GEOLOGICAL CURATOR

Volume 10 Number 7

HUGH MILLER

GEOLOGICAL CURATORS' GROUP

Registered Charity No. 296050

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

- holding meetings to promote the exchange of information
- providing information and advice on all matters relating to geology in museums
- the surveillance of collections of geological specimens and information with a view to ensuring their wellbeing
- 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.

2017 COMMITTEE

Chairperson	Matthew Parkes, Natural History Division, National Museum of Ireland, Merrion Street, Dublin 2, Ireland. Tel: 353 (0)87 1221967; email: chair@geocurator.org
Secretary	Sarah King, Curator of Natural Science, York Museums Trust, Yorkshire Museum, Museum Gardens, York, YO1 7FR, U.K. Tel: +44 (0)1904 687676; email: secretary@geocurator.org
Treasurer	Rachel Walcott, Principal Curator, Earth Systems, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, U.K. Tel: +44 (0) 131 2474068; email: treasurer@geocurator.org
Programme Secretary	Zoë Hughes, Curator of Brachiopods and Cephalopods, Department of Earth Sciences, The Natural History Museum, London, SW7 5BD, U.K. Tel: +44 (0) 131 2474068; email: events@geocurator.org
Editor of *The Geological Curator*	Matthew Parkes, Natural History Division, National Museum of Ireland, Merrion Street, Dublin 2, Ireland. Tel: 353 (0)87 1221967; email: journal@geocurator.org
Editor of *Coprolite*	Helen Kerbey, 12 Baylis Mews, Amyand Park Road, Twickenham, TW1 3HQ, U.K. Tel: 02920 513901; email: coprolite@geocurator.org
Collections Officer	Michael Howe, Chief Curator & Head of the National Geological Repository, British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, NG12 5GG, U.K. Tel: 0115 936 3105 | Fax: 0115 936 3200; email: collections@geocurator.org
Minutes Secretary	Anthony Morgan, Education Demonstrator, Interactive Centres, World Museum, William Brown Street, Liverpool L3 8EN, U.K. Tel: 0151 478 4261; email: minutes@geocurator.org
Web Officer	Simon Harris, Conservator, British Geological Survey, Nicker Hill, Keyworth, NG12 5GG, U.K. Tel: +44 (0)115 936 3100 | Fax: +44 (0)115 936 3200; email: webmaster@geocurator.org
Membership Officer	Cindy Howells, Department of Geology, Amgueddfa Cymru-Museum Wales, Cathays Park, Cardiff CF10 3NP, Wales, U.K. Tel: 029 20 573554; email: membership@geocurator.org
Ordinary Members	Emma Bernard, Curator of Palaeobiology, Department of Earth Sciences, The Natural History Museum, Cromwell Road, London, SW7 5BD, U.K.; email: e.bernard@nhm.ac.uk
	Alex Peaker, Assistant Community Learning Officer, Health and Safety Liaison Officer, Culver Parade, Sandown, PO36 8QA, U.K. Tel: (01983) 404344 | Fax: (01983) 407502; email: alex.peaker@iow.gov.uk
Co-opted members	Isla Gladstone (NatSCA representative), Senior Curator, Bristol Museum and Art Gallery, Queens Road, West End, Bristol, BS8 1RL, U.K.; email: isla.gladstone@bristol.gov.uk
	Nigel Larkin (ICON representative), Freelance Conservator, Preparator and Curator, natural-history-conservation.com, Tel: 07973 869613; nrlarkin@easynet.co.uk

 ISSN 0144 - 5294

Cover: Hugh Miller, see Figure 1 in Taylor and Anderson inside.

THE GEOLOGICAL CURATOR

VOLUME 10, NO. 7

HUGH MILLER

CONTENTS

EDITORIAL

As the editor of this journal I routinely report to the GCG Committee on the various submissions and their progress to publication, and discuss plans for the imminent issues. For quite a few years the committee have heard about a planned 'Hugh Miller Special' but must have doubted me every time it was mentioned. So to finally see this project completed, by the Herculean efforts of Mike Taylor through a protracted period of obstacles and unplanned diversions, is a great pleasure for me, especially as it has been one of the most challenging issues of this journal for me to bring through the editorial process.

Mike Taylor, Lyall Anderson, Alison Morrison-Low and Sara Stevenson have together produced a substantial work of scholarship on a dominant figure in Scottish geology. Mike Taylor has previously produced an excellent biography of Hugh Miller the man. The reason why I wanted this new work in the *Geological Curator* is that it together forms a remarkable case study of an unusual geologist who was also a significant collector. The emphasis and focus of this thematic issue comprises Hugh Miller's geological collection. This collection and how it came to exist, its history and changing value through time, and its public profile have been dissected in great detail to reveal the whole picture. These exhibitions and their host museums, whose roles are analysed through previously unseen catalogue and guide material, reflect the heart and core of our professional identity, and should be of interest to all geological curators.

