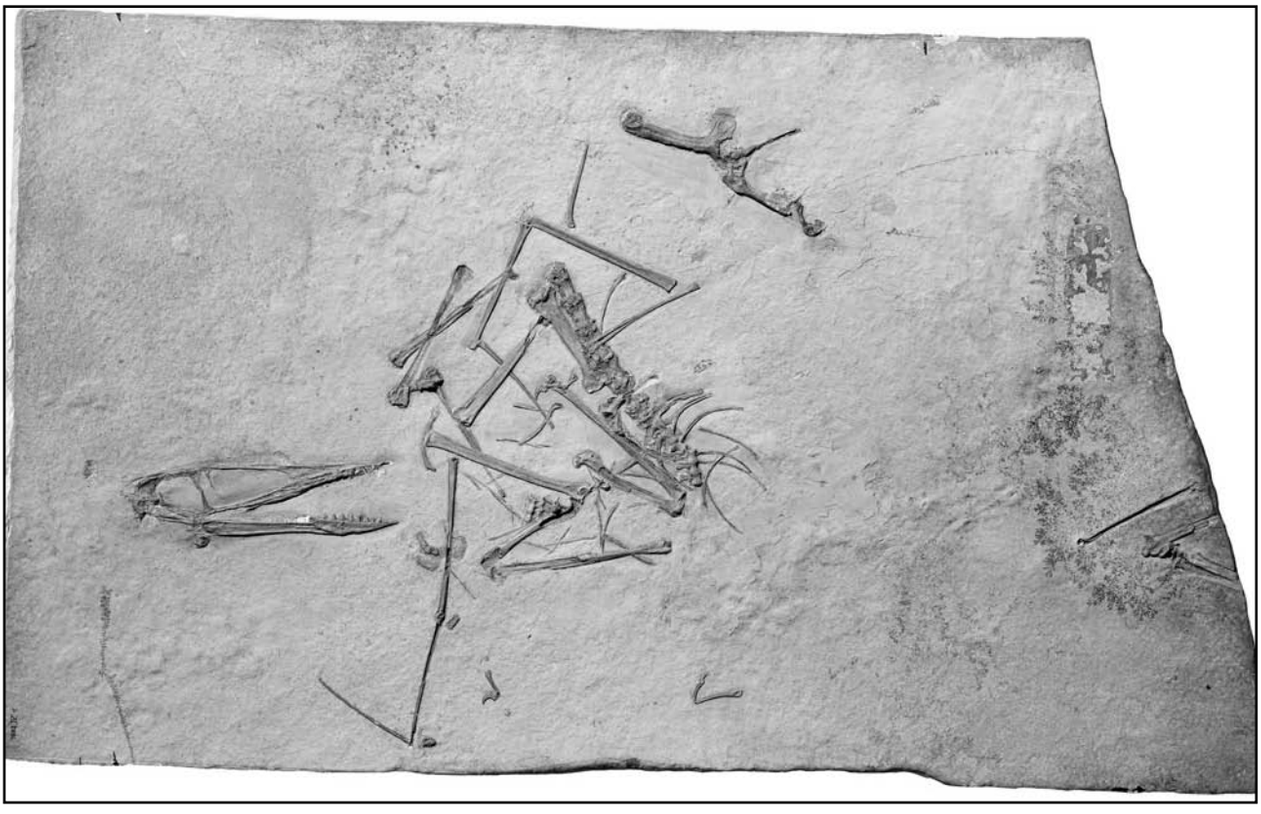

Figure 4. The holotype plate of* Germanodactylus cristatus *(BSPG 1892 IV 1). Note the region to the far right which has clear impressions of the bones which are now positioned above the skull in the counterpart (see figure 3). Image courtesy of Georg Janssen.

The plastering on both specimens and the polishing of the *Germanodactylus* counterplate were presumably done to improve the aesthetic appeal of the material. Though the plaster is now cracked and a different colour to the matrix, it was presumably a clean, smooth surface when initially applied to both specimens. The reorganisation of the *Germanodactylus* piece would have made the specimen significantly smaller (compare figures 3 and 4) and might have been the reasoning for this.

