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GEOLOGICAL CURATORS' GROUP

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- 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.

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Cover: Mastodon tooth GLAHM V5132, See paper by Liston inside.

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MANAGEMENT OF THE SENCKENBERG AMBER COLLECTION AND RESEARCH DEVELOPMENTS

by Girard Vincent, Franz Claudia, Solórzano Kraemer Mónica M.

Vincent, G., Franz, C. and Solórzano Kraemer, M.M. 2012. Management of the Senckenberg amber collection and research developments. *The Geological Curator* 9 (7): 373 - 380.

Amber and copal are fascinating materials due to their ability to preserve fossils in incredible detail, but they are also very fragile materials that quickly deteriorate when stored in unsuitable conditions. The copal surface becomes cracked after some years and amber becomes darker and fragile over time. Few studies have dealt with the problem of amber storage, but they highlighted the bad effects of environmental conditions (temperature, relative humidity, light and oxidising agents). After the acquisition of important collections of amber and copal, the Senckenberg museum developed an original storage system for its amber collection. New air-conditioned stores protect the material from temperature, relative humidity and/or light intensity variations, whilst embedding in artificial resin is used to protect the samples from the atmosphere oxidising agents. The Senckenberg museum has thus a very secure amber storage system.

Girard Vincent, Claudia Franz and Mónica Solórzano Kraemer², Senckenberg Forschungsinstitut und Naturmuseum, Department Paläontologie und Historische Geologie, Bernstein Arbeitsgruppe, Senckenberganlage 25, D-60325 Frankfurt-am-Main, Germany, email: vincent.girard@univ-montp2.fr. Girard Vincent now at Université Montpellier 2, Centre de Bio-Archéologie et d'Ecologie, 163 rue Auguste Broussonnet, F-34090, France; Claudi Franz, email: Claudia.Franz@senckenberg.de; Mónica Solórzano Kraemer also at Steinmann Institute, University of Bonn, D-53115 Bonn, Germany, email: Monica.Solorzano-Kraemer@senckenberg.de. *Received 14th September 2011.*

Introduction

Both amber and copal evolve from plant resin that is progressively fossilized by polymerisation (copal being a non-mature amber younger than 10 million years). Well known for their preservational potential, these fossil resins have been intensively studied for more than 150 years for the many incredible fossils they contain. Specimens belonging to organisms from bacteria to vertebrates (e.g. Poinar 1992; Grimaldi 1996, Penney 2010) have been found. Fossil resins have a fossil record expended as far as the Devonian to Quaternary (Ganzelewski and Slotta 1996). Amber research provides important data about the evolutionary history of several groups of organisms that are rarely preserved in the fossil record and also about the ecology of past forest environments. The diversity of resin-producing trees is also very broad. Amber and copal were produced by gymnosperm and angiosperm trees (Langenheim 2003) in warm temperate or subtropical environments, but also in tropical ones, e.g. Mexican, Dominican and Indian amber (Grimaldi 1996; Solórzano Kraemer 2007; Rust *et al.* 2010), giving important information about the evolution of past terrestrial ecosystems.

Many amber research groups have been created around the world. Germany is probably the country where amber research is most developed. Many institutes and museums in Germany have their own amber collection, most of them being studied by a team of scientists. One exception was probably the Senckenberg Museum of Frankfurt-am-Main, which had pieces of amber in its collection for more than a century, but they were never studied and managed as a separate collection until recently.

The age of the amber and copal material of the Senckenberg collection ranges from mid Cretaceous to Pleistocene/Holocene with a world-wide origin. It contains many fossils including arachnids, terrestrial and aquatic insects, crustaceans, plant remains, vertebrate remains and also microfossils. The largest part of the collection is composed of samples of Baltic amber, but there is also amber from the Dominican Republic, Mexico, Borneo, Austria, Lebanon and China, and copal from Madagascar, Colombia, Kenya and Puerto Rico. The earliest acquired amber pieces in the Senckenberg are a part

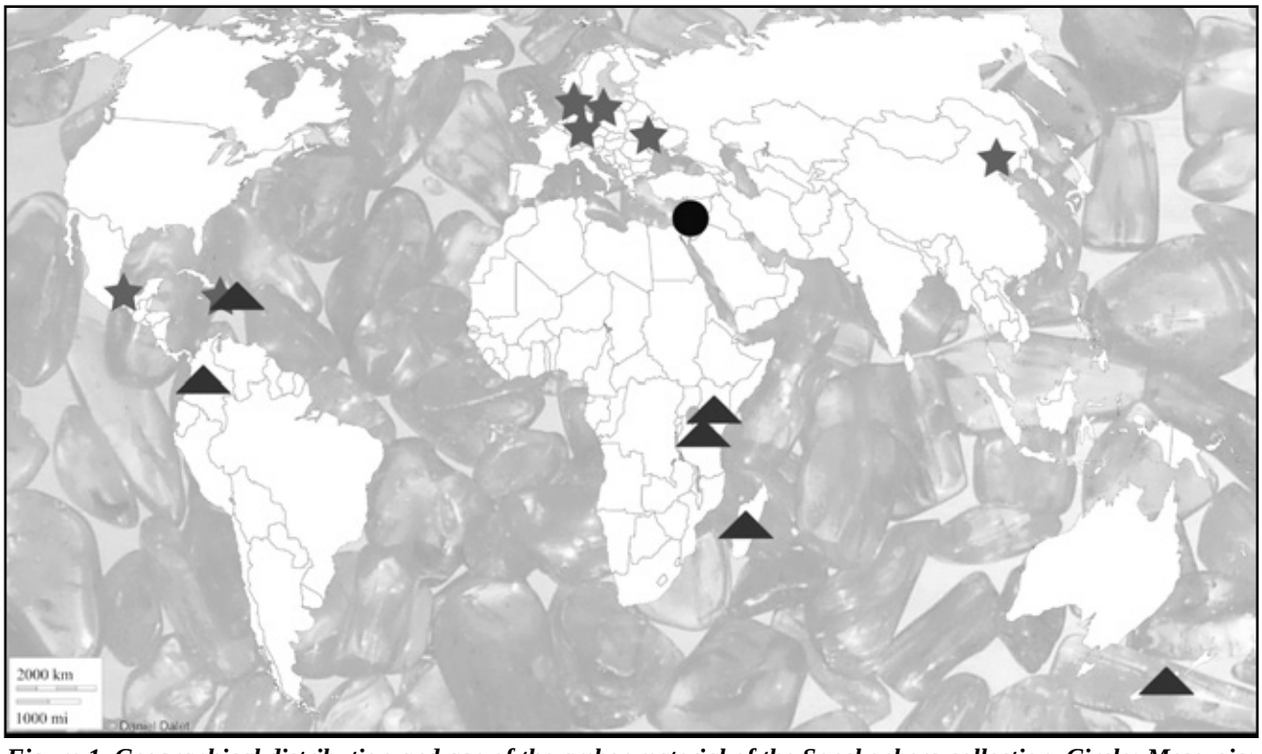

Figure 1. Geographical distribution and age of the amber material of the Senckenberg collection. Circle: Mesozoic; Stars: Cenozoic; Triangles: Quaternary.

of Hugo Conwentz's collection from1884 and a part of the Carl von Heyden's collection acquired in 1901. The Frankfurt citizens A. von Gwinner and K. Dietze then gave a few samples (Baltic amber) to Senckenberg, in 1908 and 1913 respectively. Following these acquisitions, the next new material was the B. Graffham collection of fossil resins from the Caribbean obtained in 1978. At the end of the twentieth century two new collections were purchased. The first, obtained in 1998, consists of 375 pieces of Baltic amber from Lithuania collected by amateurs S. Urbonas and J. Veilandas. In 2000 a small collection of Dominican amber and Tanzanian copal was acquired from K.A. Frickhinger. About 100 pieces of Baltic amber containing arthropods and plant remains from the L. von Carlowitz's collection were acquired in 2005.

The most important acquisition by far was bought in January 2008 - a part of the Wunderlich collection. Jörg Wunderlich is an active palaeontologist with a special interest in fossil spiders, and during his career he acquired important amber and copal material from many localities (Baltic Sea, Dominican Republic, Borneo, Lebanon, China, Madagascar, Kenya, Colombia...) totalling over 10.000 pieces. Purchase of part of this magnificent collection was made possible thanks to funds from the Dr Marschner Stiftung (http://www.dr-marschner-stiftung.de/). Other parts of the Wunderlich collection were bought by the Naturkunde Museum Görlitz (part of the Senckenberg organization) and the Geologisch-Paläontologisches Institut und Museum of the University of Hamburg. Some material was retained by the owner.

Lastly, in 2010, 36 pieces of Mexican amber, acquired from O. Gerhardt, further supplemented the Senckenberg amber collection.

Until recently, the amber and copal collection of the Senckenberg was managed as a normal palaeontological collection and no particular storage precautions were taken. Thus, the Senckenberg's old amber collection of the Senckenberg suffered the "normal" condition of storage. Samples were placed within a cupboard in a room with important daily and seasonal temperature and relative humidity variations. The storage room was not always heated and the older pieces of the collection have been moved to different locations (sometimes including displays in the museum exhibitions) e.g. from the Senckenberg museum to a newly acquired building for the Department Palaeontology and Historical Geology in another part of Frankfurt. No control or monitoring system was installed to control the environmental parameters (temperature, relative humidity, darkness) of the storage room and only few pieces of amber were embedded in artificial resin. Thus many pieces acquired several decades ago now have badly cracked surfaces and the opacity of the pieces has increased over the years. We notice that copal pieces are more cracked

than amber pieces. Indeed, many copal pieces suffer a kind of desquamation, the outer layer being progressively destroyed. Concerning amber, desquamation is less important than for copal but the increase of opacity is more pronounced.

Restoration of damaged amber pieces is in hand. For the less cracked pieces, new polishing of their surfaces is done in order to create a new undamaged surface (Figure 2). The more heavily cracked pieces are consolidated with artificial resin (GTS-Resin) before new polishing (Figure 3). The problem of opacity is harder to solve. Some chemical agents (e.g. chloroform) are sometimes used to reduce the opacity of amber (Girard. V., Pers. Obs. on mid Cretaceous amber from France). However, little is known about other effects of such chemical agents on amber and copal. For example, chloroform can partly or completely dissolve amber (Azar, 1997; Rust *et al.* 2010: Girard. V., Pers. Obs. on mid Cretaceous amber from France). Such techniques will thus not be used on the amber collection of Senckenberg prior to the establishment of a safe methodology. Recently Dunlop *et al.* (2011) demonstrated that 3D imaging of amber fossils helps to study oxidized amber pieces and to determine the fossils preserved in these pieces.

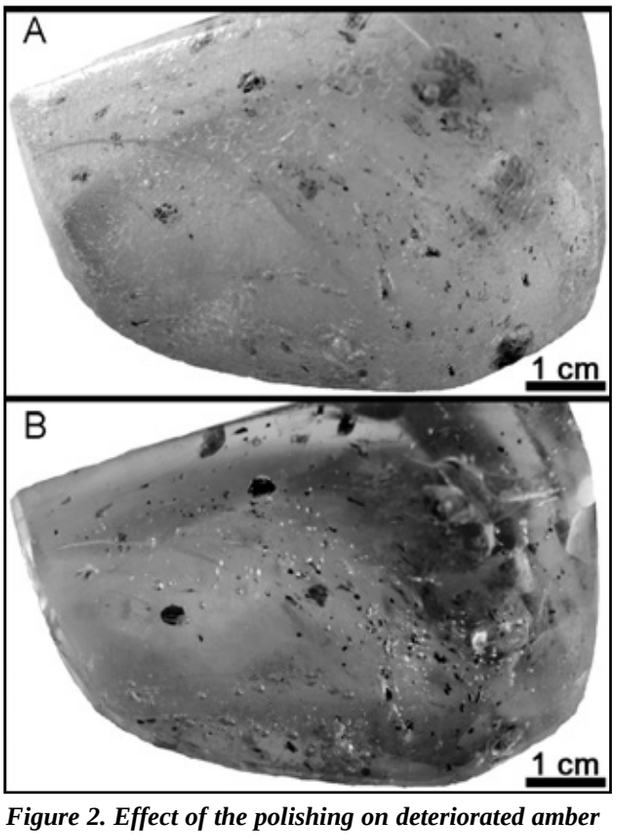

Figure 2. Effect of the polishing on deteriorated amber and copal pieces. A- Piece of Copal from Madagascar with heavily cracked surface due to deterioration. B- Same copal piece after polishing. Notice that polishing helps to erase most of the surface imperfections that disturb the observation of the fossils.

Concerning the recently acquired material, many amber pieces were already weakened when the Senckenberg acquired them. Restoration of this material is being carried out using the embedding method described by Hoffeins (2001).

The storage requirements of amber collection

Amber is a fragile material. Especially when stored in inappropriate conditions, it can deteriorate quickly. Only a few studies have dealt with the deterioration of amber. More studies about the importance to control all factors that deteriorate amber and copal are absolutely necessary.

Carmelo Corral (1999) reviewed the different agents that can contribute to amber deterioration, and Shashoua (2002) made a study of degradation of Baltic amber in museum collections. According to these workers, the most important correspond to temperature, relative humidity, light and atmospheric oxidation.

Temperature and relative humidity cause progressive fragmentation of the amber pieces whilst they become darker over time due to the impact of the light. Several authors (Beck 1982; Carmelo Corral 1999; Shashoua 2002) recommend placing amber in a stable environment, with a temperature between 16 and 20°C, a relative humidity of 35-45%, and darkness. Following these recommendations allows the preservation of amber from 3 of the 4 main deteriorating agents (temperature, relative humidity and light).

Oxidation is probably the most problematic harmful agent (Beck 1982; Shashoua 2002). Atmospheric oxidation or weathering increases the solubility of the amber and degradation is manifested as darkening of the material as a result of oxidation of C=C bonds to form acid and ester groups (Shashoua 2002). To solve this problem in many cases amber is embedded in artificial resin (e.g. epoxy resins). Hoffeins (2001) described the different steps of such an embedding. No studies have yet been made on the impact of these artificial resins on amber and copal, and we do not know if undesirable reactions occur between the artificial resin and the amber or copal pieces. However, samples of several amber collections embedded in artificial resins (e.g. the amber collection of the Museo de Ciencias Naturales de Álava) demonstrate that such embedding limits the oxidation of amber (Hoffeins 2001). Old samples embedded into artificial resins demonstrated that

Figure 3. Embedding into artificial resin. A- GTS resin, its hardener and the material used for the embedding. B- First method of embedding. The amber or copal piece is entirely immerged into the artificial resin. When the resin has hardened completely, it is cut and polished. C- Second method of embedding. The amber or copal piece is briefly immerged into the artificial resin and then put on a support to dry.

some artificial resins should not be used. For example, Canada balsam becomes darker over times. No difference has been observed between the embedding of amber and copal. However no precise study has been led on the evolution of copal after embedding and we do not know if the volatile components of copal have any influences on the preparations. Two main kinds of artificial resin are now used to preserve amber and copal: epoxy resin and GTS resin. Both have the advance of a great transparency that helps to study the samples after embedding. Also the two kinds of resin are routinely used in many museums and no negative reaction between these resins and the samples has been noticed.

For the Senckenberg amber collection, two methods of embedding are used. Samples can be entirely immerged into the artificial resin in order to create a quadratic block of artificial resin in which the sample is included (Figure 3B). This method helps to consolidate fragile samples (such as intensively cracked samples) and allow the cutting and the polishing of the samples after preparation to access the fossils. The second method consists in a brief immersion of the samples in the artificial resin (Figure 3C). After drying, it creates a thin film of artificial resin around the samples to protect it from oxidation. It is used for small samples that do not need cutting and intense polishing and also for samples in which all the fossils have not been studied. Indeed this kind of preparation can be temporary as the resin film can be removed by a new slight polishing.

Embedding is an intrusive procedure. We do not know if there are any influences of the artificial resins on amber and copal. It is not an irreversible procedure, but to remove the artificial resin, we can only polish the samples or try to remove the artificial resin with dangerous and aggressive chemical agents. Another solution was considered, to know the use of cupboards in which oxygen concentration is controlled. However these cupboards are very expensive and no funds have been found for their purchase. In the future, the use of oxygen absorbers in the Senckenberg amber cupboards will be considered.

Storage conditions at the Senckenberg

To avoid new deterioration of its collections, the Amber Research Group of the Senckenberg has bought dedicated air-conditioned cupboards (Figure 4). Developed by the company Panimatic (http://www.panimatic.fr/), these cupboards are normally used in bakeries. They allow temperature and relative humidity to be controlled within the storage area and storage in complete darkness. Panimatic cupboards are thus ideal for following the recommendations given by Beck (1982), Carmelo Corral (1999) and Shashoua (2002). In the Senckenberg cupboards, temperature is fixed at 18°C and relative humidity at 40%. When the cupboards are closed, temperature can vary about 1-2°C and relative humidity about 3-4%, but they remain into the range of variation recommended by Carmelo-Corral (1999).

Figure 4. The Panimatic cupboards. A- General view. B- Temperature (left) and relative humidity (right) monitors. Following the specifications for amber storage, temperature has been fixed to 18°C and relative humidity to 40%. C- Drawers in the cupboards. In total, the amber storage system of the Senckenberg comprises 64 drawers in 4 cupboards representing a storage surface of more than 100m².

Concerning oxidation, embedding in artificial resin remains the only convincing solution. However three main problems remain. First, as mentioned before, we do not understand the precise effects of the artificial resin on amber and copal. We do not know if some of them have pernicious effects. Second, new and interesting methods for studying amber have recently been developed, such as the phase contrast X-ray synchrotron imaging (Lak *et al.* 2008; Soriano *et al.* 2010) and inorganic and organic amber geochemistry (Dutta *et al.* 2009, 2010; Pereira *et al.* 2009, 2011; Aquilina *et al.* 2010). For these techniques, it is better to use pure amber and copal and contamination by artificial resins should be avoided. The Amber Research Group of the Senckenberg is involved in the development of these techniques, and we thus take special care to avoid any contamination of our collections. Third, the embedding in artificial resin of each piece of amber and copal is a significant time-consuming process. Because of all these problems, only the most problematic pieces (the most deteriorated) should be embedded in artificial resin. For the rest of the collection, the embedding should only be done when the fossils (including arthropods, microfossils, plant and vertebrate remains) have been completely studied. Subsamples of the amber and copal pieces (as big as possible) will be taken in order to perform chemical or physical analyses.

The online amber catalogue

For several years the Senckenberg Research Institute has developed a powerful collection management system called SeSam (http://sesam.senckenberg.de/; Brandis *et al.* 2007; Jansen and Türkay 2010). In 2010, a new catalogue was created for the amber collections. As with all the catalogues of the Senckenberg collections, the amber catalogue contains the common data such as the systematics of the fossil, its geographical provenance, age, references of the publications in which it has been described, figured or mentioned, information about donators of the fossils and other useful data. A specific label system has been applied to the amber collection, because some amber and copal pieces contain several hundreds of fossils. For example, Perrichot and Girard (2009) described a 5 × 3 × 2.5 cm amber piece that contains more than 80 arthropods, 180 microorganisms, 7 feathers and many plant remains. Conserving the information about the syninclusions found in a piece is very important for palaeoecological discussions. We started to give a number to all amber pieces from the Senckenberg collections. This number is composed of the 3 letters SMF (meaning Senckenberg Museum Frankfurt), the letters Be (meaning Bernstein, the German word for amber) and a number. For example the first piece of the amber collection is labelled *SMF Be 1*. In each piece, the fossils have the same number as the amber piece in which they have been found, and a letter is added in order to differentiate all the syninclusions of a single amber piece. For example, the fossils from the piece *SMF Be 1* are labelled *SMF Be 1a, SMF Be 1b, SMF Be 1c* and so on. If an amber or copal piece is cut into several parts each new subpiece is labelled with an additional number, e.g. *SMF Be 34-1, SMF Be 34-2*, etc.

Research perspectives

Such a huge amber collection as the one of the Senckenberg museum will provide many new fossils. This will improve our knowledge of the fossil record of many groups of organisms (from bacteria to vertebrates). The study of the Senckenberg amber collection already provided information about the past diversity of spiders (Wunderlich 1988, 2004a, b, 2008), and interesting discoveries are expected for many other groups of organisms.