This collective work however also demonstrates how important aspects of collections outside the fossils, minerals and rocks themselves can be. If we really want to understand collectors and their collections, then their archival records, documents, photographs and associated personal items become critical, as do the history and geography of their local backgrounds. Often these do not fit neatly into the systems or databases we order our lives with, but they should not be overlooked. Space must be found for them, and specialist colleagues consulted and brought in. They can help bring a story to life for a museum visitor who may not have the innate interest in a lump of rock that drives most of our working lives.

This case study is also remarkable for the high level of inter-institutional support and co-operation that underlies its story, at both local and national levels. National Museums Scotland (and its forebears), the National Trust for Scotland and its Cromarty birthplace museum, the National Galleries of Scotland, and the National Library of Scotland have all had key roles in the story (and indeed also in this publication itself which is based on their holdings). Groam House Museum and Inverness Museum and Art Gallery and others show the importance of local museums - whether for lending objects or as venues for co-operative exhibitions, or Inverness's holding of key archival material. The British Geological Survey let us replicate scarce ephemera. NMS allowed replication of the Ben Peach Guide. On a more informal but still vital level is the Courthouse Museum at Cromarty and the local historical background which it has provided over the years, both for research and public services. Such co-operation of National with local institutions is notable in itself. The Friends of Hugh Miller were formed relatively recently but are now a significant support to such work. There are numerous other people and organisations cited in the acknowledgements of each paper, but special mention must be made of Marian and Henry McKenzie Johnston and other members of the Miller family.

In terms of the research itself, a factor that is worth comment is the way that we access data has been transformed in some fields. This research exploits the daily increasing availability and searchability of newspaper archives, though this meant that successive versions of these papers had to be updated by new searches as new runs of journals were uploaded to the online archives. Another interesting feature of this work is that the slow accumulation of collections information in spreadsheets can help reveal patterns that would not otherwise be obvious. The dissemination of work is also changing rapidly, as a large proportion of members will now access this work digitally, instantly on publication, and non-members also in the future on the GCG website. However people access it now and in the future, this issue will be a landmark publication for the depth and breadth of its scholarship into a key figure in the development of Scottish geology. It seems particularly appropriate for Hugh Miller, whose today much underestimated book of 1847, *First impressions of England*, tells the story of a partly geological tour of 1845. Amongst the greatest treats, it is plain, were the museums!

Matthew Parkes, August 2017.

THE MUSEUMS OF A LOCAL, NATIONAL AND SUPRANATIONAL HERO: HUGH MILLER'S COLLECTIONS OVER THE DECADES

by M.A. Taylor and L.I. Anderson

Taylor, M.A. and Anderson, L.I. 2017. The museums of a local, national and supranational hero: Hugh Miller's collections over the decades. *The Geological Curator* 10 (7): 285-368.

Hugh Miller (1802-1856), Scottish geologist, newspaper editor and writer, is a perhaps unique example of a geologist with a museum dedicated to him in his birthplace cottage, in Cromarty, northern Scotland. He finally housed his geological collection, principally of Scottish fossils, in a purpose-built museum at his house in Portobello, now in Edinburgh. After his death, the collection was purchased in 1859 by Government grant and public appeal, in part as a memorial to Miller, for the Natural History Museum (successively Edinburgh Museum of Science and Art, Royal Scottish Museum, and part of National Museums Scotland). The collection's documentation, curation and display over the years are outlined, using numerical patterns in the documentation as part of the evidence for its history. A substantial permanent display of the Miller Collection, partly by the retired Benjamin Peach (1842-1926), was installed from c. 1912 to 1939, and briefly postwar. A number of temporary displays, and one small permanent display, were thereafter created, especially for the 1952 and 2002 anniversaries. Miller's birthplace cottage was preserved by the family and a museum established there in 1885 by Miller's son Hugh Miller the younger (1850-1896) of the Geological Survey, with the assistance of his brother Lieutenant-Colonel William Miller (1842-1893) of the Indian Army, and the Quaker horticulturalist Sir Thomas Hanbury (c. 1832-1907), using a selection of specimens retained by the family in 1859. It may not have been fully opened to the public till 1888. It was refurbished for the 1902 centenary. A proposal to open a Hugh Miller Institute in Cromarty, combining a library and museum, to mark the centenary, was only partly successful, and the library element only was built. The cottage museum was transferred to the Cromarty Burgh Council in 1926 and the National Trust for Scotland in 1938. It was refurbished for the 1952 and just after the 2002 anniversaries, with transfer of some specimens and MSS to the Royal Scottish Museum and National Library of Scotland. The Cottage now operates as the Hugh Miller Birthplace Cottage and Museum together with Miller House, another family home, next door, with further specimens loaned by National Museums Scotland. The hitherto poorly understood fate of Miller's papers is outlined. They are important for research and as display objects. Most seem to have been lost, especially through the early death of his daughter Harriet Davidson (1839-1883) in Australia. Miller's collection illustrates some of the problems and opportunities of displaying named geological collections in museums, and the use of manuscripts and personalia with them. The exhibition strategies can be shown to respond to changing perceptions of Miller, famous in his time but much less well known latterly. There is, in retrospect, a clear long-term pattern of collaboration between museums and libraries in Edinburgh, Cromarty and elsewhere, strongly coupled to the fifty-year cycle of the anniversaries of Miller's birth.