The Dublin *Germanodactylus* specimen was sold to the NMI (as the Dublin Museum of Science and Art at the time) after the main piece had already been obtained by BSPG. In the initial description the part specimen, Plieninger (1901) states that he obtained the plate piece in 1892 and that he did the preparation work himself, though he does not say where the material came from. Examination of BSPG 1892 IV 1 shows no indication that it was ever situated in a frame or was modified with any plaster. Given that Plieninger obtained this specimen before the counterplate was offered to Dublin and that he prepared the material himself, it seems certain that Krantz never obtained, and indeed may have been unaware of, the Munich plate. There is certainly no evidence that the BSPG purchased material from the Krantz company until after 1945 (M. Moser, pers. comm.) and none of their pterosaur specimens show modifications similar to those of the Dublin specimens.

It would also appear that just as Krantz was unaware of the Munich part, so researchers were unaware of the Dublin piece. There is no mention of a counterplate in the descriptions of Plieninger (1901) or Wellnhofer (1970) or indeed in the literature as a whole before a conference abstract in 2007 (Hone *et al.* 2007). Interestingly, Plieninger performed the same trick as Krantz if in a different manner: in order to reduce the size of the published photographic plate of the Munich part, he repositioned the disparate section with the three isolated bones to sit just above the skull in his photograph.

The insertion of the screws in the Dublin material was obviously done with some care. They are all some distance from the bones and were obviously inserted without breaking the slabs and this must have taken some skill. This makes the extra plaster inserted into the skull cavity on the *Rhamphorhynchus* counterplate a strange addition as it is the only occasion where preparation on either specimen has obscured information. Arguably, repositioning a portion of the *Germanodactylus* counterplate changes the information of the specimen a little, but filling the depression of the

Rhamphorhynchus skull is a far more overt obfuscation of data, even if the bones themselves are preserved just a few centimetres away.

While this work is over a century old, it still provides challenges for curators and preparators. Cleaning damaged or dirty plaster on these, or similar specimens, might well reveal hidden screws buried in the specimen or, of greater concern, underlying cracks. Plaster has historically been used at times for cosmetic reasons as well as specimen repair, its presence may not necessarily indicate underlying damage, however. The specimens described here have clearly been mounted and plastered with care, but others may contain damage that is not immediately visible. Researchers should note that slabs and counterslabs may not marry up perfectly either if sections have been moved or hollows in counterplates have been filled in.

These specimens demonstrate two instances where preparation work was performed primarily to increase the value of the specimens, though respect was apparently given to the scientific information held in them. Care was generally taken to preserve the details present, which is to be admired given the period of fossil collecting these specimens represent. Unfortunately however, this was not perfectly executed and some, admittedly minor, information has been lost. The causes of data loss here - reorganisation of specimens, removal of specimen relief through polishing, filling of specimen moulds - and the use of plaster to obscure structural details of the specimen and their mountings are practises that preparators and researchers should be aware of when handling and interpreting historic specimens.

Acknowledgements

My thanks to Nigel Monaghan and Matthew Parkes for access to specimens in Dublin and discussion about the history of the material. Thanks also to Markus Moser for access to the material in Munich, and information on the purchases from Krantz as well as pointing me to Plieninger's work on the *Germanodactylus* plate and translating key points from it. Thanks to Georg Janssen for the photograph used in figure 4. I am indebted to Mark Witton for his commentary on an earlier version of the manuscript which improved it significantly.

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GEOLOGICAL CURATORS' GROUP

36th Annual General Meeting

Great North Museum: Hancock, Newcastle-upon-Tyne.
30th November 2009.

1. Apologies for absence.
Hannah Chalk, David Gelsthorpe, Mike Howe, Leslie Noè, Matthew Parkes, Will Watts.

2. Acceptance of the minutes of the 35th AGM, Wood End Creative workspace, Scarborough.
Agreed, with the following amendment:Item 11. Amended to read "No nominations have been received….

3. Matters arising.
1. Chairman's report. Item 6. Web developments.This is a valuable resource so please use it (with suitable acknowledgments) as a source of images.