The Senckenberg amber collection is also very interesting as it allows the comparison of forest ecosystems of different ages (from the Mesozoic to recent times) and developed in different geographical contexts (on continents, on archipelagoes, etc). Palaeoenvironmental reconstructions will allow us to understand the diversity and the complexity of the past forests, such as has been done for several amber outcrops (Solórzano Kraemer 2007; Girard 2010, Penney 2010). Such study will help to understand forest dynamics at different key periods of their history (such as during the mid Cretaceous when angiosperms increased, during the 'greenhouse' and 'icehouse' periods of the Cenozoic or more recently during the climatic fluctuations of the Pleistocene). Study of the fossils is the basis of environmental reconstructions. Thus, specialists and amateurs interested in the different fossil resins and their fossils are encouraged to collaborate with us.

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THE FOSSIL COLLECTIONS OF SIR THOMAS FRANKLIN SIBLY (1883-1948), GEOLOGIST AND GIFTED ADMINISTRATOR

by Christian Baars

Baars, C. 2012. The fossil collections of Sir Thomas Franklin Sibly (1883-1948), geologist and gifted administrator. *The Geological Curator* 9 (7): 381 - 387.

National Museum Wales in Cardiff houses a collection of approximately 560 fossils from the Carboniferous Limestone collected by Sir Thomas Franklin Sibly during a five-year period when he was Professor of Geology at University College of South Wales and Monmouthshire in Cardiff. Throughout his career as a geologist, Sibly authored and co-authored almost a dozen publications on the Carboniferous geology of the Mendips, the Forest of Dean and South Wales. He worked with and learned from geologists such as Arthur Vaughan (1868-1915) and Charles Lapworth (1842-1920), and himself influenced the research choices of eminent geologists such as Frank Dixey (1892-1982), Arthur Trueman (1894-1956) and Thomas Neville George (1904-1980). Sibly later became a university administrator but retained a professional interest in geology and continued some of his research. He donated rocks and fossils to various British museums and universities although it seems that only a fraction of these survives to this day.

Christian Baars, National Museum Wales, Cathays Park, Cardiff CF10 3NP, UK. Email: christian.baars@museumwales.ac.uk. *Received 13th February 2012.*

Introduction

Thomas Franklin Sibly was born on 25th October 1883 in Bristol and was the only boy among five children. His father, Thomas Dix Sibly (about 1850-?), was a solicitor who ensured that his son was educated at Wycliffe College, Bristol, which was founded in 1882 by Thomas Franklin's own uncle, George William Sibly. Thomas Franklin went on to study experimental physics at University College of Bristol. He graduated in 1903 together with Arthur Tyndall (1881-1961; figure 1). Tyndall would later be one of the founding fathers of the School of Physics at Bristol University although, incidentally, Sibly obtained a first class degree and Tyndall only a second. As a consequence Sibly, not Tyndall, was awarded a prestigious fellowship for two years of postgraduate study, often a prelude to an academic career and commonly spent in Germany (Tyndall 2012). Sibly's subsidiary subject had been geology under Professor Sidney Hugh Reynolds (1867-1949). At the same time Sibly became acquainted with young geologist, Arthur Vaughan. Vaughan (1868-1915) was working in the position of Senior Science Master at the Army Coaching Establishment at Clifton and was just putting the finishing touches on his epochal work of a biostratigraphical subdivision of early Carboniferous rocks in the southwest of England using corals and brachiopods (Vaughan 1905). There is no record of how the two men might have met but there is ample circumstantial evidence that Sibly was in contact with Vaughan and did indeed cooperate with him. It is apparently thanks to Vaughan that Sibly became attracted to geology (Trueman 1950). Through his association with Reynolds and Vaughan, Sibly started working on the zonal sequence of the Carboniferous Limestone and its correlation in different areas. Therefore, only weeks after being awarded the fellowship, Sibly decided not to continue his study of physics. Instead, he undertook geological field work in Somerset and published his first account on the Carboniferous Limestone of Burrington Combe (Sibly 1905a). Burrington Combe was one of Arthur Vaughan's haunts although Sibly covered this section in greater detail; Sibly and Vaughan refer to each other's work in their descriptions of the section there (Vaughan 1905, Sibly 1906). Further work in Somerset included Sibly's description of the geology of the Weston-Worle ridge (Sibly 1905b), presented to the Geological Society by Vaughan. In 1905 Sibly won an Exhibition Research Scholarship and went to Birmingham where, under the direction of Professor Charles Lapworth (1842-1920), he worked on the Carboniferous Limestone of Derbyshire (Sibly 1908). At the same time he published two papers on the exposures in Somerset (Sibly 1906, 1907). He took his DSc at London in 1908, was awarded the proceeds of the Geological Society's Lyell fund and

Figure 1. Students taking Physics at University College of Bristol in 1902. Thomas Sibly is top row second from the left (with his arms crossed), standing next to Arthur Tyndall (top row left). Photo courtesy of University of Bristol Library, Special Collections.

returned to Bristol. At first, despite a first class BSc and a DSc, he could find no University post and was going to take up a school appointment in the autumn of 1908, when he was appointed Lecturer in Geology at King's College, London (Richard Sibly pers. comm. 2012).

Professional geologist 1908-1920

On becoming lecturer-in-charge of geology at King's College London in the same year his research did not progress as quickly, presumably due to the demands of his teaching schedule. Sibly's appointment was supposed to free up time for Professor Harry Govier Seeley (1839-1909) to allow him to spend more time on his own research on fossil vertebrates. However, Seeley was taken ill shortly after Sibly's appointment. Apparently, one morning Seeley went to see Sibly, asking him to stand in for him to lecture a particularly rowdy engineering class in half an hour, which he could not take as he was feeling ill. Sibly entered the lecture theatre full of trepidation in view of the reputation of the class. However, the class were initially subdued, being taken aback by the appearance of a new lecturer. The spell was broken, however, when the door was flung open and a group of men tramped in noisily in single file. By a sudden inspiration Sibly shouted "Halt!" and they halted, "About turn!" and they turned, and "Quick march!" and they marched out. This appeared to have broken the back of the trouble, and by presenting an interesting course Sibly quelled the class in half a dozen lectures (Richard Sibly pers. comm. 2012). Seeley died shortly afterwards without returning to his post and Sibly was asked to take over the department (King's College Calendar 1909-10). He did find time, however, to retain his interest in the Carboniferous Limestone and managed to undertake some further work in Somerset (1912). He also made a donation of rocks to King's College in 1914.

In 1913 a new post of Professor of Geology was established at University College of South Wales and Monmouthshire in Cardiff to which Sibly was

appointed. He immediately took up the matter of extremely limited space at the department with the principal, E.H. Griffiths, although before anything could be done about it, the outbreak of the war reduced student numbers substantially. Sibly spent much of his time doing field work on the Carboniferous Limestone of South Wales (now: Pembroke Limestone Group; Waters *et al.* 2007), building on his experiences from his work in Somerset and often assisted by a young postgraduate student, Frank Dixey (1892-1982). Dixey had grown up in Barry and knew Glamorgan well from early walks with his father (Dunham 1983). Sibly's and Dixey's work culminated in a comprehensive study on the Carboniferous Limestone of the southeast margin of the South Wales coalfield, applying the system of zonal biostratigraphy introduced by Vaughan and including lists of corals and brachiopods for each locality (Dixey and Sibly 1918).

Following his graduation in 1914, Dixey was employed by the Cardiff department as Assistant Lecturer and Demonstrator. Later, he undertook extensive geological work in Africa and became the Colonial Geological Survey's first director. When Dixey left in 1917 for Sierra Leone he was replaced as Assistant Lecturer by Arthur Elijah Trueman (1894-1956). Trueman therefore worked with Sibly for one year before Sibly's departure for Newcastle; Trueman then became Professor of Geology successively in Cardiff, Swansea and Bristol and eventually chaired the Department of Geology at the University of Glasgow from 1937 to 1946 where he was succeeded by his and Sibly's student, T. Neville George (1904-1980). George himself had been introduced to Carboniferous geology and biostratigraphy by Sibly and Trueman at University College Swansea.

It was during his time at University College of South Wales and Monmouthshire Cardiff that Sibly compiled an extensive collection of Carboniferous fossils. Two handwritten notebooks documenting Sibly's field work prior to the 1918 publication on the margin of the South Wales coalfield are kept in the archive of NMW's Department of Geology. A single thin section collected and prepared by Sibly of Carboniferous Limestone from Ffwrwm near Machen was recently found at Cardiff University and is now kept in the NMW geology collection. This thin section formed part of Dixey and Sibly's work; Sibly even recorded in his notebook number 1 about collecting the specimen from which the thin section was prepared at Ffwrwm (Sibly's locality number 27SEλ2) on 30 April 1916. Some additional evidence of this work on the Carboniferous Limestone of South Wales is still present in the teaching collection of the School of Earth and Ocean Sciences at Cardiff University which contains 24 specimens from South Wales and other localities collected by Sibly and labelled by himself in his very distinctive handwriting (Figure 2). The same collection also contains numerous specimens from localities in the Mendips, Bristol, South Wales and Derbyshire where Sibly had collected, although the labels do not identify a collector.

Figure 2. One of Sibly's very distinct and neat handwritten labels.

1918 was an important year for Sibly: besides the publication of the results of five years' field work in South Wales he married Maude Evelyn Barfoot (with whom he later had a son, Thomas Charles Franklin Sibly, 1924-1999) and took up a new post of Professor of Geology at Armstrong College, Newcastle-upon-Tyne, which at the time was affiliated with the University of Durham. Presumably it was this move that prompted Sibly to write a letter to the then director of the National Museum of Wales (NMW), William Evans Hoyle (1855-1926), offering his collection of 'several hundred' (560 were accessioned) rocks, fossils and minerals from the Cardiff District, including corals and 30 thin sections of corals from Barry Island, as a donation to the museum. Sibly's letter, as well as some of his notebooks documenting his field work in South Wales, is now present in the archives of NMW.

This collection of fossils is still kept at NMW; approximately half the collection (272 specimens) are corals from Barry Island (Figure 3). During the early 1920s Sibly suggested to Janet Mitchell Marr Dingwall (1893-1972) that she work on some problematic corals which at the time were classed as part of the clisiophyllids. For a long time the clisiophyllids had been a phylum for all manner of undefined but not necessarily related species. Sibly had developed an interest in clisiophyllids when working in the Mendips and had noted the occurrence of some cyathophyllid clisiophyllids in Vaughan's horizons a and C1 (Sibly 1906); he also described a new species, *Carcinophyllum mendipense* (Sibly 1906; figure 4.B). Similar corals occur at Barry Island, near Wenvoe in South Wales, on Gower and in

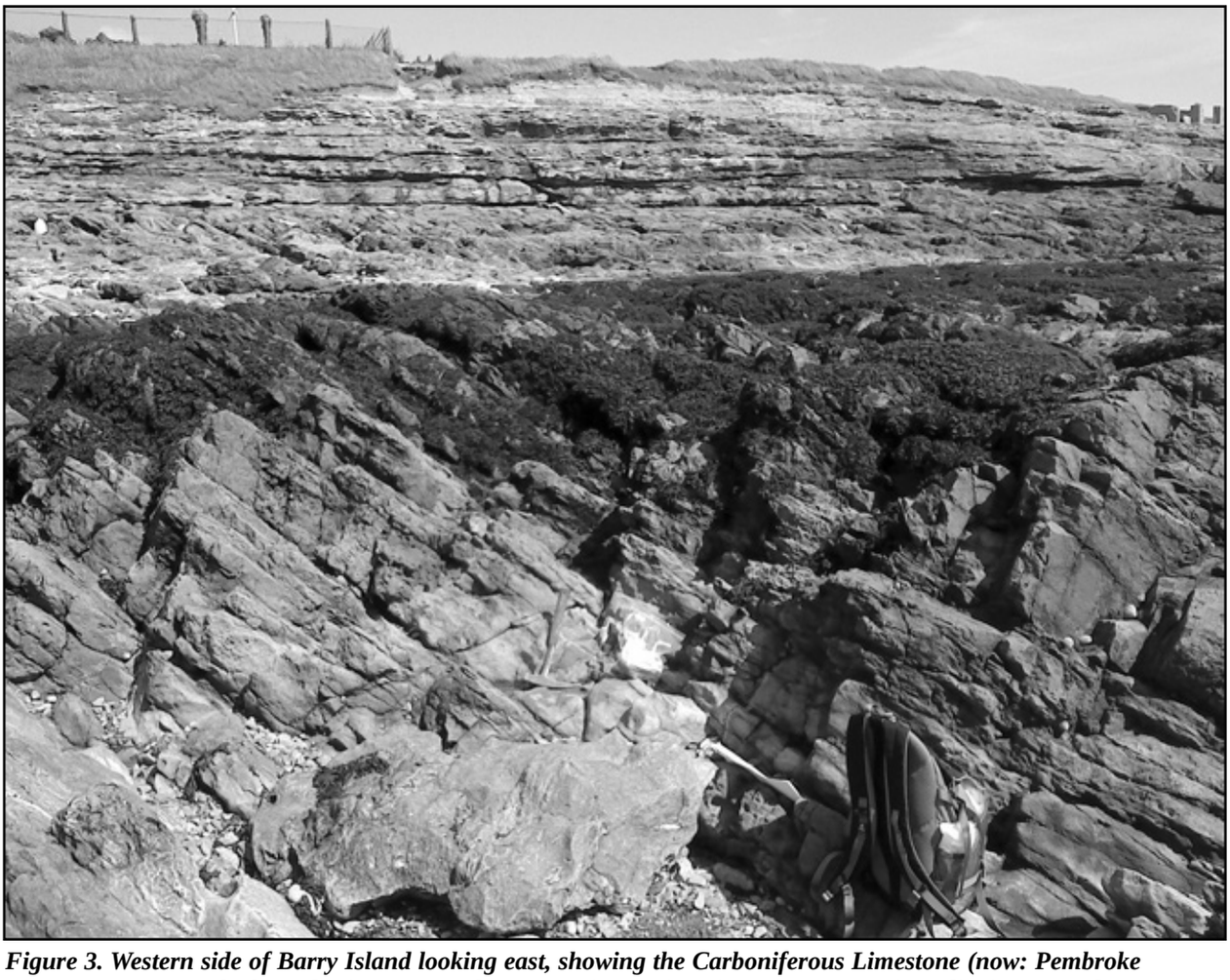

Figure 3. Western side of Barry Island looking east, showing the Carboniferous Limestone (now: Pembroke Limestone Group, Black Rock Limestone Subgroup, Friars Point Limestone Formation) dipping at 40 degrees south (partly covered by marine algae as this part is in the intertidal zone) overlain unconformably by near-horizontal Triassic conglomerates and sandstones (Mercia Mudstone Group, marginal facies). This is the locality for Sibly's Little Island collections kept at NMW.

County Dublin (Dingwall 1926). Following Sibly's advice to work on Barry Island, Dingwall undertook a detailed study of the clisiophyllids and erected the new genus and species *Cyathoclisia tabernaculum* (Dingwall 1926; figure 4.A) which is regarded as an important indicator for rocks of Tournaisian age. The name was suggested by W.D. Lang who had previously referred to the form without describing a new genus (Lang 1923). The type specimens resulting from Sibly's and Dingwall's work, as well as other corals and brachiopods presented by Sibly, are kept at the Natural History Museum in London (Cleevely 1982; Jill Darrell pers. comm. 2011). Incidentally, Janet Dingwall married the geologist John Vernon Harrison (1892-1972) in 1939 (Vincent 1972) but she did not publish on corals again.

The type material from Dingwall's study is now held at the Natural History Museum in London, with 27 additional thin sections (comparative material from Barry Island but none of them figured), originally prepared by Sibly, housed at NMW in Cardiff. In addition, the NMW collection contains five brachiopods collected by Sibly and described and figured by Frederick John North (1889-1968) in his publication on Carboniferous brachiopods (North 1920). Most of the coral specimens donated to NMW by Sibly stand out as being taxonomically unidentified because Sibly never appeared to have prepared his own thin sections, or even polished transversal cuts as did, for example, Neville George. George's extensive work on the Carboniferous Limestone spanning many decades (e.g., George 1927, 1933, 1958, 1972) updated that done by Sibly.

The University of Bristol Geology Museum houses the fossils associated with Sibly and Reynolds' (1937) work on the Carboniferous Limestone of Gloucestershire, totalling 67 specimens of brachiopods, bryozoans, bivalves, gastropods, trilobites and algae as well as rugose and tabulate corals. Also in that collection is a rugose coral from the Carboniferous of Fife collected by Sibly.

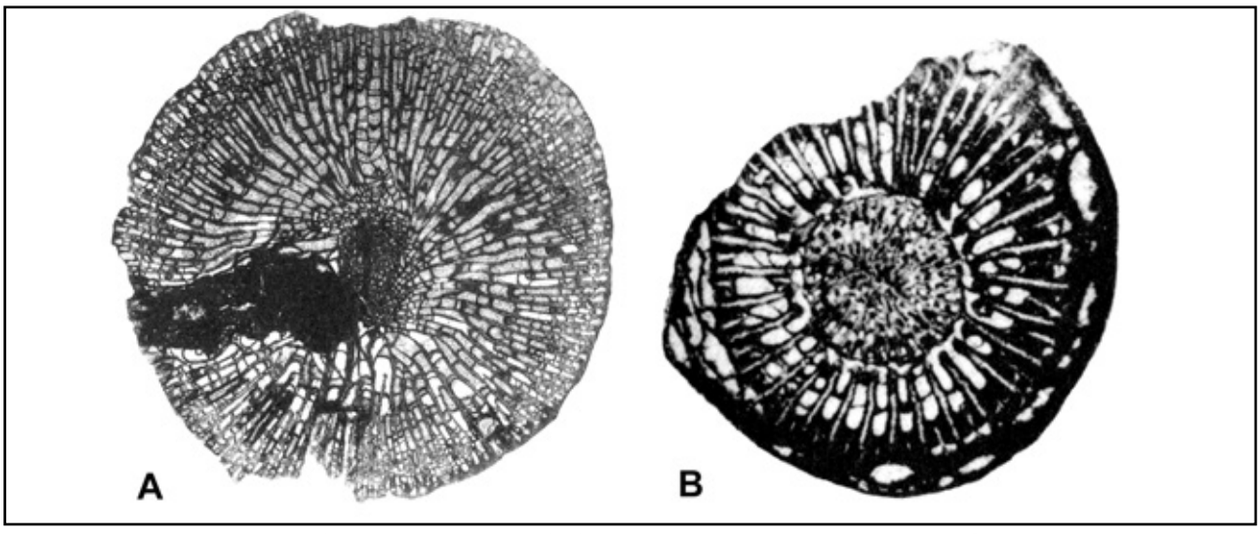

Figure 4. (A)* Cyathoclisia tabernaculum *Dingwall, holotype, NHM number R.16756 as figured in Dingwall 1926, magnification: x2. (B)* Carcinophyllum mendipense *Sibly, holotype, NHM number R.25506 as figured in Sibly 1906, magnification x1.2.

It is curious that no further collections are preserved of Sibly's extensive work on the Carboniferous Limestone over a period of at least ten years, especially considering the large size of his collection of Barry Island specimens. Judging by this collection from just one locality, Sibly and Dixey must have collected hundreds, if not thousands, of specimens during their work in South Wales. It can be speculated only that Sibly regarded the work on the margins of the South Wales coalfield as completed with the publication of the monograph, whereas he never did publish on Barry Island. He may therefore have wanted to keep his collection to allow him or others to continue this work in the future and refers to its existence in his brief publication on the Carboniferous Limestone of the Cardiff District (Sibly 1920).

Whether Sibly made any other collections from the Carboniferous is even more elusive. While University of Bristol Geology Museum holds Sibly's collection from his work in Gloucestershire, the only physical evidence of his early work in the Mendips and Bristol are three brachiopods. It is peculiar that there is not more material, especially considering that the University Geology Museum in Bristol also holds 599 specimens from the Carboniferous Limestone of southwest of England, South Wales and northern England collected by Arthur Vaughan (Claudia Hildebrandt pers. comm. 2012). There are no records of any specimens associated with Sibly at Bristol Museum and Art Gallery (Roger Vaughan, pers. comm. 2012).