** Michael A. Taylor, Research Associate, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh EH1 1JF, Scotland, and Honorary Research Fellow, School of Museum Studies, University of Leicester. Email mat22@le.ac.uk; disambiguator: http://orcid.org/0000-0002-1495-8215; and Lyall I. Anderson, Honorary Research Fellow, School of Museum Studies, University of Leicester, (formerly Department of Natural Sciences, National Museums Scotland). Email lia3@le.ac.uk.* *Received 10 May 2017. Accepted 28 July 2017.*
** All correspondence to M.A. Taylor.*
.

1. Introduction

This paper is dedicated to Marian McKenzie Johnston (1922-2009), our friend and collaborator over many years.

Hugh Miller (1802-1856), nineteenth-century Scottish geologist, editor, and writer, was a notable collector of Scottish fossils and an outstandingly important writer about geology for the wider public (Figure 1; Andrews 1982; Oldroyd 1996; Shortland 1996a; Waterston 2002a, 2002b; Borley 2002, 2003; Anderson 2005; Knell and Taylor 2006; O'Connor 2007; Taylor 2007). Miller's fossil collection must have been one of the most famous of his time, thanks to his books such as *The Old Red Sandstone* (1841). Yet rather little has been said about the history of his collection as a collection. Hugh Torrens (1995, esp. p. 282) has rightly observed that historical writing tends to rely upon written sources, neglecting objects such as fossil collections, although such collections are a valuable part of the historical picture. Making a collection was taken seriously during the nineteenth century as a means of understanding the natural world, providing a sense of control over it, and establishing one's reputation as a scientist, giving the collected fossils scientific, cultural and personal importance (Knell 1997, 2000; Knell and Taylor 2006). It is therefore timely to review the history of Miller's collection and its museums.

Figure 1. Hugh Miller (1802-1856). Detail from an engraving by Rev. Drummond (Edinburgh) after a photograph by James Good Tunny (NMS.G.1991.17.1). Courtesy and copyright of the Trustees of National Museums Scotland.

The standard collections references, Cleevely (1983) and Stace *et al.* (1987), are, necessarily, brief on Miller, though much better than Sherborn (1940). Despite what is sometimes implied, the scope of Hugh Miller's collection ranges far beyond his undoubtedly important Old Red Sandstone fishes, for he sought to collect across the scope of Scottish palaeontology, from the (then) 'Silurian' to the Quaternary. To give an example of the last, Miller in 1856 collected cold-water marine shells in the centre of the Forth-Clyde Isthmus, with implications for relative sea levels (Geikie 1924, p. 58). Fortunately about 1920, Benjamin Peach (1842-1926) wrote a 'Guide' to the collection. It has now been reprinted in company with this paper and serves as an admirable, if somewhat personal, introduction to Miller's collection (Peach *et al.* 2017).

The bulk of Miller's collection is in Edinburgh in what is now National Museums Scotland, with a much smaller portion in Cromarty north of Inverness, in the Hugh Miller Birthplace Cottage and Museum of the National Trust for Scotland. This latter is an intriguing and perhaps unique example of a museum devoted to a geologist in his own birthplace. It has proved difficult to research because it was originally owned by the family, who did not need to produce the annual reports normal to public bodies, unintentionally denying museum historians a key source. Thus it was necessary to search through copies of local newspapers (e.g. Alston 2006). However, in recent years this problem has been mitigated by machine-searchable online newspaper and magazine databases, especially the British Newspaper Archive (http://www.britishnewspaperarchive.co.uk/) with its emphasis on local news. This resource is, however, still growing; certain key years of the *Inverness Courier*, the main local newspaper for Cromarty, were put online after this paper was refereed, and Miller's own newspaper *The Witness* is not online at all.

This paper stems from our collaboration as Principal Curators for Vertebrate Palaeontology and Invertebrate Palaeontology, respectively, at NMS. The Miller Collection is stored by taxonomic category, with separate treatment for type and figured specimens, on security grounds, and special storage for certain categories of item such as thin sections and large slabs. The size of the collection and its dispersal makes it hard to study as a whole, even within one institution. We do not even have an accurate figure for the number of specimens or groups of similar

specimens such as small molluscs, but it has to be in the high thousands. To grasp the Miller Collection as a whole therefore demands elephantine memory, a great deal of time, and unusually catholic interests that cut across organizational boundaries - or, alternatively, the future creation of a computer database as part of modern curation of the collection. We carried out an initial survey to identify sources of information, and problem areas, for such a computer catalogue (as for Charles Peach's collection; Anderson and Taylor 2008; Taylor and Anderson 2015), although, in the event, the planned computer catalogue was postponed as efforts were redirected to the new displays and stores for the remodelling of what is now the National Museum of Scotland (reopened in 2011). We also carried out research for various public events and publications, and five exhibition projects, permanent and temporary, by National Museums Scotland and its cognate bodies, linked to the Miller bicentenary in 2002. In this paper we extend this work to explore the history of how such a famous collection as Miller's was acquired, curated and displayed over the years, including the foundation of the unique museum in Miller's birthplace Cottage in Cromarty, and how those reflected the changing perceptions of Miller and his times.