4. Chairman's Report.
1. Correspondence.
This has been a fairly quiet year for me as GCG Chairman. There has been little correspondence to deal with apart from issues at Bristol, as David Gelsthorpe, as Secretary, has dealt with most of the matters that have arisen.
2. Collections at risk.
Bristol. Although there has been much discussion between GCG and people in Bristol, there is little more to report. The restructuring has gone out to consultation. The geological collections will have some temporary curatorial cover but the future of the collections will not be known until funding issues are resolved.Kendal. Kendal museum is now managed under a 10-year agreement by Kendal College, for the local authority. Refurbishment of the museum starts in 2010 and the College will incorporate the museum into an expanded campus.More details will be available after David Craven has visited Kendal Museum.Yorkshire Museum. GCG offered help and advice on the development of the curatorial post at York, but the job has changed a great deal and is no longer purely curatorial. GCG have been assured that the geological collections will have the same cover and care as previously. There is no further news on candidates for appointees to the post.Hull. Temporary curatorial cover is in place for the natural sciences collections, but this is from an archaeologist.
3. Subject Specialist Networks.
Efforts are being made by NatSCA to revive the Natural Sciences Subject Specialist Network (SSN). GCG will be involved in some of this work. One of the ideas raised is to develop a database of specialists who museums and individuals can contact for help and assistance.The Collections Trust, funded by the MLA, have developed Collections Link, a collections management advisory service. This lists all of the current subject specialisms and is worth looking at.Questions from the floor:David Craven. A point of information regarding collections at risk. Gallery Oldham has lost its natural history curator and the post has been frozen.Report accepted.

5. Secretary's Report.
2009 saw a range of enquiries and monitoring of collections at risk. I co-ordinated GCG's response to the restructuring at Bristol Museums Service and discussed our approach with Claire Stringer at NatSCA. Other collections monitoring included: enquiring about a fossil auction by St Andrew's Preservation Trust and offering GCG's assistance in appointing the Curator of Geology at York. Condolences were sent to Mike Curtis' wife after the sad news of his death.Many thanks to Hannah for her work on the website, which, goes from strength to strength. The archive of Geological Curator back issues is complete and the website can be relied upon for up to date news and job opportunities.Report accepted.

6. Treasurer's Report.
Balance sheet circulated.We end the year again in a healthy position with a balance in hand of £11,202.09, which is up marginally from £10,924.66 at the start of the year. Subscriptions are pretty consistent with last year now that we have the membership list tightly under control. You will see that we actually made a profit of more than £400 on Seminar and Workshop fees. It is never our intention to make a profit from members from meetings, and this situation only arose due to the generosity of Scarborough Museums Trust in waiving all costs to GCG for last year's AGM. We express our thanks to Scarborough and to Will Watts for this. Gift Aid is slightly lower than last year, but this should now remain pretty consistent. Expenditure is always dominated by the printing and distribution of Geological Curator and Coprolite. Expenditure for the former is approximately £1,000 per issue with two issues per year.

Due to our printing only a single issue last year, we have had to pay for three issues this year. This item alone explains our higher expenditure and hence our smaller profit for the current year. Expenditure for three issues of Coprolite is similar to last year. Committee expenses have increased once more, and in this respect I urge committee members to take advantage of booking much cheaper advance tickets, rather than leaving it until the last minute. The American dollar account stands at $2,111.42 ($1,895.42 last year), and the European account stands at Euro 93.67 (Euro 487.22 last year). I would like to record my thanks to Tiffany Adrain and Matthew Parkes for their stewardship of these respective accounts, and to Caroline Buttler (Cardiff) and David Green (Manchester) for their willing auditing of the accounts. Finally, I thank Cindy Howells for her continued support as Membership Secretary. Membership for 2010 is now due and we will be happy to accept payments at this meeting.Report accepted.

Membership Report

Personal UK	171 (169)
Personal Overseas	16 (18)
UK Institutions	56 (63)
Overseas Institutions	27 (26)
Honorary	8 (9)
Total	276 (285)

As you can see, we have slightly less subscribers this year than last. This is mainly due to various museums having lost the post of geology curator and hence not bothering to renew their subscriptions. Some are also cutting down on the journals they take due to financial cut backs.This trend is very worrying and means that such museums, and their curators, now and in the future, will not have the benefit of a complete run of the Geological Curator for reference. We should all try to encourage our museums to maintain their subscription, or to renew it if they have cancelled.The subscription rates will remain the same for 2010, and I am happy to accept cheques today as this will minimize the number of reminders I have to send out.There are still around 15 people who have not updated their Standing Orders from the last raise (in January 2007), and these will again be invoiced for the outstanding balance. Questions.Helen Fothergill. Could you publish or circulate a list of the institutions who are subscribers so we can see which ones to encourage?CH. This will be done.
Report accepted.

7. Programme Secretary's Report.

After a long absence during the redevelopment of the Hancock Museum, I have finally managed to pick up the reins again with the organisation of the 2009 AGM. My apologies for the inconvenience my absence has caused other Committee members who have had to pick up the programme during this time. My sincere thanks to them for holding the fort.There have been a number of meetings and workshops over the 2009 period. These are listed below. In picking up the reins again I will endeavour to undertake some kind of attendance analysis as I believe attendance at GCG meetings is getting less and less, and we need to review this and find out the reasons why. Look out for a report in a forthcoming edition of Coprolite. As always, suggestions for meetings in the future are always welcome.