King's College, where Sibly had worked 1908-13, still has records of a donation of rock specimens in 1914 (Frances Pattman, pers. comm. 2011). The geology collection of King's College was transferred to Royal Holloway in 1985 but the Department of Earth Sciences at Royal Holloway today has no material of Sibly's in its extensive collections (John Wright pers. comm. 2011) so that Sibly's 1914 donation appears to have been lost.

Between 1918 and 1920 Sibly worked as Professor of Geology at Newcastle-upon-Tyne where the Department of Geology was closed in 1990. It gets complicated at this stage to piece together what exactly happened 20 years ago. The only certainty is that the collection was broken up when the department was disbanded. A substantial amount of the fossils were allegedly boxed up and put in storage at the old brewery site, with the remainder being stored in the ducting space of the bridge leading from the main campus to the library. The old brewery site is now a science park. There is no geological material stored in the bridge today. There are anecdotal and conflicting accounts of either the minerals or the fossils of the Newcastle collection going to the then Hancock Museum (now: Great North Museum) which does house some poorly labelled and documented material from Newcastle University although no material collected by Sibly. Apparently another part of the University collection - mainly the fossils - went to Durham University which also does not have any Sibly material today.

There is also an account of some fossils potentially being taken from the Newcastle collections to Edinburgh University although the person who would have been involved assures me that this was not the case; in addition, there are no records of any fossils associated with Sibly at the Cockburn Museum. Taking into consideration the lack of pub-

lications on the geology of northern England and the lack of evidence of collecting during his time in Newcastle it would be easy to conclude that Sibly did not undertake any field work or collecting during his time there. However, due to the colourful history of the Newcastle geology collections it cannot be excluded that there may have been a collection which was subsequently lost. The last hope of attempting to trace any Sibly material that may have been in the collection was destroyed when, during the closure of the geology department, a large part of the collection was laid out for local schools to pick over.

University administrator 1920-1946

In 1920 Sibly became the first principal of the new University College Swansea. This was quite a career change although he is said to have been a firm and strong leader, a forceful advocate and a gifted administrator (Roberts 2009). The School of Geology at University College Swansea had a sizeable collection when it was merged with the Department of Geology at Cardiff University in 1990. Part of the collection was transferred to Cardiff which is now used for teaching purposes.

Despite his move into university administration Sibly was still active in geology. He did not publish much after his move to Swansea but, as indicated by his influence on T.N. George, still maintained some involvement with geology teaching. As chairman of the Geological Survey Board 1930-43 he also continued his link with the organisation for which he had worked in 1917/18. During this time Sibly had undertaken some surveying on the geology of the Forest of Dean (Sibly 1918, 1927; Sibly and Reynolds 1937). The fossils from his work in the 1930s are still held at the British Geological Survey (BGS) collections at Keyworth today, including two lots of fossils (mainly brachiopods) from the Carboniferous Limestone of the Forest of Dean and Gloucester. The BGS collection also contains a donation of seven specimens from the D2 subzone of the Carboniferous Limestone in Derbyshire by a 'Dr T.F. Sibley [sic] from Kings' College London, January 1912. Given that Sibly worked at Kings College during this time, and his interest in the Carboniferous Limestone, it appears likely that the donation record contains a typo - especially considering that the cover of his 1905 publication in the Bristol Naturalists Society Proceedings contains the same typo. In addition, the BGS houses a collection of rocks from Monmouthshire, donated by Dr J.F. Sibley. This might well be another misspelling, with the rocks having formed part of Sibly's work of his surveying in the Forest of Dean. Besides the fossil and rock specimens, the BGS archive contains a number of letters and reports of Sibly's associated with his surveying work.

In 1926 Sibly became principal of the University of London but left in 1929 to become Vice Chancellor of the University of Reading (1929-1946), where he contributed greatly to the developing of the young university. He was honoured with a knighthood in 1938 and the award of the degrees of D.Sc. Bristol, LL.D. hon. causa Wales, Liverpool and Bristol. He died in Reading on 13th April 1948.

T.F. Sibly must have been a great character. His enthusiasm and passion for geology influenced many people who themselves did much to develop the science, such as Frank Dixey, Arthur Trueman, Janet Dingwall, F.J. North and T.N. George. During his time of active research Sibly undertook much field work and it is evident that he was a prolific collector. From what we know about the collections that did survive it seems likely that, originally, there would have been much more material. Unfortunately little of his collections is still preserved and the fate of what happened to much of the rest may never be known. What appears missing is, in particular, evidence of his early work in the Mendips and around Bristol, in the north of England during his time in Newcastle and, potentially, on Gower during his time in Swansea.

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This publication would not have been possible without the verbal accounts and kind assistance in checking collections records of many present and previous members of staff of the institutions mentioned in the text. I am particularly grateful to Andrew Ross (National Museums Scotland), Claudia Hildebrandt (Bristol University), Colin Scrutton, Frances Pattman (King's College London), Geraint Owen (Swansea University), Howard Armstrong (Durham University), Howard Bartlett (Cardiff University), John Baker, John Wright (Royal Holloway), Paul Shepherd (British Geological Survey), Roger Vaughan (Bristol City Museum and Art Gallery), Sarah Philips (Cardiff University), Sylvia Humphrey (Great North Museum), and, in particular, Richard Sibly (Reading University) for passing on some interesting anecdotes from Thomas Charles Franklin Sibly's memoir about his father, as well as Tom Sharpe (National Museum Wales) and Nigel Monaghan (National Museum Ireland) for helpful comments on the manuscript.

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PULLING TEETH: RETROSPECTIVE IDENTIFICATION OF WILLIAM HUNTER'S FOSSIL MAMMAL MATERIAL

by Jeff Liston

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As an 18th century collector, the anatomist William Hunter had a collection reflecting a diverse range of tastes and interests, including palaeontology. His credentials as a classic Scottish Enlightenment figure are most powerfully expressed in his writings advocating the fossil record as a source of evidence for extinction. This lends a peculiar significance to his own palaeontological material above all of his other collections - yet paradoxically this was one of the few collections to be neglected by his Trustees who failed to produce a catalogue of his fossil material when they audited his objects prior to their transportation to the University of Glasgow. This paper examines the evidence for work by a previous generation of palaeontological curators at the Hunterian Museum in attempting to retrospectively identify William Hunter's original specimens from within the broad range of material present in the 19th century that survives in today's collections.

Jeff Liston, Department of Natural Sciences, National Museum of Scotland, Chambers Street, Old Town, Edinburgh, EH1 1JF, Scotland. E-mail: J.Liston@nms.ac.uk. School of Earth Sciences, Wills Memorial Building, University of Bristol, BS8 1RJ, England. Division of Environmental & Evolutionary Biology, School of Life Sciences, College of Medical Veterinary & Life Sciences, University of Glasgow, Glasgow, G12 8QQ, Scotland. *Received 12th June 2012.*

A historical vacuum

One of the common problems facing an individual taking on the custodianship of an old collection, is coming to grips with the history of that collection, through its documentation. And the older the collection, the larger the problems that that can present. In this regard, the collection of the physician William Hunter (1718-1783) is no exception.

Many authors have written on the life of William Hunter, his pioneering approach to the teaching of anatomy in Britain, success as an obstetrician amongst the wealthy of London society, and consequent pursuit of collecting (Keppie 2007). The roots of his collections lie as far back as 1742, in the anatomical and pathological preparations left to him by James Douglas. But he lacked the financial wherewithal to expand his collections at this early stage in his career. After becoming a member of the Corporation of Surgeons in 1747, he began to move from surgical to obstetric practice, being appointed surgeon-accoucheur at the Middlesex Hospital in 1748, and the same at the British Lying-in Hospital the following year. This direction change marks the beginning of his rise to become London's leading obstetric consultant, with a commensurate increase in his income.

At this point, it is worth giving some indication of the wealth within the medical profession at this time. Richard Mead was "said to have made £12,000 a year from his practise - an inconceivable amount in those days, and all free of income tax, which had not yet been invented……he rode about London 'in a gilt carriage drawn by six horses and accompanied by two running footmen'." (Picard 2001: p.204). So, when Hunter became financially independent from his father in 1754, it was to the sale of Richard Mead's collection that William went for his first large scale expansions in his collections, with the purchase of books, manuscripts and portraits of figures from the history of medicine (Keppie 2007) totalling just under £190 (Brock 2008a). At this stage, the focus of the material that Hunter was acquiring was still very much medical - even the purchase of an Egyptian mummy from Mead's sale reflected his interest in embalming more than the acquisition of a mere cultural artifact (Keppie 2007). By 1755 he required a bank, so opened an account with Drummond's at Charing Cross (now the Royal Bank of Scotland) with £230, and by early 1756 he was medical adviser to the ladies Bolingbroke, Hertford, Hester Pitt and the Countess of Coventry, and able to start buying substantial amounts of government stock (Brock 2008a). As Fabricius (1784: Chapter 5) observed "Anyone distinguished and rich enough who needed

an accoucheur had to be served by Dr. Hunter." Thus, when Queen Charlotte became pregnant for the first time in late 1761, his success with this aristocratic clientele must have had no small part in the Sergeant Surgeon to the King advising that Hunter should be appointed to advise during the pregnancy. By September 1762, over £18,000 had reached his Drummond's account from government stock activities (Brock 2008a), and his status servicing the aristocracy was endorsed in that same month, with Hunter formally being appointed as physician-extraordinary to her Majesty Queen Charlotte (Illingworth 1967). His financial security is further demonstrated by the fact that in July 1767 he was even able to afford to turn down offered payment for his services, despite a moving appeal from the grieving Earl of Suffolk[1], when the outcome had been unsuccessful (Brock 1996).

With this expanding resource, so also were his collecting horizons soon to expand markedly.

In 1763 William Hunter had requested of the King and his First Lord of the Treasury (a similar post to today's prime minister) Lord Bute, the grant of a plot of ground on which to establish a public museum of anatomy in London (Keppie 2007, Brock 2008a). Bute resigned on April 8th, having failed to raise the issue with the King as per Hunter's request, and there is little evidence that his successor, George Grenville, did any better. There are many possible reasons as to why this proposal was not embraced: both men were tasked with trying to rebuild Britain's finances following the Seven Year War (Lewis 2009) under the continued pressure of the ongoing costs of financing the British Army in the American colonies. Grenville also seems to have had some personal differences with Pitt the Elder and others in the British government that were clients of William Hunter (Eccleshall & Walker 1998) (Grenville being one of the few Prime Ministers after 1762 that did not engage Hunter's obstetric services for his wife, Elizabeth Wyndham), as well as with the King. Hunter was also the target of some anti-Scottish sentiment in some parts of London society (see Brock 2008b: p.260), perhaps heightened in the wake of the most recent Jacobite rising (1745). Regardless of the exact reason, after several months of unsuccessfully pursuing a response to his application, in 1765 Hunter abandoned his planned public anatomy school for London (Keppie 2007), in spite of the personal intervention of the 2nd Earl of Shelburne William Petty, who tried to save the project through subscription[2]. In 1766, he bought the house and grounds at 16 Great Windmill Street[3] and from 1767-1768 converted the building (at a cost of some £8,000) into a house, with private anatomy school (lecture and dissecting rooms) and museum/library (Brock 2008a).

It is interesting to reflect that, in his initial submission to the King via Lord Bute in 1763, cognisant of the monarch's broader cultural interests, Hunter explicitly suggests that his anatomy school/museum could form "a small part of an institution, worthy of the British nation, and a British King." (Brock 2008a: p.177). In effect, he had substituted a proposed public anatomy school/museum within a far broader cultural institution for up to £7,000 of his own money, for building his own private anatomy school with a broader museum and library for around £10,000 of his own money. But still - arguably unlike many 18th century collectors (Rolfe 1985) - he was not a 'stamp collector' simply compiling a cabinet of curiosities or sybaritic expressions of status - which would have been a pointless activity to one who never engaged with London Society (Brock 2008b: p.265), but acquiring material with the aim of supplementing his knowledge of (and interest in) the related branches of natural science (Keppie 2007).

From Hunter's plans, it can be seen that the museum/library was given at least the same footprint as the medical theatre (GB 0247 MS Hunter H484), perhaps indicating an equivalence in importance to him. By this stage his concept of what would be in his museum had also altered, as he embarks in 1767 on acquiring natural history objects, in 1768 on ethnographic material (from James Cook) and by the time he moves into the finished building in 1770, he has also begun to collect coins and medals, the single most expensive of all his collection areas (Keppie 2007). By the time of his death, across the diversity of his collections (Liston 2007), the numbers of both his coins/medals and natural history objects far outstrip the medical preparations, books, manuscripts, ethnographic objects and artworks (Keppie 2007), as seen in Table 1.

As part of Hunter's expansion into natural history, his collecting began to encompass palaeontological material around 1767 (Keppie 2007; Liston 2013a in

[1] "You gave up everything to us! and now by a delicacy, a sentiment, a principle, unknown to the mean souls of these times, you rise superior to Reward!" (Brock 2008a: p.253).

[2] Even to the extent of offering a thousand guineas of his own (Brock 2008a: p. 194).

[3] Either for £1200 or £2100. (Brock 2008a: p.236).

Category	Approx Year 1	Significant Sources	Approx Numbers at Death
Anatomical/Pathological prepns	1742	James Douglas	3,000
Books	1754	Richard Mead	10,000
Manuscripts	1754	Richard Mead	650
Artworks	1754	Richard Mead	65 paintings
Natural History objects	1767		15,000
Ethnography	1768	James Cook	200
Coins/Medals	1770		30,000

Table 1: The collections of William Hunter, arranged by discipline, showing approximate size at the time of his death and showing sources of significant quantities of relevant acquisitions. Information compiled from Keppie (2007) and A. Dulau pers. comm. 29/2/2012.

press). It is significant that this is the same year that he witnessed Peter Collinson present to the Royal Society on the 'Ohio incognitum' (mastodon remains from Ohio) (Collinson & Croghan 1767; Collinson 1767), which seems to have been the prompt for his published work arguing that the mastodon could represent an animal that was now extinct (Brock 2008a: p.276) [4,5]. In his notes for this scientific paper (not used in the published version, although possibly used during his verbal presentation to the RS) he admits that "This subject, tho a little out of the course of my studies" then some earlier suggestions of 'struck' and 'drew my attention' are scored out before he arrives at "raised my curiosity." (GB 0247 MS Hunter H135(5))[6]. Over the next fifteen years, his natural history collection expanded to some 15,000 specimens (Keppie 2007, p.25), within which the fossil material appears to have played a significant part for him (hinted at both in his library category listing GB 0247 MS Hunter H247, and also in his plans for a dedicated volume - see below), to the extent that Hewson even complained in 1771 that Hunter was becoming distracted from anatomy by his collection of books, coins and "natural history Catalogue" (Brock 2008b: p.83).

At the point of Hunter's demise, under the terms of his 'English Will', his Trustees were engaged to care for and audit the collections until the University of Glasgow was ready to receive them. The palaeontological collections were unfortunately the 'poor relation' of this activity, with no catalogue undertaken by the trustees. It is telling that in 1794, Matthew Hunter Baillie states that "everything which is valuable" has been recorded (Keppie 2007: p.39), yet of the geological material, merely the minerals are listed (perhaps because, as Fabricius noted, they were "not exactly numerous", Fabricius 1784, Chapter 5). Within this, it is fair to say that there are some fossil wood specimens noted, but nothing remotely palaeozoological. And yet the fossil material - particularly that of vertebrates - was of particular importance to Hunter. Fabricius (1784: Chapter 5) remarked that Hunter had begun work for a similar volume to his 'Gravid Uterus', expressly devoted to "the animal fossils, in which he seeks to explain in particular the origin of these fossils. Several copperplates of the most extreme beauty have already been engraved for this work." Notwithstanding this recorded intention or work in progress, Hunter did publish on fossil vertebrates during his lifetime, contending - somewhat controversially for the time - that extinct animals could be represented by such fossilised remains. This sees Hunter's philosophical mind, unfettered by the constraints of polite society, and prepared to engage with ideas that some would consider heretical or even blasphemous (Liston 2013b in press).

But, as Brock (1996: p. ii) noted, under the aegis of the Trustees "there is evidence that the museum while in London did not receive the care that it deserved." As far as producing catalogues of the material, Brock (2008a: p.xv) notes that "where it would have required work organizing the material, no catalogues were produced", yet in this regard she paints an overly-favourable picture of the Trustees, as the natural history and fossil material, reported as well-arranged by both Tyson (Brock 2008b: p.216)

[4] As such, Collinson's (1767: p.469) last line of "this great creature….wherever it exists" contrasts strikingly with Hunter's (1768: p.45) "its whole generation is probably extinct".

[5] Collinson's two papers were read on 26/11/1767 and 10/12/1767. Hunter's paper was submitted to the Royal Society a mere ten days later on 20/12/1767.

[6] It should, however, be noted that Collinson's interpretation of herbivory for the animal (Collinson 1767; Brock 2008a: p.276) was more accurate than John Hunter's of carnivory, reported by his brother William (Hunter 1768).

and Fabricius (1784), was similarly neglected. The fossil material certainly was not held in Hunter's esteem by the Trustees - in particular, by George Fordyce, who was charged with cataloguing that part of the collection (Liston 2013a in press)[7]. So there is no Trustees' inventory of this collection, and no collector's catalogue (as with other aspects of Hunter's collection - e.g. Hunter's catalogue of his own library), which is particularly galling given the level of organization in the displayed material reported in 1776[8]. Some information can retrospectively be interpreted from James Laskey's *A General Account of the Hunterian Museum, Glasgow*, a visitor's virtual 'walk-through' guide to the displays, that is the earliest evidence of fossil material contained within Hunter's collection [Liston, 2013a in press].

Empty registers

Recent cataloguing work on the fossil vertebrate registers highlighted the paucity of specimens conclusively identified as coming from William Hunter when the material was first registered: there were precisely none. The Hunterian Museum's written palaeontological specimen registers only date from the early twentieth century (possibly following on from an initiative by the newly-appointed assistant curator, Ethel D. Currie, Ian Rolfe pers. comm., February 2012, (Keppie 2007 ref.: pp.100-104)) and feature a variety of forms of handwriting that testify to a diverse number of recorders. The original registrars failed to record any specimen whatsoever as explicitly from William Hunter, regardless of such material being noted in Laskey's 'walk-through' guide to the displays in the first incarnation of the Hunterian Museum in Glasgow (1813) (Fig. 1a). A model for how and why this might have happened is presented later ('A Model For Loss'), however, it is clear that not only was the filling of the registers begun some time after the material was originally received, but the process of their recording has been staggered over decades. The material is initially ordered by pages of catalogue numbers being assigned to large taxonomic groups. This taxonomic numerical arrangement (where batches of pages, and their associated catalogue numbers, were allocated to discrete groups of animals) only began to be abandoned after Ethel Currie's time, in the 1960s (this move was partly associated with the need to find room in the registers for a large quantity of unrecorded marine reptile material from the Alfred Leeds collection, which had arrived shortly before Ethel Currie started as Assistant Curator of Geology (Liston 2006)), and ceased entirely in the 1990s with the full adoption of the computer catalogue (and its associated embracing of undefined - i.e. prefix-less - and 'section free' catalogue numbers for all new material acquired across the collections).

As has been noted, no specimens of the fossil vertebrates in the Hunterian registers were explicitly identified as belonging to William Hunter. Are there any records in the Register which might potentially 'disguise' specimens of William Hunter's original collection? A significant quantity of the material in the Hunterian Registers lacks explicit donor information, and falls into roughly three main categories: The first is a blank provenance entry - no information is recorded as to where it came from (this, along with misuse of 'ditto' marks, is of course a common problem in historical collection registers). The second is an entry - in one handwriting - of 'Old Collection'. The third is an entry - in a very different handwriting - of 'Hunterian Collection'. There has been significant internal departmental disagreement over what was meant by the scribes that entered the last two terms in the Registers, and it has traditionally been seen as safest to regard them as dubious, probably referring solely to the material being 'pre 20th century'. It seems inconceivable that all of William Hunter's fossil vertebrates were lost from the Hunterian Museum's collections between their being noted in Laskey's 1813 *A General Account…* and the present day, so it is most likely that William Hunter material lies somewhere within these three 'unidentified' categories of provenance record. Given the unlikelihood that all of William Hunter's fossil vertebrates were lost from the Hunterian Museum's collections and subsequently replaced with identical (yet 'conveniently' unprovenanced/source unnoted) material, it seems reasonable to determine whether any of the descriptions in the 1813 *A General Account...* could be matched with material lacking provenance. If such specimens were found, it would seem more correct to identify those specimens as most likely to be Hunter's original material - especially when only a finite number of such specimens are available. To this end, an exercise was embarked on to match material that Laskey identified in his *A General Account...* with material in the above three 'provenance-less' register categories. This yielded significant success in identifying fossil fish specimens of Hunter's on display in the first incarnation of

[7] Albeit that after nineteen years as a Trustee with said responsibility, George Fordyce died in 1802 before the material was sent to Glasgow (Brock 2008a:xvi).