Terminological issues. Hugh Miller bore the same name as his father (d. 1807) and son Hugh Miller (1850-1896). The son was not termed Hugh Miller Jr, but usually Hugh Miller F.R.S.E., F.G.S., or 'of the Geological Survey', which is valid only for later life. We simply call him Hugh Miller the younger, or Hugh the younger.

The meaning of 'museum' has proved ambiguous in this project, varying with time and context to denote a collection of objects, the collection and its room together, the building or cabinet housing the collection, and the organization responsible for it, or even some combination thereof.

Sources and abbreviations. Personal data are not normally referenced and are taken from Scottish parish and statutory records, probate records, Register of Sasines (real estate registry), census data, and valuation rolls (local taxation) in NRS, and similar data for England, Canada and Australia from www.ancestry.co.uk; and South Australian wills from APR.

Abbreviations: APR, Probate Registry, Adelaide, South Australia; AUL, Barr-Smith Library, University of Adelaide, Adelaide; b, born; bap, baptised; bc, birth certificate or equivalent parish record; BGS, Library Archives, British Geological Survey, Keyworth; CAMSM, Sedgwick Museum, University of Cambridge; CCH, Cromarty Courthouse Museum, Cromarty; CUL, University Library, University of Cambridge, Cambridge; dc, death certificate or equivalent parish record; ECA, Edinburgh Council Archives, City of Edinburgh Council, Edinburgh; ELGNM, Elgin Museum, Elgin, Moray; EMSA, Edinburgh Museum of Science and Art, RSM from 1904; EUL-NC, New College Library, Edinburgh University Library, New College, Edinburgh; EUL-SC, Special Collections, Edinburgh University Library, Edinburgh; GLAHM, Hunterian Museum, University of Glasgow, Glasgow; GLAMG, Glasgow Museums, Glasgow; GSL, Geological Society of London; HES, Historic Environment Scotland, Edinburgh, CANMORE database on https://canmore.org.uk/; HMBCM, Hugh Miller Birthplace Cottage and Museum, Cromarty (held by NTS); INVMG, Inverness Museum and Art Gallery, Inverness; mc, marriage certificate or equivalent; NLS, National Library of Scotland, including street directories and Ordnance Survey mapping on www.nls.uk; NMS, National Museums Scotland (formerly National Museums of Scotland, and incorporating RSM); NRS, National Records of Scotland, accessed mainly through www.scotlandspeople.gov.uk, with some records accessed at General Register House, Edinburgh; NTS, National Trust for Scotland; RSM, Royal Scottish Museum, and NMS from 1985; vr, valuation roll, NRS.

2. From cottage bedroom to purpose-built building: Miller's private museums

Hugh Miller collected geological specimens all his life, starting in his childhood with pretty pebbles from the beach (Knell and Taylor 2006; Taylor 2007). In the beginning, as a stonemason based in Cromarty, Miller collected locally in the 1820s and 1830s, mainly from the Upper Jurassic and Old Red Sandstone at nearby Eathie, and then from the Old Red Sandstone at Cromarty, till his collecting broadened with his travels and his increasing disposable income as an editor and writer.

Miller made most of his collection himself, in the field. He did receive significant specimens from others, notably Robert Dick (1811-1866) of Thurso, Caithness, whose Old Red Sandstone fossils featured in Miller's publications and who 'robbed himself to do me service' (Figure 2; Miller 1896, e.g., pp. 55-56, 73, 325-326); Patrick Duff (1791-1861) of Elgin, Moray (Miller to Duff, 27 January 1839, ELGNM letter MS G3/4); Ben Peach's father Charles W.