2009 Programme:

12th - 13th May 2009. GCG Workshop: Moulding and casting. BGS, Keyworth.
22nd September 2010. GCG Seminar with SVP. Bristol University.
Autumn 2009. Study Tour. Cancelled.30th November - 1st December 2009. GCG Seminar and AGM. The Great North Museum, Newcastle.2010 meetings programme:
11th May 2010. GCG Workshop: Digital imaging for geological collections.British Geological Survey, Keyworth, Nottingham.
28th June - 3rd July 2010. GCG Seminar: Symposium on collecting, curation and conservation of palaeontological collections. Third International Palaeontological Congress. NHM and Imperial College, London.
23rd - 24th July 2010. GCG Seminar: 200 years of West Country Sea Dragons. Street, Somerset.
Late September 2010. GCG Workshop and Seminar - with SVPCA and SPPC. Cambridge University.
October 2010. GCG Study Visit: Field Museum, Chicago, USA. (Proposed visit).
7th - 8th December 2010. GCG Seminar and 37th AGM. Ulster Museum, Belfast.
Report accepted.

8. Journal Editor's Report.

Volume 8, No. 10 was issued shortly after last years AGM, and Volume 9, No. 1 was issued in the summer of 2009 with 3 papers. Volume 9, no. 2 is ready for printing, except for the minutes of the 2008 AGM, which will be included. Printing and distribution will be completed in December 2009. Several papers are in hand or promised but will be delayed until the Autumn 2010 issue, Volume 9, No. 4. This is because Volume 9, No. 3, to be published in the Spring of 2010, is planned as a thematic volume aris-

Geological Curators' Group
36th Annual General Meeting, Newcastle-upon-Tyne 30/11/2009
2009 Accounts 13/11/08 - 12/11/09

Income			**Expenditure**		
Subscriptions	£ 4,359.38	(4,339.00)	Geol Curator	£ 2,825.00	(955.73)
Seminar and workshop fees	£ 645.00	(185.00)	Coprolite	£ 1,477.00	(1,584.00)
Gift Aid	£ 621.65	(750.25)	Workshop expenses	£202.40	
Uncashed cheque	£12.00		Committee expenses	£ 782.86	(357.79)
			Web site fees	£73.34	(62.02)
	£ 5,638.03			£5,360.60	
Balance as at 12/11/2008	£10,924.66		Balance as at 12/11/2009	£11,202.09	
	£16,562.69			£16,562.69	

NOTES

American Account currently at $ 2111.42
European Account currently at 93.67

Auditors: David Green

J R Nudds Treasurer 12/11/2009

Caroline Buttler

ing from the Preparators and Conservators session at the Society of Vertebrate Palaeontologists meeting in Bristol last September (equivalent to SPPC, which precedes SVPCA in a regular year). As well as contributions from the meeting, we are accepting submissions on any related topic from those who could not attend the meeting. The deadline is the end of the year, so there is still time for additional papers to be submitted. From initial levels of interest and submissions, it is likely to be a substantial issue.The journal takes book reviews. If anyone has any suggestions for books to be reviewed, please send them to David Craven. Anyone offering to do a review can keep the review copy.Report accepted.

9. Newsletter Editor's Report.

2009 saw completion of the 20th year of publication of Coprolite, with Numbers 58, 59 and 60, totalling 44 pages (compared with 48 last year and 42 in 2007). Over the 60 issues, Coprolite has totalled just over 1,000 pages of news, reports and programme information. Issue number 60 seems like an appropriate point for me to step down as Newsletter Editor, a job which I have done since the first issue in 1990. I wish my successor, to be elected at this AGM, every success in taking Coprolite forward for the next 20 years. Do make sure that you continue to send your news and information to the new editor, so that Coprolite can keep everyone abreast of what is going on in your neck of the woods (unless you are up to something that you would rather no one knew about…).Thanks are due to Barnes Print Group of Nottingham who have been very effective and efficient in the printing and distribution of Coprolite since the very beginning. I also wish to record my thanks to Monica Price who helped out so much with the production of Coprolite in its early days and to all GCG members who kept me informed with their news.Report accepted.On behalf of all members, Helen Fothergill thanked Tom for all the work he has done producing the Newsletter and getting it out to members on a regular basis.