[8] Letter from Tyson to Gough on 24/5/1776 notes that "His books, his medals and his natural curiosities which last are very numerous and classed so well as to be of real use to any Naturalist." (Brock 2008b: p.216).

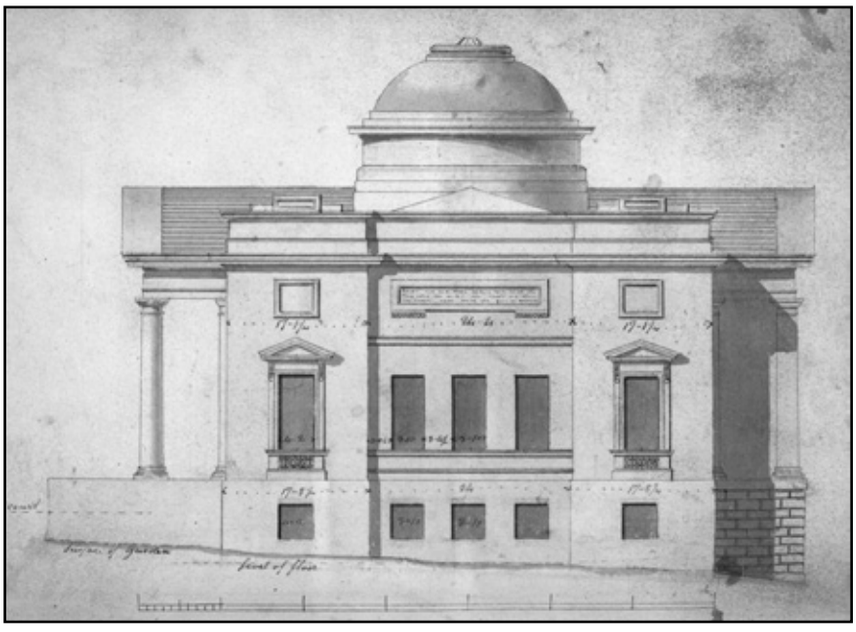

Figure 1. The original circa 1804 drawings of William Stark (1770-1814), architect of the first Hunterian Museum. University of Glasgow Archive Services, GB0248 BUL6/56/70.
Figure 1a). Side elevation shows the external emergence of the basement level of the museum from the ground level stairway entrance to the left of the image, to the right for the Halls of the Elephant and Anatomy.

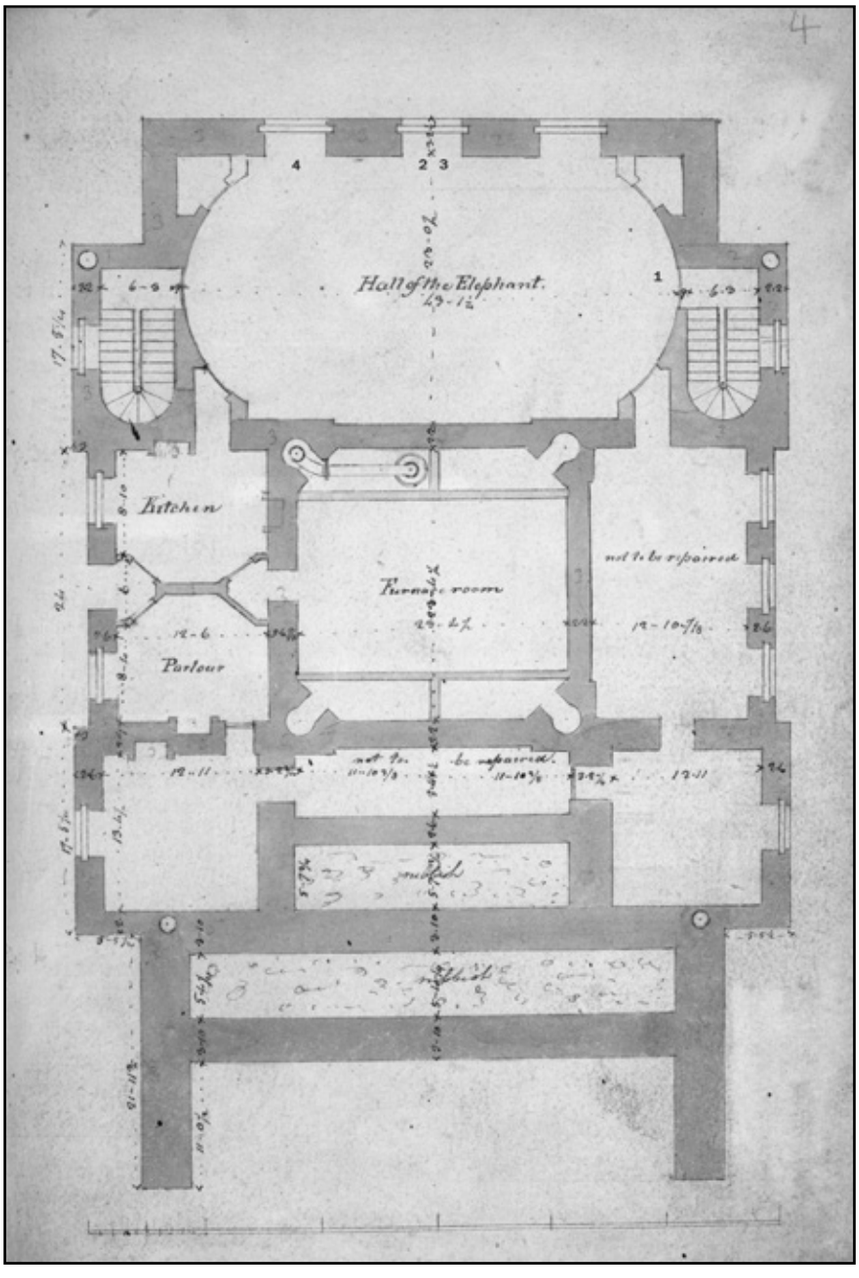

Figure 1b). Plan view of basement level, with numbers added to show the locations of William Hunter's fossil vertebrates (see Table 2 for relevant descriptions).

the Hunterian Museum in Glasgow (Liston 2013a in press), and although this underlined Hunter's broad interest in vertebrate fossil material as part of a fossil record that contained extinct animals (reflected in his library GB 0247 MS Hunter H247), of more direct interest is identifying Hunter's fossil mammal material, an area on which he scientifically wrote with the aim of formal publication. As such, this method was therefore considered worthy of expansion to the descriptions of fossil mammal material contained in Laskey (1813).

The beasts of Hunter

Laskey presents us with a total of twenty eight different descriptions of fossil vertebrate material (see Table 2). Descriptions 1-4 (in the 'Hall of the Elephant' Fig 1b) and 20-22, 26, 28 relate to mammal material; descriptions 5-16, 18, 19, and 25 all relate to fish, both cartilaginous and bony; description 17 alone pertains to reptilian material (a tooth); descriptions 23, 24 and 27 are ambiguous as to their nature (Fig. 1c). In a separate paper, the question of identifying the fossil fish specimens, where the collec-

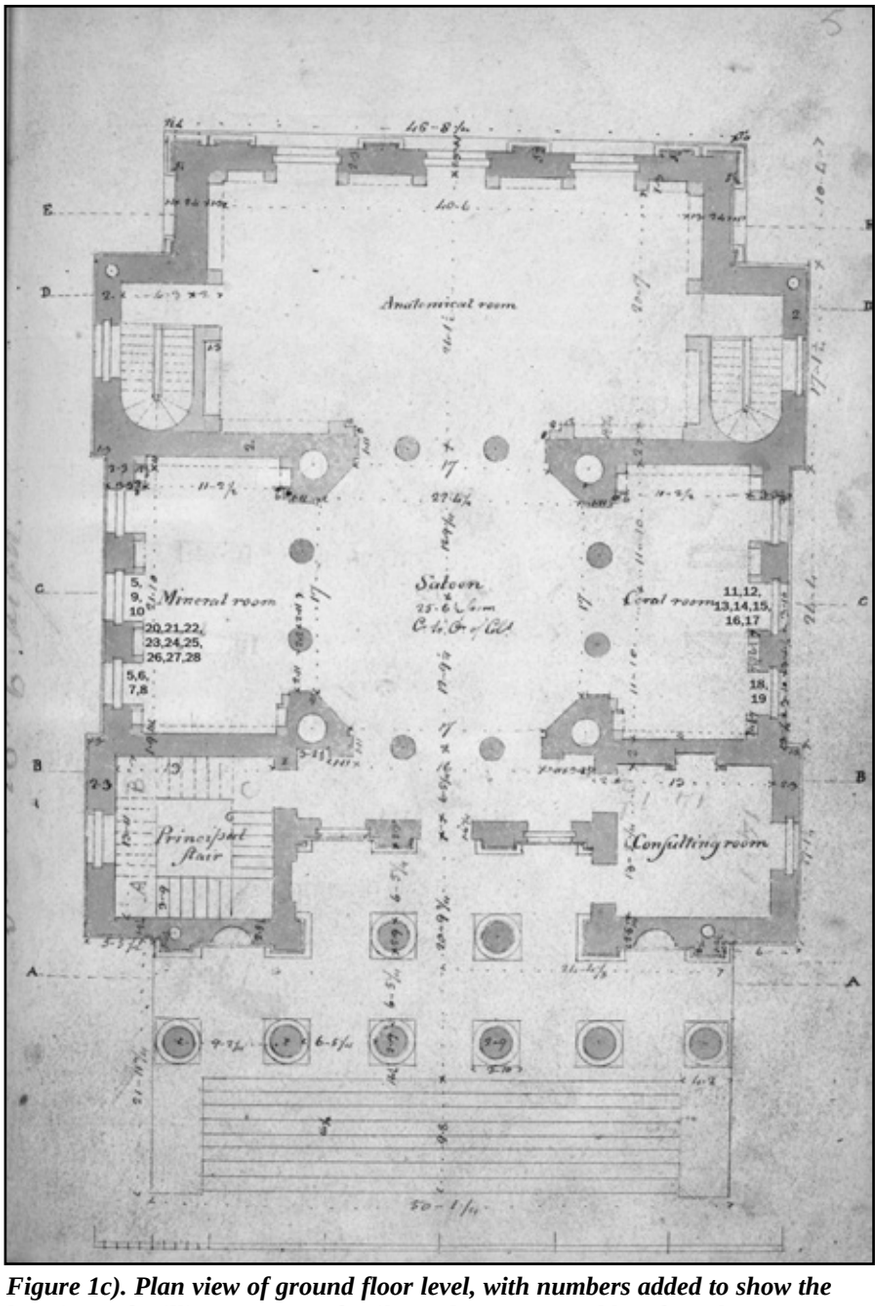

Figure 1c). Plan view of ground floor level, with numbers added to show the locations of William Hunter's fossil vertebrates (see Table 2 for relevant descriptions).

tion has uniquely been added to an online catalogue in its entirety (along with complete specimen photographs), has been dealt with (Liston 2013a in press). The fish material, being more plentiful, needs a larger scale assessment process such as selection using a database, whereas the fossil mammal material is scarcer, more distinctive and can be more easily assessed. As such, Rolfe (1983) has previously identified the large *Megaloceros* antlers (GLAHM V5531, Fig. 2) referred to by Laskey as being in Glasgow (one of which is referred to by Fabricius (1784) as being on display in the gallery of the Great Windmill Street museum in July 1782), noting that William's private correspondence also revealed that he had a second set between 1770 and 1771 (GLAHM V5532, Fig. 3a,b). Durant and Rolfe (1984) further noted the Gibraltar bone breccia (GLAHM V6032, specimen now lost since Durant & Rolfe 1984) sent to him by John Boddington in December 1769 (Brock 2008a, pp.325-327). Both of these works provide material fulfilling descriptions 1 and 28 from Laskey.

Description 2 refers to an ebony mammoth tusk 47 inches long. This appears to correspond to a specimen referred to by Hunter in correspondence to an unidentified recipient (Item 214, pp. 350-352, Brock 2008a, who speculates that it is in fact intended for Collinson) on 11/7/1770, in which he refers to "the largest Tusk, in my collection, from the Ohio" (implying that he had others) having a 15 inch (=38cm) girth at its thickest point, and being "3 feet 3/4 inch" (=933 mm) in straight line measurement - which is comparable to Laskey's 47 inches (=1195 mm) in absolute length. There is indeed a black tusk in the Hunterian's collection today (GLAHM V5530, Fig. 4a,b) of 1100 mm length, maximum girth of 37.5cm and 'bow strung' 880 mm. (It is worth noting that the base of the tusk has been sawn, conceivably subsequent to the earlier measurements being taken.) The determination of other possible mastodon tusks within the Hunterian's collection today will have to wait until the material has been transferred to the online computer catalogue, with the associated provenance checking.

Description 3 refers to parts of two mammoth thigh bones, of which no trace can be found in the collection.

Description 4 refers to deer antlers from the peat bogs of Ireland, thus far not identifiable between two candidates (Fig. 5a, b).

The rest of the fossil mammal material noted by Laskey lies in his description of Saloon, Left

No.	CASE	PAGE	DESCRIPTION	NUMBER (approx.)	IDENTIFIED SPECIMENS	Register Entry	Parkinson equivalents	Tring diagrams	TEXT
1	Hall of the ELEPHANT	71	Megaloceros antlers	One pair	V5532 (also V5531)	Hunterian Collection			Over the Door at the entrance are the remains of a pair of Fossil Horns from the Peat Bogs of Ireland, they are commonly known by the name of the Horns of the Moose Deer of America; but this is an erroneous idea, as there is not the least affinity between them.
2		74	Mammoth tusk (47 inches, ebony black)	1	V5530	Hunterian Collection			Tusk of a Mammoth, about forty-seven inches in length. From rivers Ohio, Wabash, and Missouri in North America.
3		74-75	Mammoth Thigh bones (parts of two)	2					From rivers Ohio, Wabash, and Missouri in North America.
4		75	Deer antlers from peat bogs of Ireland (fossil)	(at least two, probably one pair)	V5539 or V5540				Fossil Antlers of the Deer, found in the peat bogs of Ireland.
5	SALOON A.1	113	Vestena Nuova or Bolca Palaeogene Fish	several specimens = 3-10	V3300, V3302,V3303,V3310	Hunterian Coll. (all)			Fossil Fish from Vestena Nuova, commonly called Monte Bolca.
6	A.2		Fossil Fish from Gijon (Naples) and Eisleben (Saxony)	two	V3240 [V3250]	Hunterian Coll. (both)			Fossil Fish in a black fissile stone, from Gijon near Naples. A similar Specimen (marked 2 B.) from Eisleben in the county of Mansfeldt in Upper Saxony; this schist which is argillaceous, is very hard and black, and overlays coal.
7	A.3		Fish in chalk, ten inches long, possibly England.	one	[V3473?]	Hunterian Coll.			A fine specimen, nearly perfect, about ten inches in length, of the fossil remains of a fish in chalk.
8	A.5	114	Mass of Fish scales, Sheppey.	one					Scales of Fish in an aggregate mass, from. Sheppey Island.
9	B.9		Fish vertebrae, Sheppey.	several specimens = 3-10					Several specimens of Vertebræ of Fish from Sheppey Island
10	B.13	115	Slug palates' - shark/Lepidotes teeth	several specimens = 3-10			15	[Asteracanthus]	Several detached specimens of the Palatum Limax, or the Slug Palate, commonly called by the quarry-men Petrified Leeches; these are found in the lime-stone of Wiltshire, Oxfordshire, and the Cliffs at Lime in Dorsetshire.
11	L.46	125	Sheppey clay slab with fish bones	one					A Pyritous Slab of Indurated Blue Clay, from Sheppey, replete with fish bones, &c.
12	L.47	125	white shark, (Squalus Carcharius, Linn.)	one	V3312,3315,3318,3319	Hunterian Coll. (all)	11	[6]	Teeth of Fish of various species. : The specimen marked H. is supposed to approach the nearest in form to those of the white shark, (Squalus Carcharius, Linn.)
13	L.47	125	straight conical 'Glossopetrae', Malta	suggests 3-5	V3336	Hunterian Coll.	2	[2]	Teeth of Fish of various species. : Teeth marked I, are straight conical Glossopetrae. These are also from Malta.
14	L.47	125	*Squalus Galeus* , Linn. (Acanthiodontes by Lhwyd, No.1417) Kentish chalk pits	suggests 3-5			[3] [V3334?] [not V3346?]	[?3?]	Teeth of Fish of various species. : Teeth marked K. nearly resemble those of Squalus Galeus, Linn. Its length hardly exceeds its width; and its point is so much inclined to one side, as to form a notch on that side. The edges are very finely serrated. It seems to be the species named Acanthiodontes by Lhwyd, No.1417. These are from the Kentish chalk pits.
15	L.47	125	resembling *Squalus Squatina* , Linn.	suggests 3-5	V3332	Hunterian Coll.	9	5	Teeth of Fish of various species. : Teeth marked L. are simply pointed, with a broad base, and no lateral points; somewhat resembling Squalus Squatina, Linn.
16	L.47	125	conichthyodontes reciteretes, plectronitae, rostragines ('birds bills')	suggests 3-5	V3333	Hunterian Coll.	8	4	Teeth of Fish of various species. : Teeth marked M. The straight or slightly bent conical teeth, conichthyodontes reciteretes, have been termed plectronitae and rostragines, and frequently are called birds bills by the quarry-men. These are from different parts of England.
17	L.47	125	Conichthyodontes striati	suggests 3-5			4 [Reptile]	7	Teeth of Fish of various species. : Teeth marked N. Conichthyodontes striati, are rare fossils, described by Mr Walch as being of a conical form, round on all sides, with the superior termination as it were truncated, and the whole surface of the tooth so covered with longitudinal striae, as to give them somewhat the appearance of a dentalite.
18	M.B.	126	Bufonites'	at least 2			6,12,7	9,10,11	Bufonites. These are molar teeth, which are placed in the back part of the jaws, and even on the palate of some species of fish.
19	M.F.	127	St Peter's Mount dice-like fish palate bones	at least 2 components					Detached Bones of a fish palate, of a dice-like form, from St Peter's Mount.
20	Saloon Left Apartment Fossils Case No. 3.	128	Mastodon teeth, Ohio, North America.	several specimens = 3-10	V5129 [NOT V5132], V5135	Old Collection (both)			Several teeth of the Mastodon or Mammoth are in the collection, one of which ... has six points in pairs and a single point in front on its crown, and weighs about five pounds. It is probable that this tooth, when in a perfect state, might have possessed eight points, as part of it appears to have been broken off at one end.
21		130	Elephant teeth.	several specimens = 3-10	V5160,V5163,V5153,V5156				Several fossil teeth of Elephants. ...the tooth, (A.3) possesses no less than twelve double plates within the length of nine inches, also three lines of detached rings or points formed by the digitated processes of the plates.
22		131	Rhinoceros/Coelodonta teeth	several specimens = 3-10	V5374				Several Fossil Teeth of the Antediluvian Rhinoceros.
23		131	20 inch circumference/1.5lb. Sheppey vertebra	one					uncommon large vertebra from Sheppey. To what animal it belonged is unknown; it measures in circumference 20 inches, and weighs 1.5 lbs.
24		131-132	Dark brown bony horn from Sheppey	one					It is a very curious fragment of a bony substance of a dark brown colour, supposed to be from Sheppey Island, nearly resembling the proboscis or horn of the Sword Fish. It is of a conical form, and appears to taper similarly to the weapon of that fish.
25		132	Large mass of fish scales, Sheppey	one					an uncommonly elegant and large mass of the scales of some unknown fish; it is presumed it was found also at the Isle of Sheppey.
26		132	Megalonyx claw fragment, America	one					An excessive rare fragment of a fossil claw of the Megalonix, the Antediluvian Sloth; it is supposed to have been brought from America, where the remains of this extinct animal was discovered a few years since, and described by Mr Jefferson
27		132	Unascertained fossil bones.	an assemblage'=many					The under compartment of this Case contains an assemblage of fossil bones not ascertained, shells, &c.
28		132	Gibraltar fragment with bones	one	V6032 (Durant & Rolfe 1984)	[blank]			A large fragment replete with bones from the Rock of Gibraltar.