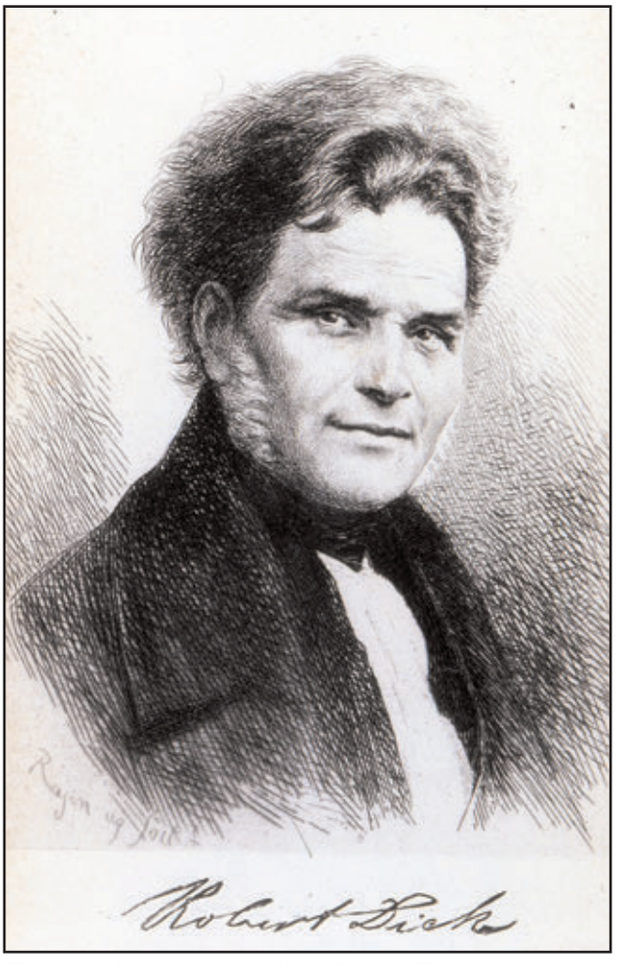


Figure 2. Robert Dick (1811-1866) of Thurso, one of Miller's most important collaborators on Old Red Sandstone fossils, who supplied him with many fine fossils. Image from Smiles (1878).

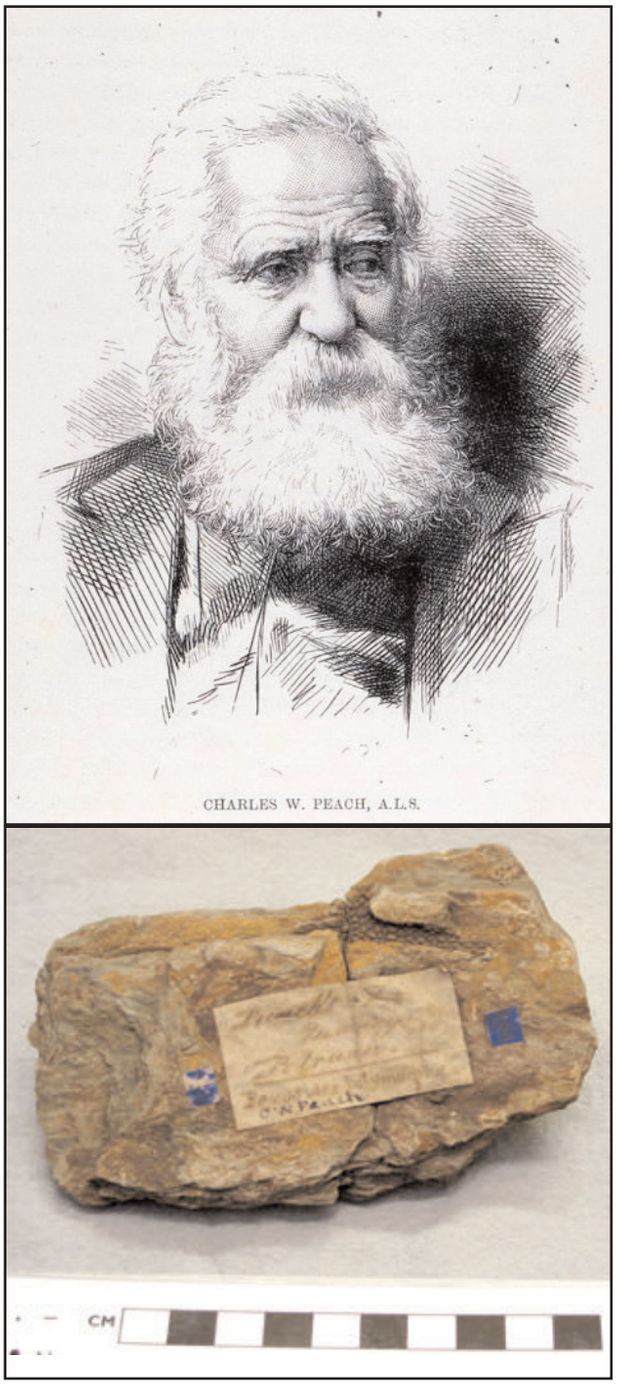


Figure 3. (A). Charles W. Peach (1800-1886), after Smiles (1878). (B), a specimen labelled as the Silurian coral* Favosites polymorpha*, collected by Charles Peach from Polruan, Cornwall, and given to Hugh Miller (NMS.G.1859.33.2029). Copyright and courtesy of the Trustees of National Museums Scotland.