10. Recorder's Report.None received.

11. Election of Officers and Committee for 2010.

One nomination for Committee has been received. This is for Mark Evans (Leicester).

Newsletter Editor's role will be shared by David Craven and Lyall Anderson.

All other posts are unchanged.

Proposed: Phil Doughty. Seconded: Geoffrey Tresise.Changes agreed.

Election of Auditors.David Green and Caroline Buttler have agreed to continue as Auditors.Proposed: John Nudds. Seconded: Cindy Howells.Agreed.

If anyone is interested in standing for Committee in any capacity, please contact any member of the current Committee.

12. Any other business.

Website report from Hannah Chalk.

General data. Website statistics are available. A general trend shows that the number of sessions, hits per session, and duration of sessions has risen each year (note: the data for 2009 is Jan-Nov).Website work.Once again, the GCG website has continued to grow, and the following additions have been made:

Archive. All back issues of the Geological Curator are now available electronically inpdf format up to Volume 8 number 6. Individual pages have been created for each of the Collectors/Dealers featured in the GCG Information Series on Collector/Dealer labels, in addition to the pdf document.Please can people send me the paper / electronic copies of Coprolite sothat I can start scanning them for the archive. I already have the followingissues: 26, 48, 49, 50, 51, 52, 53, 54, 55, 56, and Coprolite 1-50 name index.

Collections. Again, little has changed here, but I have updated/corrected information inresponse to a couple of emails supplying me with new information.Committee. All committee members (except for Leslie and myself!!!) have photos alongside their information. Please can new information be sent to me as and when necessary.

News. A new News Archive page has been added to ensure a record of past news remains available.The jobs page has been revised slightly, hopefully to make it more useable; new jobs are clearly marked, and information about the date that the job was posted, has also been included.

Flickr.The GCG Flickr account was created and a link appears on the home page.There are currently 72 images and 4 sets comprising: 4 x SedimentaryStructures, 1 x Building Stones, 21 x Plymouth 2006, 9 x Scarborough 2008. Note to everyone: Please keep adding pictures!

13. Date and venue of next Annual General Meeting.

7th - 8th December 2010. Ulster Museum, Belfast, NI.

At the close of the meeting, Helen Fothergill thanked Steve McLean and the staff of the Great North Museum for organising and hosting today's Seminar and AGM.

THE GEOLOGICAL CURATOR

Publication scheme

Two issues of The Geological Curator are published for each year (usually in the Spring and the Autumn); a complete volume consists of ten issues (covering five years) and an index.

Notes to authors

Articles should be submitted as hard copy in the journal style, on good quality paper (A4 size) double spaced, with wide margins, and on disk (although e-mail submissions are also accepted). Three copies should be sent to the Editor, Matthew A. Parkes, Natural History Museum, Merrion St., Dublin 2, Ireland (tel 353-87-122-1967; e-mail: mparkes@museum.ie). Line drawings should be prepared in black ink at the desired publication size. Photographs for halftone reproduction should be printed on glossy paper. Both drawings and photographs should be proportioned to utilise either the full width of one column (85mm) or two (175mm). References in the text follow the Harvard system, i.e. name and date '(Jones 1980)' or 'Jones (1980)'. All references are listed alphabetically at the end of the article and journal titles should be cited in full. Authors will normally receive proofs of text for correction. Major articles are refereed. Copyright is retained by authors.

If submitting articles electronically please note the following:

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

Regular features

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

FACT FILE contains basic information for the use of curators. All items relating to this column should be sent to the Editor (address above)

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

GALLERY REVIEW comprising short pieces on new museums or exhibitions.

CONSERVATION FORUM helps keep you up to date with developments in specimen conservation. Information on techniques, publications, courses, conferences etc. to Dr Caroline Buttler, National Museums and Galleries of Wales, Cathays Park, Cardiff CF10 3NP, Wales, UK.

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

INFORMATION SERIES ON GEOLOGICAL COLLECTION LABELS consists of loose A4 size sheets, issued irregularly, which carry reproductions of specimen labels usually written by a collector of historic importance. The aim of the series is to aid recognition of specimens originating from historically important collections. Contact the Editor.

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UK Personal Membership	£15 per year
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Backnumbers

Backnumbers of The Geological Curator (and its predecessor, the Newsletter of the Geological Curators' Group) are available - please enquire with your requirements. All issues are available for download from www.geocurator.org.