Table 2: List of twenty eight entries for fossil vertebrate specimens in the collection of William Hunter, as identified from Laskey (1813), and combined with the results of the current work. Columns referring to 'Tring' and 'Parkinson' relate to drawings done by Laskey in what appears to be his copy of his Account...., now held at Tring, and apparently traced by him from Parkinson (1811). See Liston 2013a In Press.

Figure 2. GLAHM V5531 (the* Megaloceros *specimen sampled by Ozawa), as mounted outside the Zoology Museum in 2005. Note upper part of frame for double doors in picture, as indicator of scale.

Apartment, Fossils, Case no.3 (Laskey 1813: p.128-132). These remaining descriptions are numbers 20 (mastodon teeth), 21 (elephant teeth), 22 (coelodont teeth) and 26 (*Megalonyx* claw). Leaving the last item to one side, there are series of all of these three sets of teeth in the collections today, and it seemed that there was little prospect for Hunter's originals being identifiable, even with data-checking for entry on to the online computer catalogue. But recent collection research has yielded some labelling evidence which has proved extremely helpful.

In 2006, a specimen-level audit programme was embarked on in the Hunterian Museum's vertebrate palaeontological collections which unexpectedly led to the detection of patterns of organisation amongst this previously unconstrained material, showing earlier curation of this material, and the work of earlier curators in identifying William Hunter specimens. Rolfe pioneered the pre-electronic version of reduction and elimination utilised in the above search of the collections for Hunter's fossil fish material, in order to identify specimens mentioned by Hunter (and noted by James Laskey as being part of the Hunterian Museum displays in at least its first years of being open to the public at the original University of Glasgow site at the Hugh Street). As his searches were pre-electronic, they were most effectively applied in searching for objects that were easy to detect through either being very large (antlers of

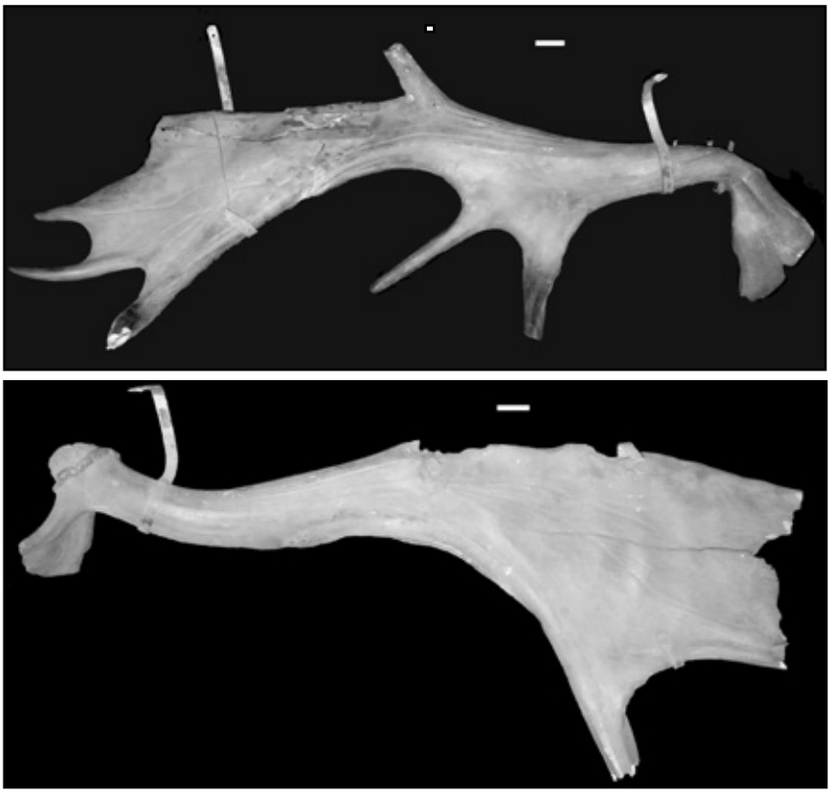

Figure 3a,b. V5532 - the left and right of Hunter's second set of* Megaloceros *antlers, as determined by Rolfe (1983). Scale Bar = 50mm.

Figure 4a,b. Mammoth tusk; GLAHM V5530 This description, from 11/7/1770, of "the largest Tusk, in my collection, from the Ohio" was sent by Hunter in order that a correspondent (whom Brock 2008a: p.350-352 suggests was likely to be Collinson) might "understand the shape or Twist which I have spoken of as a presumtive [sic.] mark of distinction.". a) "The first, or uppermost figure shews its curvature as lying on the ground. This I shall call it's Curve." b) View of sawn end. "The second figure shews its appearance when it is so held up that you look partly on its side and partly on its concavity. This shews its winding, or spiral line, which I call the Twist. Most Bulls which I have seen have little more than the curve(it.) in their horns; that is, the axis of the horn is all in the same plane: but cows and oxen, have, besides the curve, the spiral Twist of horn. Now I am sure you understand me." Both pictures by N. Clark. See main text for sizes.

Megaloceros - GLAHM V5531, Fig. 2, and V5532, Fig. 3a,b, Rolfe 1983, p.276 and 285) or extremely distinctive - a lump of Gibraltar bone breccia (GLAHM V6032, specimen now lost since Durant and Rolfe 1984 p.20, Kaeppler 2011, p.53). But exclusively within the mammal part of the vertebrate palaeontology section of the Hunterian's collections today, there was evidence that Rolfe's work was not the first attempt to record such identifications. In the course of the 2006 audit, it became evident that significant parts of the Hunterian's fossil mammal material had been subjected to a very specific regime of labelling. In a system that seems to match the affixing of small squares marked 'L' on specimens of fossil mammal teeth (e.g. Fig. 6b) from the Thomas Brown of Lanfine collection (which is reinforced by the Lanfine Catalogue of the collection, as well as confirmatory entries in the Hunterian's Registers), there are over a dozen specimens bearing a small square marked 'H' (Fig. 6a, c, e Fig. 7a-g, Fig. 8). It is worth stressing that the match is not just in the style of the squares of paper, but also the quality of the paper, the handwriting, the type of ink used, as well as the type of implement used to apply the ink. As such it is easily distinguished from other superficially-similar affixed labels[9]. The handwriting and style of the 'H' and 'L' labels strongly correlate with that of John Young. Under Keeper from 1859-1899

Figure 5a,b. Deer antlers - There are two candidate specimens for the deer antlers mentioned by Laskey (1813: p.75): a) GLAHM V5539 and b) GLAHM V5540. Further research may identify further similar elements.; Scale bar = 50mm.

[9] For example, a series of 'H' labels applied to fossil mammal material from Siwalik received after 1830 (Stace *et al*. 1988: pp.112-113) has different paper, different (invariably) faded ink and different penmanship (Fig. 17).

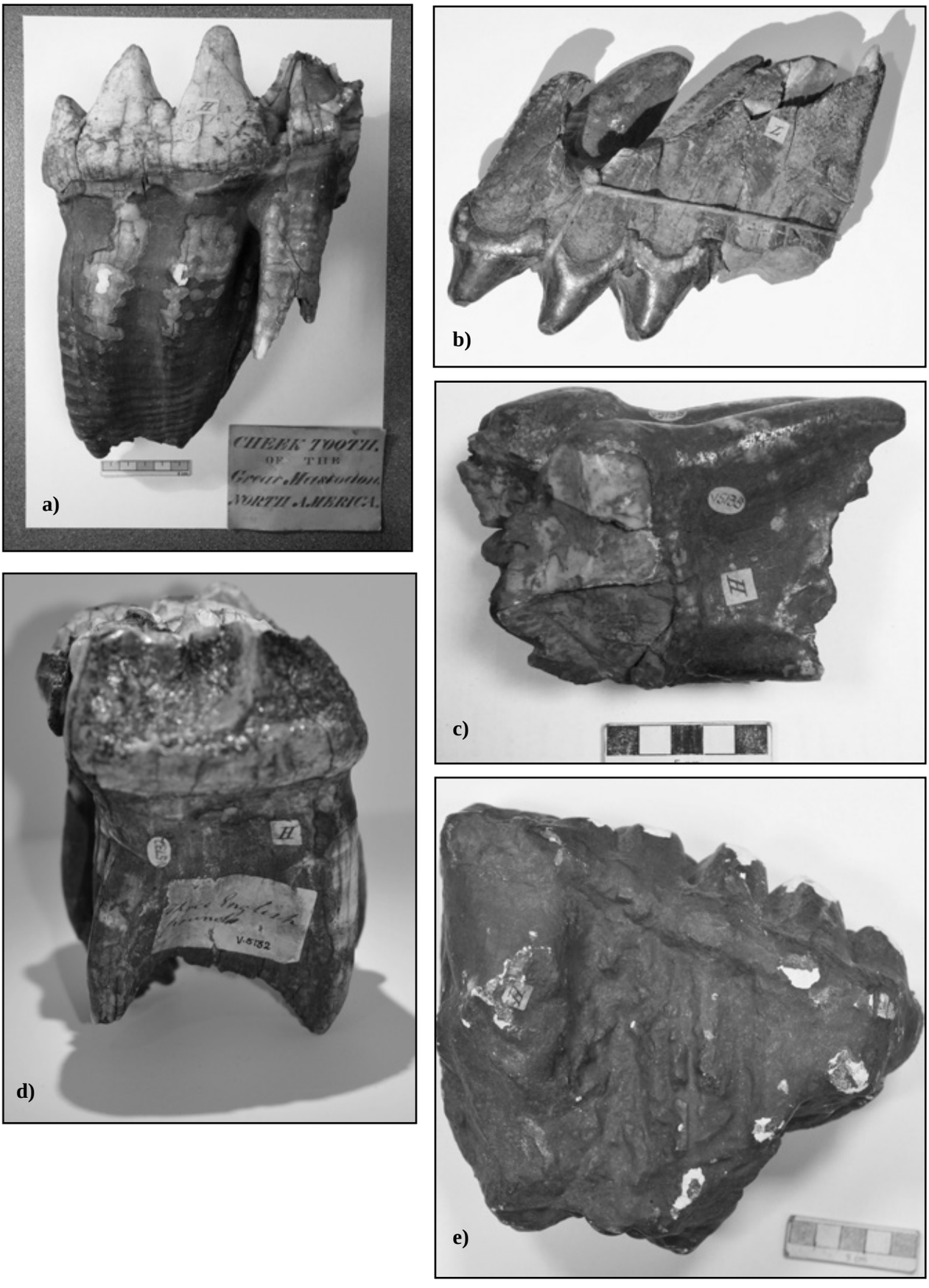

Figure 6. Mastodon teeth; a) V5129, an 'H' label (on crown), identified by Laskey, and confirmed in both appearance and weight; b) V5137, an 'L' label, for a Lanfine specimen; c) V5135, a 'H' label; d) GLAHM V5132, the Wilsone tooth as identified by Laskey (1813) through both weight and description - despite the 'H' label; e) plaster cast specimen, with 'H' label. a,c by the Author. b,d,e by N. Clark. Scale bar = 50mm.

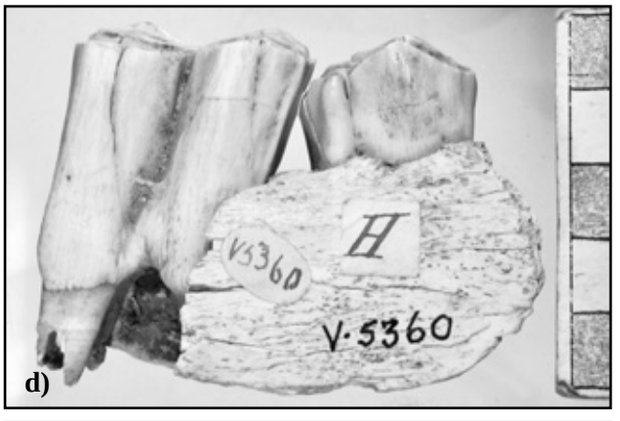

Figure 7. Other 'H' label specimens: a) GLAHM V5163 Elephant tooth, b) GLAHM V5160 Juvenile Elephant tooth, c) GLAHM V5414* Bos *(cattle) ulnar fragment, d) GLAHM V5360* Ovibos *(muskox) tooth, e) GLAHM V5361, f) V5364, g) V5367, Horse molar teeth. Scale bar = 50mm. a,b by the Author. c-g by N. Clark. Scale bar = 50mm.

(Keppie 2007: p.86-87), he was the most distinguished custodian of the Hunterian Museum's palaeontological collections (both through the curation of large amounts of backlogged material, as well as supplementing it with material he collected himself), which would fit with a late nineteenth century assessment of the material.

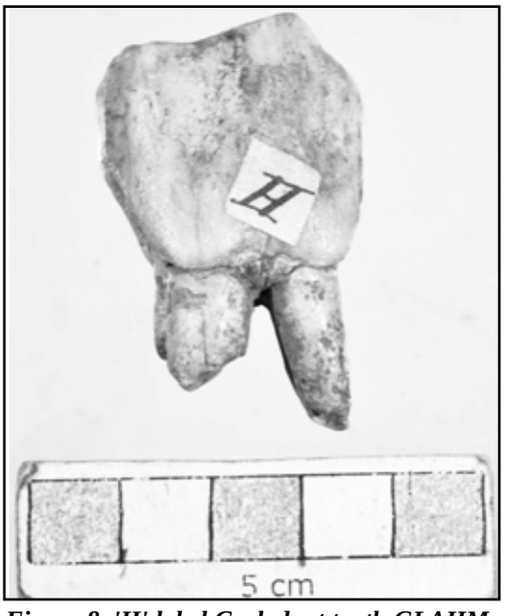

Figure 8. 'H' label Coelodont tooth GLAHM V5374. Picture by N. Clark. Scale bar = 50mm

Figure 9. Coelodont/Elephant tusk display labels. Picture by N. Clark.

The 'L' labels have a one-to-one correspondence with Lanfine specimens, as validated by the Hunterian's registers and Thomas Brown's own catalogue of the Lanfine collection before it came to the Hunterian (from 1853 onwards, Stace *et al*. 1988: p.45). It appears that both labelling regimens were embarked on having decided that there were two important early collection groups within the Hunterian fossil mammal material that needed to be marked, in the absence of other identifying features, and in the days before the existence of any register of the Hunterian Museum's Collections. What distinguishes them from other labelling regimes, is the consistency of the handwriting, label style and ink.

Using the model of the Lanfine material, one might well speculate that the 'H' in terms of specific pre-twentieth century donors could only refer to 'Hunter'. This is supported by a section of text from James Laskey's *A General Account...* to the Hunterian Museum's displays, which quite explicitly identifies (by weight as well as description of wear and damage) a mastodon tooth as having come from Hunter (GLAHM V5129, Fig. 6a), and this specimen is one of the teeth that bear an 'H'. It therefore does not seem unreasonable that this batch of specimens marked with an 'H' have all been identified as Hunter's by a past employee of the Museum at some point after the collection arrived in Glasgow.

There are, of course, a variety of letter labels applied to specimens across the Hunterian collections, the vast majority being twentieth century - what makes these special is that they have a consistency within 'L' for Lanfine, that can be bridged to 'H' for Hunter via the V5129 specimen, and the meaning can be extrapolated to the rest marked 'H' in this way. The match of the 'L' also makes it unlikely that 'H' simply stands for 'Hunterian', as the Lanfine specimens would also be described in that way, if it was not a collector/collection-based identifier. It is also worth noting that the teeth marked with an 'H' not only match the sets described by Laskey, but also are consistent with teeth that Hunter records himself as having examined in connection with the mastodon research.

Labels of the lost

This exercise resulted in a number of successful identifications, combined in Table 2 with the results from the work identifying Hunter's fossil fish. A further indicator as to the presence of fossil mammal material in the early years of the Hunterian Museum in Glasgow has also recently emerged, but outwith the palaeontology collections. Over the last five years, during the work of zoology curators Hancock and Reilly to curate the recent mollusc material, a series of labels have come to light within the drawers of the attic of the Graham Kerr Building. The Graham Kerr Building is home to what was the zoology department, including the zoology museum, which developed comparative anatomy displays under Kerr's direction in the early twentieth century, incorporating fossil specimens from the Hunterian Museum. Although divorced from any relevant specimens, the labels concerned clearly relate to fossil mammal material. All of a similar nature in terms of handwriting, ink, paper type and shape, they

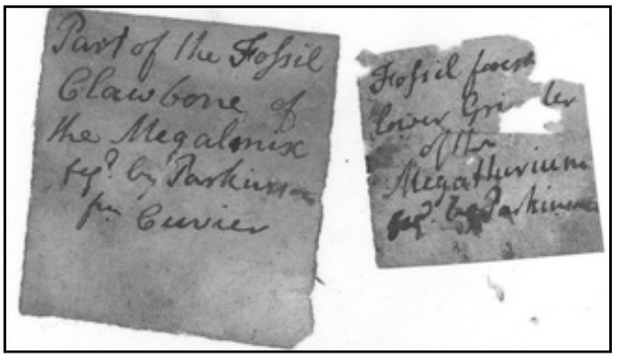

Figure 10. **Megatherium/Megalonyx** ***display labels.***

Figure 11. Shelburne's **Megalonyx** ***claw (cast) from Natural History Museum, London. NHMUK 7367.***

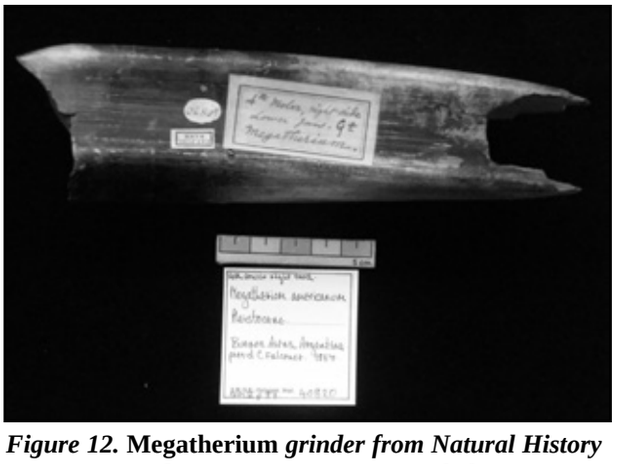

Figure 12. **Megatherium** ***grinder from Natural History Museum, London. NHMUK 40820. Scale bar = 50mm.***

appear to be display labels (rather than specimen storage labels, owing to the comparatively large handwriting, with a minimum of information recorded) from the early nineteenth century. This date is not just indicated by the age of the paper, but by the fact that one of the labels deals explicitly with a specimen mentioned in Laskey's *A General Account*... to the first incarnation of the Hunterian Museum in Glasgow, and two of the labels bear references that relate to publications around the time of the opening of the Museum.

All of these labels, bar one (a label for a *Megatherium* element), refer to specimens noted in Laskey. So there are seven labels for 'Fossil Rhinoceros tooth' (Fig. 9, equivalent to the coelodont teeth of description 22), which if these do relate to the original displays, would give us a minimum number of such teeth for that description. Thus instead of an unconstrained number of coelodont specimens, we now know that there were at least seven. One of the labels also refers to the 'fossil tusk of an elephant', which might be a loosely written label for the mammoth tusk (Fig. 4a,b).

The other labels refer to sloth material (Fig. 10), of which there is no direct sign: the *Megalonyx* claw (like, for example, Fig. 11, from the NHM) noted by Laskey (description 26) is recorded as 'Part of the Fossil Claw Bone of the Megalonix', and noted as 'figd Parkinson From Cuvier'. Similarly, a somewhat damaged label that seems to relate to the 'Lower Grinder of the *Megatherium*' (like, for example, Fig. 12, from the NHM) notes 'figd Parkinson' on it. These are referring to Parkinson's Volume 3 (1811) of the Organic Remains..... series, and Cuvier's 1804 publication in Annales: but clearly this does not mean that the specimens in the Hunterian that these labels related to were actually figured by James Parkinson or Georges Cuvier (Figs. 13-15). Those figured specimens are deposited in other collections. It appears that instead the phrase 'Figured Parkinson' is being used in an unconventional way, to say that the animal being discussed is figured by Parkinson, rather than that actual specimen: in other words, referring the reader to a visual resource to see what the whole animal was like, of which the displayed object is only a small part of a different individual. A subtle difference in meaning and emphasis - but nonetheless a sign of the degree to which Parkinson was seen as a revolutionary and universal resource at this time - and not just by Laskey, but by whomever created these labels.