Peach (1800-1886) (Figure 3); and William Stevenson (1820-1883) of Duns, Berwickshire (Duns 1887). As one would expect, Miller did make casual purchases at localities such as Dudley where quarrymen and dealers were apt to have specimens to offer (Miller 1847, pp. 93-94). He sometimes also made purchases from specialist dealers, such as an order on 21 February 1851 to Edward Charlesworth (1813-1893) for sets of 'recent' and 'Mountain Limestone' fossils (letter offered for sale by Jeremy Norman & Co., Inc., http://www.jnorman.com/cgi-bin/hss/43015.html?id=GVIyt6Ur&mv_pc=195, downloaded 6 October 2016). No doubt this was to extend his experience of British fossils and to provide comparative material to complement his Scottish finds (cf. Knell and Taylor 2006). It is less clear whether Miller bought whole collections outright, though he reportedly purchased a collection of fish from the Carboniferous locality of Burdiehouse from the executors of one 'Mr Campbell, of the Exchequer, long a member of the [Edinburgh Geological] Society' ([Lyon] 1867, pp. 2-3).

Miller's collection seems to have remained largely intact. He did not give away specimens on a large scale to gain kudos and reputation. Nor did he sell them, unlike Charles Peach, who did so piecemeal to support his family and work, and whose collection is now fragmented amongst several institutions (Anderson and Taylor 2008). Miller did, however, give and exchange small numbers of specimens, some of which are now in other museums, though so far as we are aware none of those contain many specimens. Those require further research to confirm that

Figure 4. Hugh Miller's Cottage, on the left, soon after rethatching, and Miller House, on the right, 2011. Note that the cottage has two doors opening to the side yard, and just visible traces of a third in the gable end on to the street; also the commemorative tablet (to the top right of the gable). Just visible to the right are the entrance pillars and, behind, the tower of the Courthouse. Miller's father built Miller House at the beginning of the 19th century to replace the cottage as the family home, but was drowned in the wreck of his ship before the family could move in, and Miller House was rented out. Hugh himself and his new wife Lydia began married life in Miller House in 1837. Andrew Dowsett photograph, copyright and courtesy of the National Trust for Scotland.

Figure 5. Hugh Miller's reconstructed bedroom in his birthplace cottage. Copyright and courtesy of the National Trust for Scotland.

they really are Hugh Miller specimens (given potential confusion with his son of the same name), and whether the museum had them from Miller himself or through a third party. For now, we simply note the actual or presumed presence of Miller specimens at the University of Aberdeen (King's College); Sedgwick Museum, Cambridge; Hunterian Museum, University of Glasgow; Inverness Museum and Art Gallery; Natural History Museum, London; Institut de Géologie de l'Université de Neuchâtel, Switzerland; Montrose Museum; Yale Peabody Museum, New Haven, USA; Paisley Museum and Art Gallery; Academy of Natural Sciences, Philadelphia, USA and Paleontological Research Laboratory Statesville, NC, USA (Miller 1847, p. 361, 1858, pp. 114-115; Longmuir 1860; Anon. 1889a; Andrews 1982; Cleevely 1983; Stace *et al.* 1987; pers. obs.; NMS records and files).

Miller's first 'museum' was, presumably, the shelves in his cottage bedroom (Figures 4, 5). The collection soon went up in the world when its owner became a bank accountant and freelance journalist and he could at last marry his fiancée Lydia Fraser (bap.

Figure 6. One of the attic rooms in Miller House, with geology displays and a hands-on table. Copyright and courtesy of the National Trust for Scotland.

1812-1876; Sutherland and McKenzie Johnston 2002; McKenzie Johnston 2008). They all moved into Miller House next door to the Cottage (Figure 4), where an 'attic room was occupied with shelves, on which his few books and fossils, the nucleus of a good library and a valuable museum, were arranged' (Bayne 1871, II, p. 109). This must be one of the two rooms now devoted to geology in the current display scheme (Figure 6). 'You have now filled an entire shelf in my little collection which is gradually creeping over the wall', wrote Miller to Duff in thanks for fossils, presumably from Moray (Miller to Duff, 27 January 1839, ELGNM letter MS G3/4). It was perhaps of this house that Lydia recalled: 'He took pleasure when he could - for that was rare - in sitting with fossil-shelves and book-shelves around him, and with a heap of literary confusion about, which was order to him, and which no hands might touch. And if I came in and sat on his knee and talked to him a little, that was his paradise' (L. Miller 1902, p. 515).

In 1840, Miller became founding editor of an Edinburgh newspaper, *The Witness*. This supported the wing of the Church of Scotland which, in 1843, split off in what was called the 'Disruption' to form the Free Church of Scotland (Taylor 2007; Stevenson 2017). Initially the family rented houses, latterly at 2 Stuart Street at Jock's Lodge, in eastern Edinburgh. In 1854 Miller bought his own house, Shrub Mount, an old-fashioned and even then much altered house on the High Street of Portobello, a seaside resort-cum-industrialising-Edinburgh-suburb (Figure 7; NRS, Register of Sasines, 27.1986 f. ccxlviii, 25 April 1854). Fortunately, Campbell and Holder (2005) wrote an admirable architectural history of Shrub Mount, identifying the separate geological museum which Miller had built in the large garden (Figure 8; there is no suggestion that Miller constructed it with his own hands). Miller might have moved quickly after the April 1854 purchase, for in July he was asking for the roof glass and ventilators of what might be the museum to be checked (letter to Andrew Williamson, 10 July, NLS Ms. 7516 f. 54; this does not actually name the museum, but see f.132). We guess that Miller had long wanted such a museum, and seized the opportunity. There is a children's novel, *Sir Gilbert's Children*, by his eldest