It is worth noting that although no 'grinder' of *Megatherium* is present in the Hunterian collections today, there is the distal part of a femur (GLAHM V5529, Fig. 16). It seems unlikely that the writer of the label misidentified the body part in question, so it appears that the *Megatherium* partial femur specimen does not relate to the *Megatherium* label.

The presence of these specimen labels does support Laskey's record that not everything that went in the cases of the Hunterian Museum when it opened in Glasgow, was originally in the collection of William Hunter: Hunter died in 1783, the first *Megalonyx* remains were not recovered until 7/7/1796 in Virginia (Cuvier 1804), and the first *Megatherium*

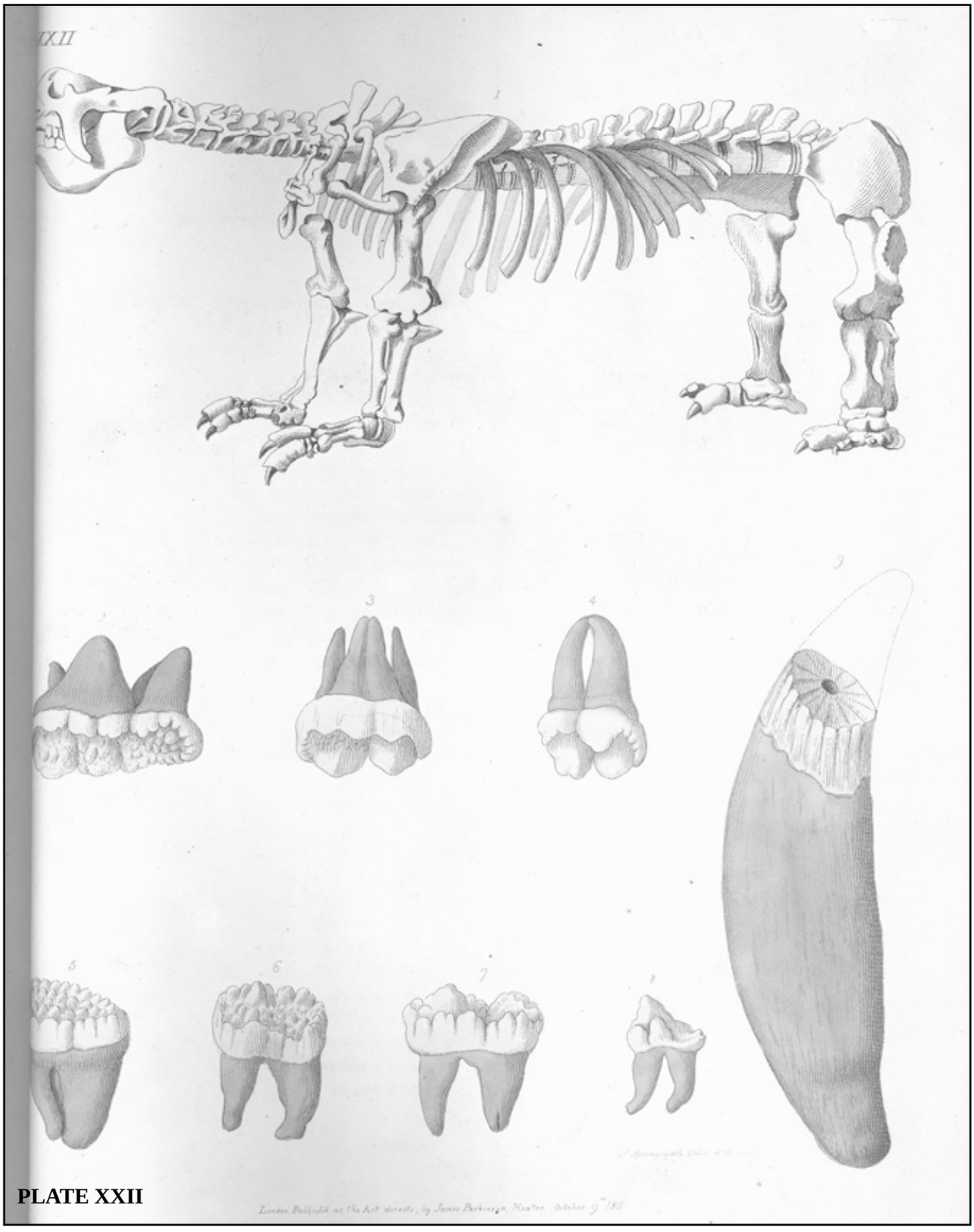

Figure 13. Plate from Parkinson referred to in old Hunterian display labels. Parkinson (1811) Plate XXII, showing* Megatherium *at the top - the rest are cave bear remains.

was not collected until 1789 in Paraguay (Cuvier 1796). One might be tempted to think that this was an indication that, although the Trustees did not acquit themselves of their responsibilities to Hunter's palaeontological material by recording it all, that they may have nonetheless acquired the odd new discovery as they came on the market. However, Brock (2008a) cautions us otherwise[10]: it seems far more

[10] Baillie, in response to new material being offered for the Museum, remarked "as the museum goes to Glasgow after a certain number of years it is no object with me to increase it." (Brock 2008a: xv).

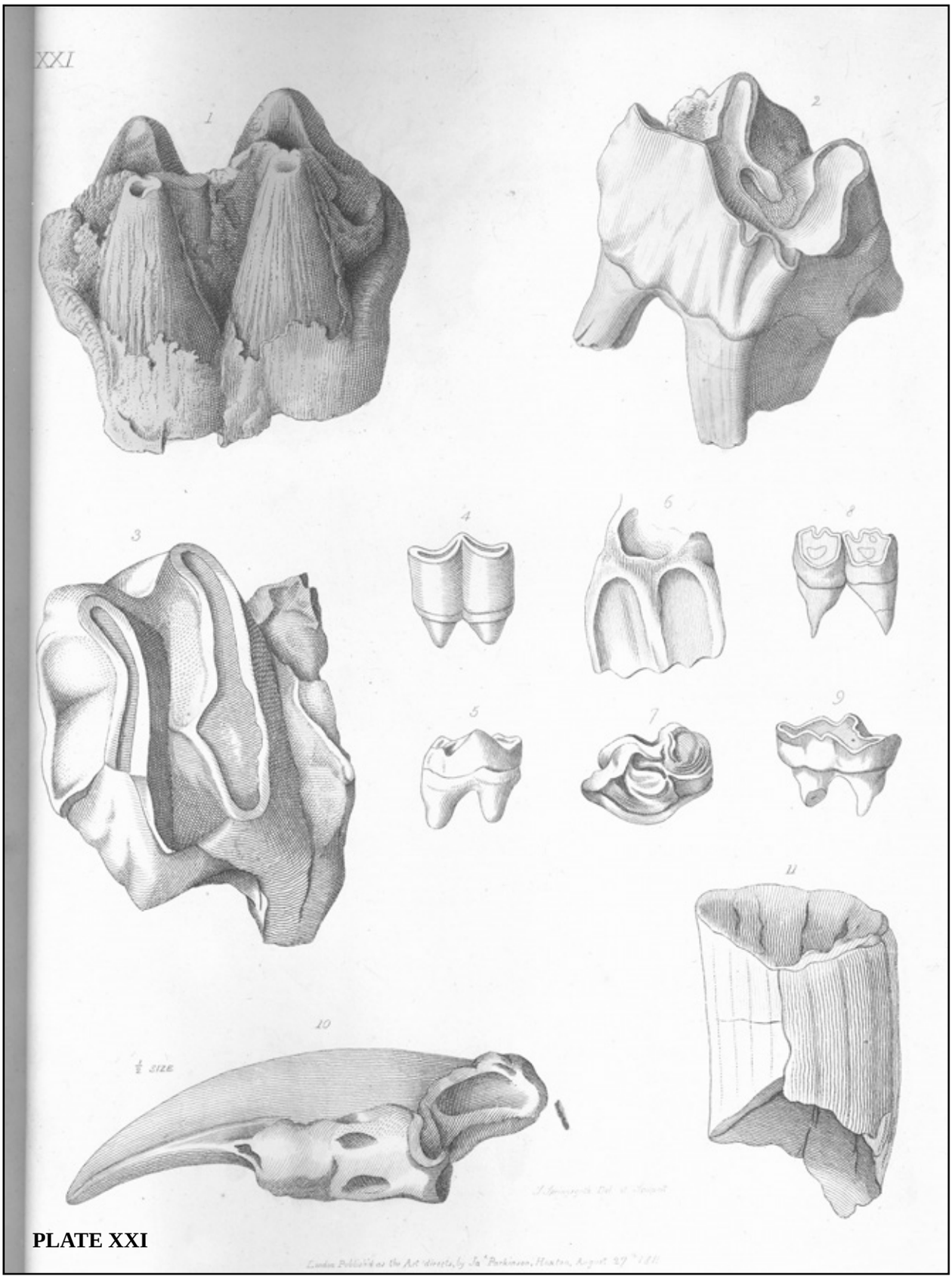

Figure 14. Plate from Parkinson referred to in old Hunterian display labels. Parkinson (1811) Plate XXI, showing* Megalonyx *"(claw, bottom left).

likely that these items were procured at the behest of the University of Glasgow authorities, prior to the opening of the Museum at the High Street site.

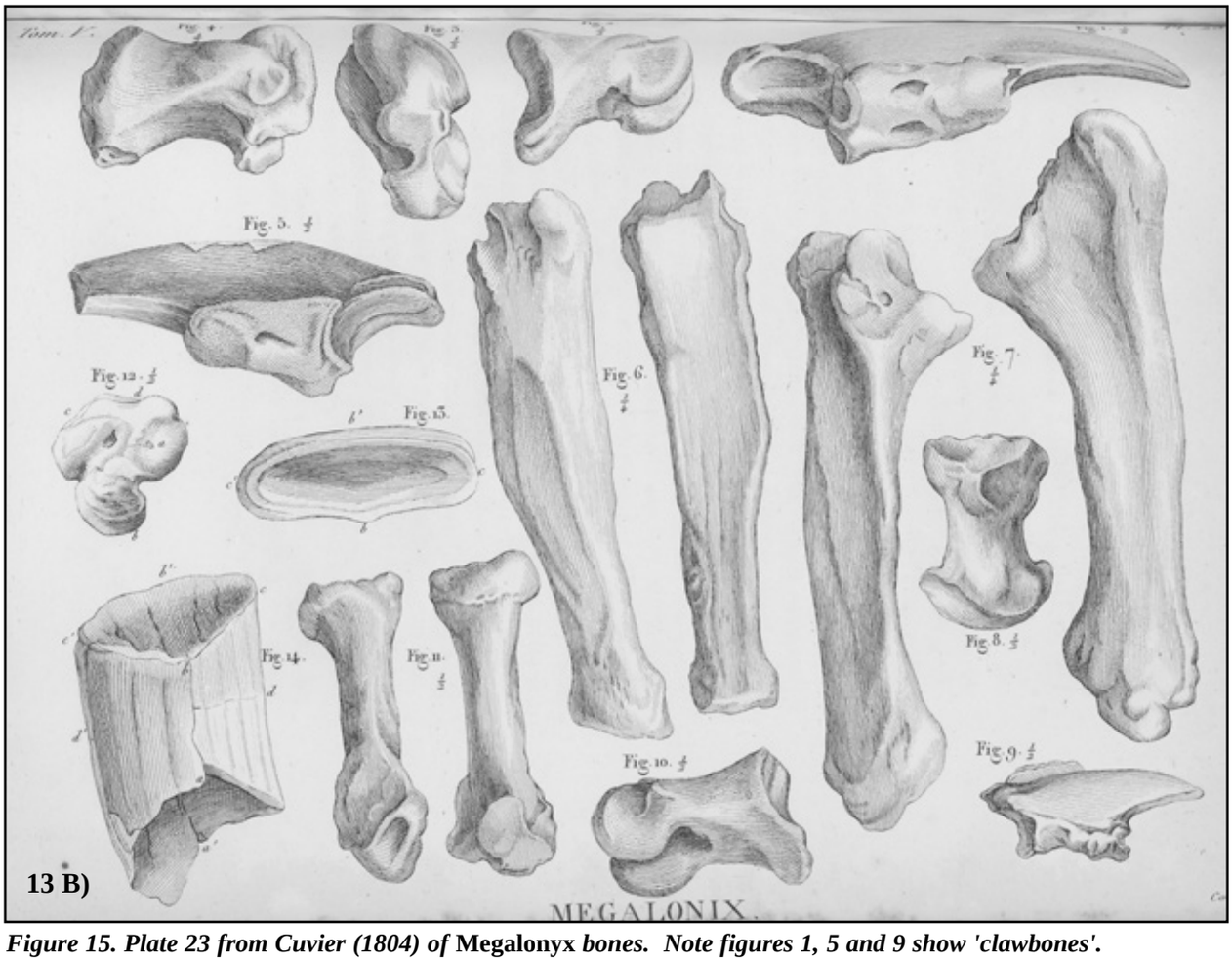

Figure 15. Plate 23 from Cuvier (1804) of* Megalonyx *bones. Note figures 1, 5 and 9 show 'clawbones'.

Echoes from the past - a model for loss

From a modern perspective, it might seem unthinkable that the core first or 'primary donation' of material to a university's museum might go unrecorded. However, it is not hard to conceive of a model by which this would happen. By simple weight of presence, in the early days, the important minority category that would need to be recorded as an anomaly within the large scheme of the collection, would be the material that was 'not-Hunter', vastly outweighed as it would be by William Hunter's bequest. Those looking after the collection at the time would therefore have, as a more achievable/manageable priority, the recording of the sources of material that came from anywhere other than Hunter's bequest. However, with time, Hunter's material would gradually become the minority in quantity, next to subsequent acquisitions of material from other donors and sources. All that would then be necessary, for the knowledge of the unnoted material being Hunter's to be lost, would be for the individuals in charge to leave office, and be replaced by others lacking this information - a loss of specialist curator knowledge that happens all too easily in all museums. At this point, if the information identifying Hunter objects had not been written down somewhere, it would simply disappear, and the spec-

Figure 16.* Megatherium *distal part of femur GLAHM V5529. Scale bar = 50 mm.

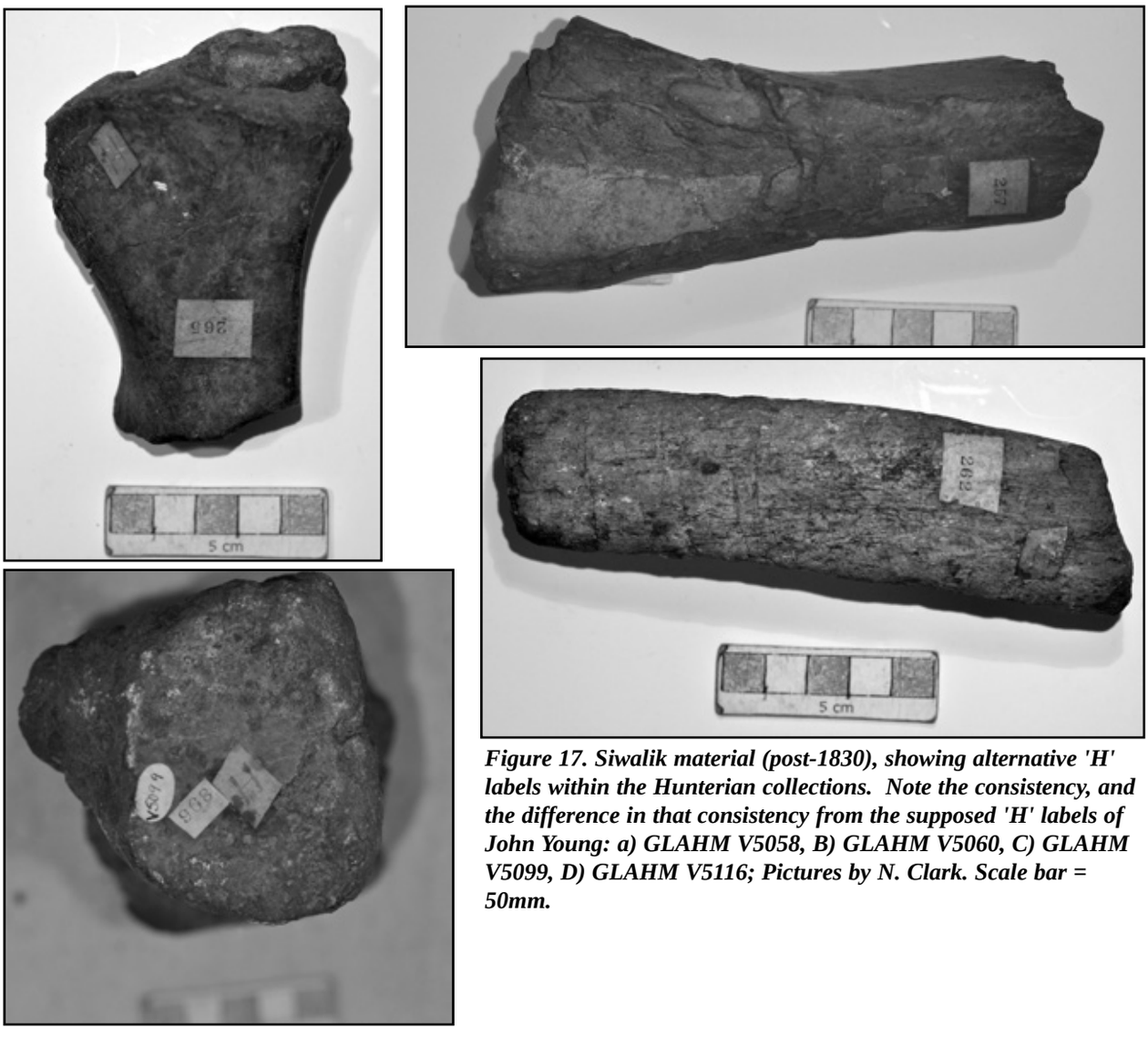

Figure 17. Siwalik material (post-1830), showing alternative 'H' labels within the Hunterian collections. Note the consistency, and the difference in that consistency from the supposed 'H' labels of John Young: a) GLAHM V5058, B) GLAHM V5060, C) GLAHM V5099, D) GLAHM V5116; Pictures by N. Clark. Scale bar = 50mm.

imens anonymously absorbed into the general collection, as with Lhwyd's material in Oxford (Edmonds 1950).

In this context, it should further be noted that any University of Glasgow collections that predated the arrival of Hunter's bequest were kept in the University Library and consisted of scientific instruments, some paintings and Roman stones. These objects were largely acquired thanks to the zeal of the university librarian (1697-1701) Robert Wodrow (Durkan 1977), whose collection of "things tending to the carrying on of natural history of stones, shells, &c." (10/9/1703, Sharp 1937: p.264) does not seem to have come to Glasgow (Durant & Rolfe 1984). In other words, Hunter's natural science and particularly fossiliferous material was the first to enter the University's collections, sso there is no risk that there was any unprovenanced fossil vertebrate material predating Hunter's, that would have otherwise complicated this assessment.

This again underlines that the need to identify what specimens were Hunter's in the early stages, would not be nearly as important as identifying those that were 'not-Hunter'. The acquisition of new collection material would slowly start to change the emphasis from a few 'not-Hunter' specimens, to the Hunter specimens being in the minority, in tandem with the passage of time wreaking its usual inevitable havoc with the evaporation of curatorial knowledge that was not written down against a background of escalating backlogs of material….until William Hunter's specimens would become swamped in a sea of material of unrecorded source.

Discussion

In July 1782, Johann Christian Fabricius noted of another of William Hunter's collections that "It is a shame that there is no proper, complete catalogue of it. A good many specimens lose their value if the circumstances….are forgotten over time." (Fabricius 1784: Chapter 5). And, indeed, the lack of a

Trustees' catalogue has been a burden for palaeontological curation at the Hunterian Museum. It has allowed the promulgation of a belief/fantasy that Hunter had no fossil vertebrate specimens (N. Clark pers. comm. 2005), and over the years, material later demonstrated to be Hunter's has been inadvertently lent out for handling in general teaching kits (pers. obs.) and inappropriately selected for destructive analysis (V5531), through ignorance of its source/provenance.