Figure 7. Composite photograph of Shrub Mount, Portobello High Street, 2002. Miller's house is the two-storey building in the middle, much modified and with projecting shop fronts added, in 2002 an amusement arcade, bistro and kebab house (the perspective is unavoidably somewhat distorted on the left). The former entrance door was at the side, facing onto a front garden, now built over by the three-storey building on the right. The door is now accessed by the light grey door on the right which leads to a close (Scots: alley) through the three-storey building. Over this doorway (but not on Shrub Mount itself) is an oval commemorative plaque to mark Miller's residence, placed in 2002 by Portobello Community Council and Portobello History Society. Photograph copyright and courtesy of Ian Campbell.

Figure 8. On the left, detail of the 1856 map of Portobello by Sutter (north to top left). The High Street runs obliquely from left to right at the bottom. Shrub Mount house is clearly marked with the extensive garden beyond. Miller's new museum is the broadly rectangular building in the re-entrant corner of the garden, indicated by an arrow. After Campbell and Holder (2005, fig. 4.8). On the right, vertical aerial photograph, 1973, north to the top left (but sun shining from lower right), and High Street running from left to right at bottom. Shrub Mount is on the High Street between two higher buildings, a chapel to the left, and a tenement block to the right with double bayed roof. The original villa has a distinctive bay window, indicated with a single white arrow. Miller's museum building appears to have been incorporated into the range of buildings forming the lower side of the industrial or commercial yard opening from Tower Street on the right, as shown by the roofline kinks indicated with two white arrows. This area was demolished sometime before 2002 and is now used for housing and car parking. Aerial photograph SC 587720, copyright and courtesy of Historic Environment Scotland.

daughter, Harriet Davidson (1839-1883). It is largely autobiographical, if somewhat embroidered, and recognisably based on life at Shrub Mount (Davidson 2011; McKenzie Johnston 2011). In the novel, the family home indeed has a 'splendid museum built lately in the grounds, to which visitors came from far and near', and Sir Gilbert, the father-figure, remarks with satisfaction that the museum is a great improvement from early married life when 'I used to fill our little sitting-room with stones and books till sometimes there was scarcely a decent chair to sit upon' (Davidson 2011, pp. 3, 5). A collector's collections often expand to fill the space available, and no doubt this purpose-built space spurred Miller to collect still more, especially from the local raised beaches, Quaternary brickclays, and Coal Measures.

The museum was substantial, the main block being about 15 or 16m long, perhaps a round 48 feet in reality (the 1856 Sutter map gives slightly different figures from the Ordnance Survey Portobello town plan of 1894, sheet IV.5.10). The additional projection on the west end, seen in the 1856 map, was surely the porch known from other sources (Figure 8; Campbell and Holder 2005). Perhaps the porch, at least in summer, was somewhere for Miller to ponder upon his collection, and to think and write. It was far enough from the house to minimise intrusion by the rest of his household, just as his first floor study and bedroom were apparently isolated by the house's idiosyncratic layout (Campbell and Holder 2005, p. 65). Miller, with his mason's skill, presumably trimmed and prepared his fossils in the porch or some nearby shed. He sent plaster casts of his fossils to colleagues, but we do not know if he made them himself or farmed them out to a local plaster-caster (Egerton and Miller 1860, pp. 131-136; cf. ichthyosaurs, Taylor and Clark 2016). Of Miller's children Harriet, at least, seems to have been roped into helping with the museum; she portrayed herself in her novel, 'sitting near the window, fixing small specimens of shells on cards for her father's museum, an occupation in which he often employed her neat fingers' (Figure 9; Davidson 2011, p. 17). A later report stated that Miller would never let his museum be entered if he was absent (Anon. 1857d), but there nevertheless survives a note from him saying that his daughter Harriet knew the collection well enough to show a visiting Miss Miles around in his absence (NLS Ms. 7528).

We know a little about the museum's design and fittings. It was brick-built (Anon. 1858l), unsurprisingly for Portobello where the fossil-bearing Quaternary marine clays were worked for brick and tile making (Baird 1898). Evidently Miller was not so extravagant as to use stone. As noted above, the museum had roof ventilators and glazed windows, still giving

trouble in October 1856 (NLS Ms. 7516 f. 132; letter by James Tod & Son to Miller, 9 October 1856). So the museum was at least partly sky-lit, improving its lighting and security, and maximising efficient use of space: nicely functional for a private museum. The porch benefited from a security system, a mantrap given by a Portobello friend, George Fox, first Baron Kinnaird of Rossie (1807-1878), when Miller fretted about burglars in the garden (Bayne 1871, II, p. 463). It was a so-called humane mantrap, befitting the Liberal politics of this peer, its toothless jaws bruisingly gumming the burglar's shin, rather than ripping straight to the bone like a conventionally toothed trap.