It even led to the erroneous display of a non-William Hunter specimen (posing as an example of Hunter's material) in the recent bicentenary redisplay of the Hunterian Museum (Liston 2013a in press). It is therefore a matter of some importance that attempts be made to constrain the identity of William Hunter's specimens as much as possible. Recent specimen-level audit work has produced a valuable online resource, which can allow swift and broad level searches to examine material and compare it, and this has yielded a number of specimens believed to have constituted part of Hunter's original fossil fish material (Liston 2013a in press).

As with the fossil fish material, there are some fossil mammal specimens that have not been yielded up by the collection searches. However, it is anticipated that with the eventual transferral of the Hunterian's fossil mammal material to the electronic catalogue, and the rigorous documentation and provenance checking associated with this, that at least the deer antlers might be ultimately identifiable.

As for the *Megalonyx* claw, the *Megatherium* 'grinder' and the mammoth thigh bone fragments, it is not inconceivable that they will yet turn up, having suffered misidentification in the past under non-specialist curation.

The obvious questions arise regarding these 'H' labels: who did them, and why? Perhaps it was the intention of this unknown recorder to proceed further down the 'Chain of Being' with those distinguishing labels - or perhaps it was only the mammal group that it was possible to determine the donor information for with any certainty. Maybe it was an exercise undertaken while packing up the High Street Museum, prior to the University's move across Glasgow to the Gilmorehill site in 1870. As has been noted elsewhere (Liston 2013a in press), there is no evidence that the Hunterian Museum displays of fossil material were ever revised between first going on display in the High Street in 1807, and the move of the University campus to the Gilmorehill site, with the completion of the Gilbert Scott Building, in 1870. As such, it may simply be that the material all being in 'Case 3' of that original display was part of the grounds for the 'H' or Hunter attribution being accorded to this group of specimens. Certainly, the material all fits with Descriptions 20-22 - teeth of mammoth/mastodon, elephant, coelodont/rhinos by Laskey of fossil mammal teeth in Case 3 of the original Hunterian Museum.

Today, we cannot ascertain the source of the data used by John Young (or whomever) for him to arrive at the provenance identification of Hunter - but it is unequivocal, just as any fuller specimen label which bears no question mark would not have its veracity called into question - unless there was good evidence for an alternative explanation that was robust enough to ignore a label stuck to a specimen.

What is significant about these labels, is that they are very specifically applied to the specimens, without any ambiguity or uncertainty, and they therefore are free of the vagaries of any terminology used in the written registers. Whereas collection registers can be a place of pencilled addenda, question-marked speculations and square-bracketed inferences, the affixing of a label directly on to a specimen is an emphatic definitive act of confidence. We cannot know on what basis these identifications were made (although we can guess), and cannot therefore criticise them, any more than we can cast doubt on collection registers (without due cause) - and if we did that then it would become hard to justify trusting in any collection documentation anymore.

And if the suggested model for the application of these labels (i.e. resulting from the emptying of the Case 3 display for packing prior to the 1870 move) is valid, it may also explain the one specimen that can be proved not to be Hunter's, despite bearing an 'H'. Another mastodon tooth, again indicated by both weight and physical description, is one of two mentioned by Laskey as not coming from Hunter, but also part of the Case 3 display. This specimen, today numbered GLAHM V5132 (Fig. 6d), bears an 'H', along with a label reiterating the 'avoirdupois' weight noted by Laskey. Indeed, failure to read Laskey's description with care resulted in GLAHM V5132 being erroneously displayed as an original William Hunter specimen (contra Laskey) in the Hunterian Museum, even through the recent bicentenary celebrations of the opening of the first Glasgow incarnation of the Museum, in spite of being donated in 1807 (Stace *et al.* 1988: p.365).

Conclusion

The work likely to have been done by Under Keeper John Young (probably circa 1870) to record the identity of William Hunter specimens was a definitive and distinctive effort, which has now been recognized and given long overdue credit. We may well never know why these labels are limited strictly to mammalian teeth in the palaeontological collections - perhaps simply an artefact of packing, perhaps the personal priority of a given curator, respecting the relevance to Hunter's own scientific writings pertaining to these objects. They all relate to his work on the remains of the 'Ohio incognitum' and the other animals that he compared it with. But as uncertain as we may be to why, as curators we can only be thankful that someone took the time to record what the Hunterian's own registers failed to.

Note: GB 0247 MS Hunter H247 refers to Glasgow University Library, Special Collections, 'Papers of William Hunter'. GB 0248 refers to drawing in University of Glasgow Archive Services.

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EDWARD B. TAWNEY: AN EARLY GEOLOGICAL CURATOR

by Lyall I. Anderson and Rob J. Theodore

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The archival paper collections of the Sedgwick Museum of Earth Sciences, (University of Cambridge) have been the subject of recent cataloguing efforts (2010 - 2012). Within the Archive are 19 notebooks which formerly belonged to Edward B. Tawney (1840 - 1882). These span Tawney's early field investigations of the south-west of England, his work at the Museum in Bristol, and his time in Cambridge up until his death in 1882. Distinctive printed paper labels accompany Tawney's personal fossil collection, now also incorporated into the Sedgwick Museum. Furthermore, some rock slices (thin sections) prepared for Tawney have been identified. Their later treatment in the collection catalogues of the petrologist Alfred Harker provided information on the beginnings of the building of the Petrological Collection at Cambridge. This paper lists the holdings of Tawney's notebooks in the Archive, identifies fossil collections attributed to him and augments our scant knowledge of this important early geological curator.

Lyall I. Anderson & Rob J.Theodore, The Sedgwick Museum of Earth Sciences, Dept. of Earth Sciences, University of Cambridge, Cambridge, CB2 3EQ, UK; Corresponding author e-mail: Euproops@aol.com. *Received 26th June 2012.*

Introduction

Edward Bernard Tawney (1840 - 1882) was employed at the Woodwardian Museum (the pre-1904 forerunner of the Sedgwick Museum) between 1878 and 1882. He was recruited by the then Woodwardian Professor of Geology, Thomas McKenny Hughes (1832 - 1917). Tawney had previously been employed by the University of Bristol where he lectured and curated collections in the Museum there (Figure 1).

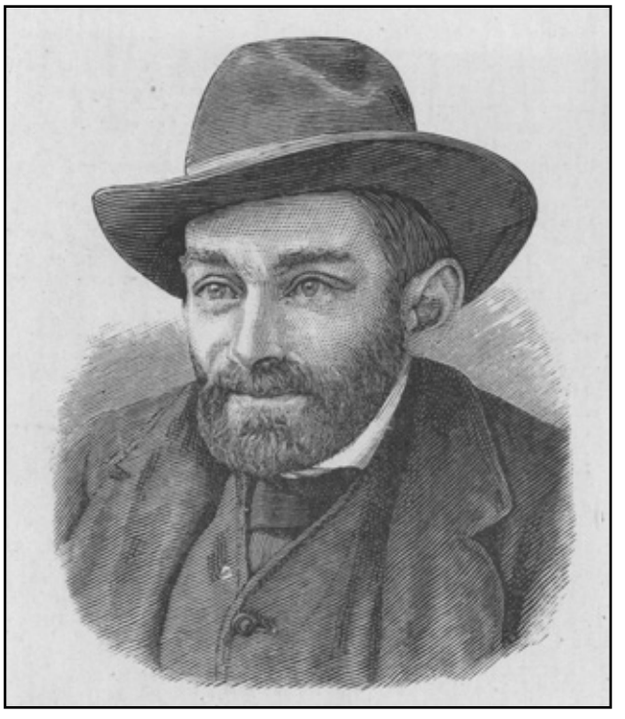

Figure 1. Lithograph of E. B. Tawney held in the Sedgwick Museum Archive.

Sadly, due to ill health, Tawney's promising career was cut all too short. He travelled to the south of France in December 1882 "*for the good of his health*" and died there shortly afterwards (Anon. 1883). However, the vacancy which Tawney's death opened was soon to be filled by another of Hughes' hand-picked graduate students, Alfred Harker (1859 - 1939). Harker rose to become a world-renowned petrologist later in his career. This career was built upon the careful and comprehensive study of rock slices or glass-mounted thin sections using the petrological microscope. Examination of Harker's early laboratory notebooks (also held in the Sedgwick Museum Archive), demonstrate that Harker took over from where Tawney had left off with this field of investigation.

Tawney attended taught courses between 1860 and 1863 at the Royal School of Mines in Jermyn Street, London (Anon. 1883). In 1872 he was appointed Assistant Curator at the Bristol Museum. It was in 1878 that he moved to the Woodwardian Museum. Shortly after his move to Cambridge, he was awarded an honorary M.A. degree (1879) and became a Fellow of Trinity College.

Tawney was the first person to systematically re-examine the rock specimens collected from North Wales by Adam Sedgwick in the 1830's. He also worked through trilobite material in the collections that had been collected by John Salter and Frederick M‘Coy (between 1846 and 1850). Tawney later contributed to scientific knowledge of the Headon Hill faunas through fieldwork on the Isle of Wight with his museum colleague Henry Keeping. Many of these investigations were later to be published. These are listed here in Appendix 1.

Materials examined

Distinct collections relating to individuals or discrete organisations are identified within the Sedgwick Museum Archive by the prefixing of box numbers by a letter code unique to that individual. In the case of Edward Tawney's notebooks, the identifying code is 'TWNY' (Alfred Harker's notebooks are identified by 'HRKR' and similarly John E. Marr's notebooks by MARR). As part of the re-boxing and reorganisation of the Archive, papers were removed from various miscellaneous storage containers and arranged in standardised conservation-grade boxes. These were consecutively numbered and coded before being arranged on shelves on metal racking. Tawney's notebooks are stored in Box TWNY 581, with individual objects contained therein being given a unique identifier number. These are listed in Table 1.

In addition to the paper collections, there is a significant number of fossils attributed to Tawney's collecting efforts now held in the Sedgwick collections. Furthermore, his notebooks reveal an ongoing programme of field collection of rocks, particularly in North Wales. Some of Tawney's fossils still retain their original printed paper labels and an example of one of these is illustrated in Figure 2A.

Description of notebooks

Table 1 is a list of Tawney's notebooks and provides an indication of the date range over which entries were made in each item. A preliminary survey of the notebooks has generated more in-depth descriptions which are available via the following internet resource, the JISC-supported 'Archives Hub' (http://www.archiveshub.co.uk). Using 'Edward Tawney' as a search term, allows the free access recovery of this information. Brief summaries of the contents are given below with supporting notes on relevance to the collections of the Sedgwick Museum.

TWNY 1/1

'Devonshire 1872'

This notebook comprises entries made between 1864 and 1873. It provides the earliest information on Tawney's development as a field geologist as it records his first independent expeditions after his training at the Royal School of Mines. The notebook commences with a listing of scientific literature relating to the Bristol, Somerset and Devonshire areas. There then follows notes on rock exposures at Padstow and New Quay (*sic*) in Cornwall examined in October 1869. Following this are entries relating to the Devon coast at Babbacombe, Hope's Nose and Smuggler's Cove made in April 1870. Other geological localities that Tawney noted visits to here included Guernsey and Sark in the Channel Islands (July 1871) and Dundry quarry in North Somerset (February 1873).

TWNY 1/2

'Fossil Fish Classific. - Rhaetic & Cretac. Cephalop.'

This notebook comprises entries in the form of short descriptions of fossil species each with an accompanying pencil sketch. The notebook covers the period between 1865 and 1872, so was certainly written prior to Tawney's work at either the Woodwardian Museum and possibly also the Bristol Museum. Initial entries are on invertebrate fossils; later entries are concerned with fossil fish. Tawney described the dentition of *Rhizodus* and *Ceratodus* fish species in particular detail. Specimens of *Ceratodus* have been identified in Tawney's fossil collection and these corroborate the dating of this notebook (see Figures 2B and C). On p.96 of TWNY 1 /2 is the heading "Supplementary 1872". This is accompanied by items identified by the letter 'T' and an associated number. This is perhaps a rudimentary attempt at listing his fossil collections (if the 'T' stands for 'Tawney' and this is his personal collection prior to any museum affiliation). However, fossils in Tawney's collection which we have examined do not bear any numbering system. The notebook ends with the description and sketching of Cretaceous ammonite fossils.

Notebook title	Date Range
• TWNY 1/1 Devonshire 1872	1864; 1870; 1872 -73
• TWNY 1/2 Fossil fish classific	?1865 – 1872
• TWNY 1/3 Extracts from Mollusques	1867
• TWNY 1/4 Notes on Heer's Flora pt 1	1867
• TWNY 1/5 Notes on Heer's Flora pt 2	post-1867
• TWNY 1/6 Devonshire 1868 – 1872	1868 – 1872
• TWNY 1/7 Secondary Fossils	post-1871
• TWNY 1/8 Geological Notes [Bristol]	1874 – 1879
• TWNY 1/9 St David's 1877	1876 - 77, 79 – 80
• TWNY 1/10 Microscopic Rocks Pt. 1	1878
• TWNY 1/11 Silurian Trilobites	1878 - 1882
• TWNY 1/12 Welsh-Rocks	1878 - 1882
• TWNY 1/13 Carboniferous Fossils	1878 - 1882
• TWNY 1/14 Rock-slices No. 245	?1878 - 1882
• TWNY 1/15 Rock-Slices (continued) pt. 2	post-1878
• TWNY 1/16 Auvergne 1879	1879 - 1881
• TWNY 1/17 Channel Rocks	1880 - 1882
• TWNY 1/18 Nevin notebook	1880 – 1882
• TWNY 1/19 Paris 1881	1881
• TWNY 1/20 Headon Hill	pre-1882

Table 1: A chronological listing of Tawney's notebooks held in the Sedgwick Museum Archive.

TWNY 1/3

'Extracts from Mollusques fossils des Gres Verts des environs des Genève.'

This notebook was started in 1867 as evidenced by the signed and dated inside front cover. It comprises entries copied from Pictet and Roux's (1847 - 1853) work on the fossil faunas found near Geneva, Switzerland. Entries are accompanied by pencil or black ink sketches of the brachiopod, bivalve mollusc and gastropod species in question. This may have been a handy self-constructed field identification guide which Tawney assembled prior to visiting the area. There then follows a series of watercoloured sketches of rock fold structures in the Swiss Alps.

TWNY 1/4

'Notes on Heer's Tertiaria Helvetica Pt. 1 EBT'

This notebook was written in 1867. It contains information copied from a work on the Tertiary fossil plants of Switzerland. Individual species descriptions are accompanied by pencil sketches of plant fossil morphology. Again, this appears to have been a portable identification guide which Tawney made prior to his visit to Switzerland.

TWNY 1/5

'Notes on Heer's Tertiaria Helvetica Pt. 2 EBT'

This notebook was written post-1867 and follows the same format as TWNY 1/4. Species descriptions are accompanied by neat pencil sketches of fossil morphology. A pressed deciduous leaf was found within a pouch attached to the inside front cover of this notebook.

TWNY 1/6

'Devonshire 1868 - 1872'

The inside front cover of this notebook is signed and given the date range "1868 - '69". The first entries are a series of three references to Charles R. Darwin's botanical works. There follows entries made on geological field work in North Devon at Barnstaple, Clovelly, Ilfracombe and Hagginton beach (between 1868 and April 1869). Later entries relate to excursions to South Devon (and Torquay in particular) in June and July 1869.

TWNY 1/7

'Secondary Fossils'

This notebook was written post-1871. It comprises entries relating to fossil invertebrates. The notebook is filled with species names, short descriptions and often an accompanying pencil or black ink sketch. Fossils discussed are mainly Jurassic in age from the Isle of Portland, Dorset, and the Inferior Oolite of Dundry, Somerset.

TWNY 1/8

'Geological Notes [Bristol] 1874 - 1879; 1878 N. Wales'

This notebook comprises entries on geological observations made prior to Tawney's appointment to the Woodwardian Museum. On the first page is written Tawney's name and his then place of work 'The Museum, Bristol'. A table on p.2 relates angle of dip, depth and bed thickness of sedimentary rocks.

Entries made in 1875 relate to the Old Red Sandstone (ORS) at Clevendon, near Bristol. On p.5, Tawney sketched the unconformable relationship between the ORS and New Red Sandstone at this locality.

Notebook TWNY 1/8 also contains entries relating to the September 1876 *British Association for the Advancement of Science* meeting held in Glasgow with its' attendant field excursions. These included a visit to Ballaghan Spout waterfall, Finnich Glen and the next day, Beith quarry in Ayrshire. Tawney collected a specimen of Gleniffer Porphyry and at Beith, he visited Trearne quarry and collected fossil sponges there. The following year, Tawney visited Radstock in Somerset in September. That October, he travelled to Swindon to examine exposures of Kimmeridge Clay in railway cuttings.

TWNY 1/9

'St David's 1877'

This notebook comprises entries made by Tawney between 1876 and 1880. It therefore spans his time at both Bristol and Cambridge. Below Tawney's name on the inside front cover is the name and address of a thin section maker based in London. Mr F. J. Cadell (Lapidary) of 52, New Compton St., Soho. Cadell was tasked with manufacturing Tawney's microscope slides. When Alfred Harker later continued Tawney's work on the collection he too employed the services of Cadell. Harker often noted in his field notebooks when he sent boxes of rocks from the field and when he received the finished slides back in Cambridge from Cadell (for example, HRKR 2/1/13, p.61, a list made on 18 April 1888).

At the start of TWNY 1/9 there are minor entries relating to Switzerland and exposed geological sections on the railway between Banbury and Cheltenham (Oxfordshire). The rest of the entries are predominantly concerned with geological observations made in Wales. Tawney recorded being accompanied in the field by Dr Henry Hicks and W. H. Huddleston, and later by a Dr Miller from Cambridge. Henry Hicks (1837 - 1899) was a physician, surgeon and amateur geologist with interests in Welsh geology and the Devonian of Devon and Somerset. Wilfred Huddleston Huddleston (1844 - 1909) was another Fellow of the Geological Society of London. The Dr Miller mentioned in this account was likely to have been William Hallowes Miller (1801 - 1880) the Welsh geologist and crystallographer who had formerly held the post of Professor of Mineralogy at Cambridge until 1870. Alfred Harker was later to meet Henry Hicks over the same geological ground as part of the 1883 annual Sedgwick Club excursion to St. David's [HRKR 2/1/3, p.112].

This visit to Pembrokeshire in August 1877 let Tawney indulge his fossil collecting passion. He recorded collecting a specimen of the trilobite *Conocoryphe lyelli* (a species first described by Henry Hicks). The notebook then reveals that Tawney was in the company of both Hicks and Huddleston the following day. The trio were collecting at Church School Quarry. He then visited Haverfordwest, St. David's and Ramsay Island.
Later that month (August), Tawney was back in North Wales collecting with both Henry Hicks and Dr Miller at the Cefn Carn Slate Quarries. According to the obituary note written by McKenny Hughes (1883, p.143) this meeting with Miller was when Tawney was offered the job at the Woodwardian Museum.

TWNY 1/10

'Microscopic rocks Pt.1'

This notebook comprises numbered entries relating to the microscopic examination of rock slices from the UK, Sweden, Norway and Germany. This notebook was compiled in 1878 and probably records one of Tawney's first tasks at the Woodwardian Museum. On the inside front cover is pasted in a newspaper advert for the rock and mineral dealer, 'James R. Gregory (London)'. The title written on p.1 is "Notes on the microscopic structure of rocks series from St. Davids". A wide variety of igneous rocks are then listed as thin section preparations.

TWNY 1/11

'Silurian Trilobites'

This notebook comprises entries relating to the collections of the Woodwardian Museum. It was written between 1878 and 1882. It deals with descriptions of material collected by John William Salter (1820 - 1869) and Frederick M‘Coy (1817 - 1899). In the text, Tawney referred to 'Barrande's Classification of Trilobites'. This is followed by a list of 'Salter's arrangement of families'. For each trilobite genus, there is a list of defining characteristics and an accompanying pencil sketch of general morphology.

TWNY 1/12

'Welsh-Rocks'

This notebook comprises entries made recording observations on 'rock slices' (thin section microscope slides) using a petrological microscope during 1878-1882. They include slices made from rock samples originally collected by Adam Sedgwick and also

Thomas McKenny Hughes. In the main, these samples represent the felsites and dyke rocks of North Wales. Each entry consists of a unique identifying number, a name and a breakdown of the mineral constituents observed. The vast majority of the samples are Welsh, but a few originate from Ireland. Some of these slides were later re-examined and renumbered by Alfred Harker as outlined in his notebook HRKR 2/2/7 (p.72).

TWNY 1/13

'Carboniferous Fossils'

This notebook consists of notes and sketches of Carboniferous plant, invertebrate and vertebrate fossils in the collections of the Woodwardian Museum. On the inside back cover is a recipe for the manufacture of cement used in sticking together fossils or adhering them to wooden display tablets. Tawney's recipe consisted of: "*1lb of Shellac, 2lbs of grease (beeswax is better) and 2lb of Plaster of Paris*". Again we can date it to between 1878 and 1882 based on Tawney's employment at the Woodwardian Museum.

TWNY 1/14

'Rock Slices No. 245'

This notebook consists of observations made on rock slices in the Woodwardian Museum using the petrological microscope. The rock samples originated from Bavaria, Brazil, Norway and the Pyrenees. Lithologies represented were 'eklogite' [eclogite], lherzolite and granulite.

TWNY 1/15

'Rock slices pt.2'

This notebook similarly describes petrological observations made on rock slices. Material examined originated from Bavaria, Finland, the Pyrenees and Saxony. All samples described are either igneous or metamorphic in origin. Lithologies examined included teschenite, 'eklogite', granulite, gneiss and rhyolite.

TWNY 1/16

'Auvergne 1879'

This notebook spans the period 1879 to 1881. It contains entries on geological fieldwork in the Auvergne region of France, the Jurassic coastline of Dorset and localities in the vicinity of Cambridge. Specimens collected during Tawney's French excursion are indicated by the use of square brackets within the main body of Tawney's notebook text.

Entries relating to Cambridge were made in July 1878 and relate to Drift deposits unconformably overlying Jurassic strata. These local Drift deposits were later to become an enduring research interest of Hughes' successor as Woodwardian Professor, John. E. Marr (1859 - 1933).

Tawney explored localities such as Stair Cove, Durdle Door and Osmington during his visit to Dorset in March 1880.

TWNY 1/17

'Notes on Rock Slices in Woodwardian Museum - Channel rocks' [1880 - 1882]

This notebook contains petrological descriptions of rock slices (thin sections) derived from rocks in the Woodwardian Museum collections. Many of the descriptions are accompanied by a sketch of crystal relationships and general appearance down the petrological microscope. The samples from which the rock slices were made were collected by various sources including Thomas McKenny Hughes, Adam Sedgwick, a Dr. Roberts and Edward Tawney himself.

The rock samples from Devon collected by Tawney include both sediments and igneous lithologies. They reveal a number of novel sampling techniques involved in their collection. For example, rock sample No.2 was a granite "*collected from the doorstop of the Brixham Orphanage*". This locality was actually the 'Seaman's Orphan Home', a place taking care of the children of fishermen from the local harbour who had been lost at sea.

The maritime theme continued with samples obtained from fishermen's dredge nets from boats operating out of Brixham harbour. So sample No.20 was a granite taken from the nets of the trawler '*Ernest*' in December 1881. Sample No.22 was a hornblende granite taken by the trawler '*Pelican*' 20 miles south of Eddystone on 14 February 1882. The same trawler supplied Tawney with rock specimen No.23, a micaceous sandstone dredged some 5 miles SE of Start Point on 25 February 1882. This remote sampling technique allowed some investigation of the geology of the English Channel at a time when submersible technology was yet to be dreamed of. The rock slices described in this notebook are examined further in the discussion of Alfred Harker's later treatment of the petrological collections. Three examples are illustrated in Figure 3.

TWNY 1/18

'Nevin Notebook'

This notebook was compiled between August 1880 and June 1882. It records Tawney's fieldwork in Wales (1880), Devon (1881) and the Isle of Wight (1882) during this period. It charts field observations and includes many pencil sketches of strata exposed at the various localities. In the latter part of this notebook are entries on fieldwork at Headon Hill on the Isle of Wight with Henry Keeping.

TWNY 1/19

'Paris'

This notebook comprises entries made on geological fieldwork in France (Paris region) in June 1881. There follows the description of an excursion to Braemar, Aberdeenshire and south-west to Killiecrankie in Perthshire during August 1881. Later that month, Tawney attended the British Association meeting held in York. He travelled back to Cambridge afterwards via Lincoln.
The next entries relate to a visit to Italy late in September 1881. Tawney climbed the slopes of Vesuvius and pencil sketched erupting ashes emerging from a cinder cone. Entries for 1882 relate to excursions around sites of geological interest in Dorset.

Tawney's fossil collection in the Sedgwick

The data presented in this section was collected during tenure of an East Region Peripatetic Natural History Curator Project by R. J. Theodore between October 2009 and April 2011. The collection is here sub-divided on the basis of the geological periods it was collected from.

Cambrian

Material under this heading is represented by hyolithids and trilobites from Wales. Some of this was collected in the 1879 field season with Henry Hicks.

Ordovician

Wales is once again strongly represented in Tawney's collection under this heading with graptolites from the Llanvirn [D. bifidus Zone] of Llanvirn Quarry, Abereiddy Bay, Porth Hayog and Ramsay Island. Llandeilo [D. murchisoni Zone] graptolites were collected from Abereiddy bay. Both graptolites and trilobites were collected from the Upper Arenig of Pennarfyrydd Farm, Aberdaron [Caradoc Stage]. At the time of their collection, these fossils were of course labelled as 'Lower Silurian' in age, following Adam Sedgwick's scheme of 1847. They awaited Lapworth's 1879 definition of the Ordovician Period to be reclassified.

Silurian

Collections from this Period are represented by fossils collected from the Tortworth Inlier in Gloucestershire, England. These include trilobites and tentaculitids which were collected from the Llandovery of Damey Bridge [Llandovery: Telychian (Holland and Bassett 2002)] and brachiopods from the Wenlock Series.

Devonian

Tawney's collecting in Cornwall and Devon figure highly under this category. They include corals, trace fossils, bryozoans, brachiopods, bivalves, rostroconchs and gastropods from the Lower and Middle Devonian of Devon. From the Upper Devonian of Devon are recorded bivalves, ammonoids and nautiloids. The collection also contains brachiopods and corals from the Middle Devonian of Germany as well as Lower Old Red Sandstone fish from Herefordshire.

Carboniferous

Fossils under this division are more widespread in their collection localities. They include crinoids from Yorkshire (possibly from Sedgwick Club excursions), and fossil sponges from Scotland. These latter items were probably collected on the BAAS excursion to Ayrshire outlined in TWNY 1/8. The rest of the Carboniferous holdings were collected from Gloucestershire and include trilobites, brachiopods, bivalves, bryozoans, corals and conularids.

Triassic

Material under this heading is perhaps the most geographically diverse within Tawney's collection. The Rhaetic bone bed material from Gloucestershire is perhaps expected based on Tawney's proximity to it in his collecting years (Figure 2). The collection also contains brachiopods, echinoids and crinoids from the Keuper of Austria, brachiopods from Italy and fish fossils from the Upper Triassic Kota-Maledi of India. We can determine from Tawney's notebooks that he visited all of these places apart from India. This is perhaps evidence of purchase, exchange or gifts from other collectors within his fossil collection.

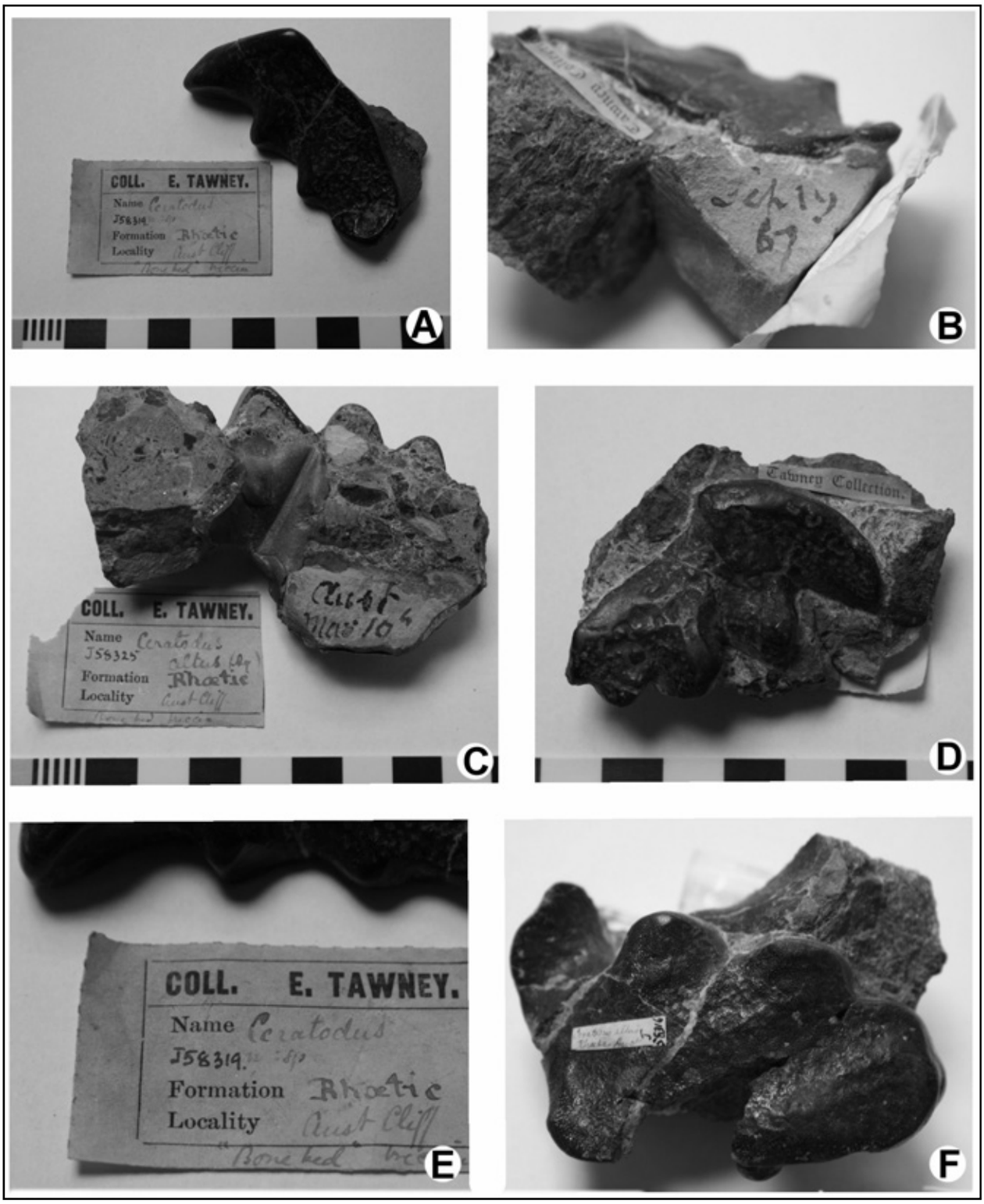

Figure 2. The distinctive labelling style of Tawney's fossil collection: A. SMES J.58319, a specimen of* Ceratodus *from Aust Cliff, South Gloucestershire. The original paper label has become detached, but demonstrates the style and appearance of Tawney's labels; B. SMES J.58318. This specimen bears a variety of labels. One corner has been sawn off the matrix. On this flat surface, Tawney wrote the find date in black ink "Sept 19 67"; C. SMES J.58325. Labelled specimen with additional find date data written in black ink on a smoothed corner of the matrix. It reads "Aust May 10th" ; D. This specimen of* Ceratodus *illustrates the green rectangulat Gothic script label style. (Scale in centimetres); E. SMES J.58319. Tawney Collection paper label with original find date annotation sandwiched between Name and Formation fields. This reads "22. 1. 1870"; F. SMES J.58316 with a small hand written original label overprinted by A. G. Brighton's numbering scheme handwritten in black ink.

Jurassic

This portion of the collection is the most diverse in terms of geographic localities within Britain. Invertebrate material was collected from Wales, Somerset, Worcestershire, Dorset, Gloucestershire, Oxfordshire, Northamptonshire and Yorkshire. Outwith Britain, there are representative fossils from France and Switzerland. Bivalves, ammonites, corals, gastropods and brachiopods make up the vast majority of this portion of Tawney's collection.

Cretaceous

Once more the Dorset coast and Isle of Wight figure highly in terms of collected localities. Collections from here are mostly bivalves and brachiopods. There are also invertebrate fossils from Switzerland, France, Spain and Belgium.

Palaeocene

This time period is represented by bivalve fossils collected from the Thanet Sands of Kent.

Eocene

The Headon beds of the Isle of Wight figured heavily here including bivalve, gastropod and mammal fossils. Eocene fossil fish from Italy are also included here.

Pleistocene

This time period is represented by gastropod fossils from the Coralline Crag of East Anglia, England.

In total, Tawney's fossil collection consists of around about 3878 specimens, which are represented by 880 records on the Sedgwick's electronic database SNBase. This represents an improvement in collections knowledge through audit and retrospective documentation from the 2375 specimens of Tawney origin recorded by former Sedgwick Museum curator David Price in 1985.

Labelling styles

In order to investigate any information which could be gleaned from Tawney's fossil collections, we examined in particular the Triassic 'Bone Bed' fossils of Aust Cliff in Tawney's collection. These all bear a distinctive printed paper label style which is illustrated in Figure 2A. It consists of a white rectangle of paper [48 by 27 mm] with the title "COLL. E. TAWNEY". Below this are printed three further data fields: Name, Formation and Locality. The handwriting on the white paper label is in ink and has faded in some instances. This is in Tawney's own hand (as compared with entries in his notebook TWNY 1 /2, p.60 and specimen J.58322) and suggests that it is his original labelling scheme for his own personal fossil collection made prior to his appointment at either Bristol or Cambridge museums. An addition to these three data fields consist of a date annotation either on the paper label or written in black ink directly onto the matrix enclosing the fossil itself (See Figures 2B, C and E).

The *Ceratodus* fossils were numbered with 'J.' series numbers by A. G. Brighton: J.58314 - J.58326. Of these, the following possess date of collection information: J58314 reads "22.i.1870"; J58318 has 19 Sept. '67 written in black ink; J.58319 reads "22.1.1870"; J.5823 also reads "22.1.1870"; J.58325 Black ink on the specimen matrix reads "Aust 10 May".

This labelling indicates that Tawney had made at least three distinct visits to the Aust Cliff site. The slightly out of chronological order of the J. numbers is an artefact of museum curation post-Tawney's time. On some, but not all specimens, is a small green rectangular paper label printed in Gothic script with 'TAWNEY COLLECTION' (Figure 2D). This is identical in format to other named and museum labelled collections in the Sedgwick (such as Darwin's Beagle Collection rocks). It dates from post-1900 and was added by as yet undetermined curatorial staff.

Tawney did not number his collection individually on the labels. However as we have demonstrated above he did have some form of cataloguing and notebook cross-referencing system in place. Rather he concentrated on providing age, identification and provenance information. Did he have a catalogue of his collection? If it existed we are yet to locate it.
There are a number of Aquisition Dates associated with material in Tawney's fossil collection recorded in the electronic database. These are: 1860, 1861, 1866, 1867, 1873, 1880,1881 and 1887. The 1887 date is some 5 years after Tawney's death. Perhaps this reflects when the collection was finally accessioned by Keeping or Harker?

Tawney's petrological rock slice collection: genesis and subsequent curation

Tawney's laboratory notebooks described above reveal his involvement in the first systematic petrological study of Sedgwick's 1830's collected rocks (see also Harker 1939). Anon (1981) recorded that

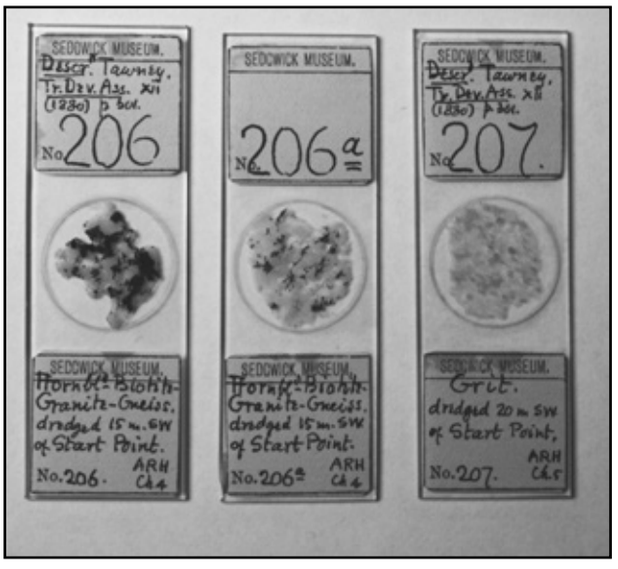

Figure 3. Three thin sections in the Harker Petrological Collection originally commissioned and described by E. B. Tawney in the 1880's. Slides 206 and 207 were figured in a publication by Tawney in 1880. The handwriting on the slide labels is that of Alfred Harker. The Initials 'ARH' are those of Harker. The annotation 'Ch.4' and 'Ch.5' relate back to Tawney's original numbering in his notebook.

Adam Sedgwick employed Robert Farren as an assistant during his tenure of the Woodwardian Professorship, but Farren had not used the new science of rock slice petrology in his duties. Tawney employed a simple internal numbering system which he used in his notebooks. At this time, the collection of rock slices was probably small enough that this was sufficient. However, by the time McKenny Hughes had appointed Alfred Harker as a University Demonstrator in 1884, the collection had ballooned and a new approach was required. Prior to 1879, Harker had been a keen and accomplished fossil hunter honing his skills on the North Yorkshire coast between Flamborough and Whitby [HRKR 2/1/1]. Embarking on this work on the rock slices was to change his career path forever.

Harker began by compiling catalogues of the pre-existing slide collection before continuing the same during a time of exponential growth of that collection. Harker renumbered the collection (apparent from the fact that Tawney's notebook numbers and Harker's do not correspond).

The Catalogues of the Harker Petrological Collection now held by the University Library at Cambridge, reveals Tawney's early input into the Woodwardian Museum's collection and where Harker took over. In Volume II of the Catalogue, is the first mention of an Adam Sedgwick collected specimen. This was numbered '16' under Harker's arrangement of pre-existing rock slices. The next section '17' was prepared from a specimen collected by McKenny-Hughes. Other specimens denoted as 'Wheeler' are indicative of purchases into the collection. Other early purchases were made from Sturtz. The first mention of a rock slice relating to Tawney is Harker's number 65. The following rock slices numbered by Harker were attributed to collection by Tawney: 65, 67a and 96 (olivine basalts), 98 - 100, 104, 108, 118, 143 - 148, 205 - 210, 292 - 318, 327 - 344, 415a, 458, 459, 486 (basalt, Glasgow), 496 (Gneiss, Braemar), 519 - 580, 595, 597 - 605a, 606 - 631, 632 - 641, 649, 650, 663 and 693. A total of 181 rock slices.

The first mention of material relating to John E. Marr were slides 153 and 154. In fact, the first item relating to Harker himself was thin section 168. This correlates with Harker's own former numbering system used in his field notebooks and is a renumbering of A105 collected by him from the Amlwch area of N. Wales in 1884 (Notebook HRKR 2/1/4). This lack of a strict correlation between specimen collection and slide manufacture is particularly apparent with Slide 545 attributed to material originally collected by John Stevens Henslow (1796 - 1861). Henslow was long dead when this numbering system was finally put in place.

In summary, this collections data indicates that although Tawney had had prepared and may also have purchased rock slices for the Woodwardian Museum pre-1882, it was Harker who did the early curation from scratch and hence the resultant catalogues. The early records in Volume II of the Petrological Collection Catalogue indicate that Harker was listing slices as they turned up rather than sticking to any strict chronological order of collection or manufacture. In effect, Harker was retrospectively tidying up pre-existing records prior to a more systematic treatment of new acquisitions. Upon this firm foundation was laid the successive additions to a slide collection which now numbers in the region of 40,000 individual slides curated by Harker.

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Appendix 1

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