The museum was doubtless furnished with the usual mixture of shelves, cabinets of drawers, and glass-fronted display cases, some perhaps purpose-built and others brought from previous houses. An 1858 inventory mentions a wall case (Geikie 1858 Ms.). Harriet's novel has Sir Gilbert's eldest son fitting out his corner of the children's room with 'wood shelves […] arranged [with] a number of stones […] named and labelled in his round boyish hand, in imitation of the fossils in his father's museum' (Davidson 2011, p. 3). One of us (MAT) many years ago came across an unforgettable fact, though his memory of the source has not been so reliable. A cabinet of drawers from Miller's museum (but not the specimens in it, so far as we know) somehow ended up at St Trinnean's School, the private establishment for young ladies which was founded in 1922 in St Leonard's Hall, now part of Edinburgh University's Pollock Halls of Residence. Its name is, of course, familiar from the encounter with one (or perhaps two) of its pupils which led Ronald Searle (1920-2011) to create the infamous cartoons of St Trinian's School [sic], inspiring the films starring Alastair Sim (1900-1976) as the Headmistress (Webb 1961; Cant 1984, pp. 109-111).

Miller's was a 'museum' in the senses of a collection, a room, and (from 1854) a building. It was never seemingly public, in the sense that there was a standing invitation to the public to visit it, as made by the London palaeobotanist James Bowerbank (1797-1877), secretary of the Palaeontographical Society, to view his fine museum (Williams and Torrens 2016). Miller was plainly not using his collection to make a public mark (except in his books, of course), unlike Gideon Mantell (1790-1852), who set up the Mantellian Museum in Brighton in the hope of boosting his credibility as a fashionable medic (Cleevely and Chapman 1992). However, Miller proudly welcomed fellow geologists and palaeontologists. Visitors, some to his previous homes and some to Shrub Mount, ranged from the pre-eminent palaeontologists Adam Sedgwick (1785-1873), Roderick

Figure 9. Small postglacial freshwater molluscs from the former Boroughloch, now the Meadows, of Edinburgh, glued on card and arranged partly in the pattern of an Ionic capital (in the centre), perhaps by Miller's daughter Harriet (NMS.G.1859.33.5009). Copyright and courtesy of the Trustees of National Museums Scotland.

Murchison (1792-1871), Richard Owen (1804-1892) and Sir Philip Egerton (1806-1881), to a young student named Archibald Geikie (1835-1924), who later started his stellar career with a reference from Miller to Murchison (Miller 1896, pp. 55, 73; Geikie 1924, pp. 24-25, 40). The palaeobotanist Charles Bunbury (1809-1886) mentioned a 'beautiful *Sphenopteris* […] from the Edinburgh coal-field', presumably seen on a visit in 1849-1850 with the naturalist Edward Forbes (1815-1854) (Bunbury 1852, p. 35; Lyell 1906, I, pp. 335-336). Mountstuart Grant Duff (1829-1906), later Liberal politician but interested in geology, spent an hour and a half in 1853 with Miller in his 'Museum', which must have been a room at Jock's Lodge, talking 'almost exclusively about his favourite science' (Grant Duff 1897, 1, esp. p. 59).

Non-geologists were also shown the delights. It was probably Robert Carruthers (1799-1878), the editor of the *Inverness Courier* and Miller's friend, who wrote in that newspaper of Miller in the garden museum 'descant[ing] on the peculiarities and the locality of each' of his 'precious specimens' (Anon. 1858l). James McCosh (1811-1894) was a Free Church minister and professor of logic and metaphysics at Queen's College, Belfast, and later President of the College of New Jersey, today Princeton University (Hoeveler 2007). Miller was best caught on a Wednesday or Saturday evening, when *The Witness* had gone to press and he could relax; he showed 'me his museum with the feeling of a boy showing his toys to his companion' (Bayne 1871, II, p. 453). Perhaps those visits helped McCosh to write his important work on natural theology. A printer's apprentice on *The Witness* recalled bringing proofs to Miller at Jock's Lodge: 'With what loving words he used to show his museum [...]!' (Cuthbert

1902). Miller's younger daughter Bessie (1845-1919) was perhaps talking of the garden museum when she remembered how her father 'took her and a small friend round his museum, receiving them at the door with the courtesy he would have shown to distinguished grown-up visitors, and explaining his treasures to them with a vivid charm of description and a graciousness of manner she never forgot' (Anon. 1919). And it was undoubtedly in the garden museum in 1856 that Miller showed the patience and courtesy remembered by Harriet's schoolfellow Jeanie Buchanan (1840-1922), who would later marry Harriet's brother Hugh (Morison 1876; Sutherland and McKenzie Johnston 2002, pp. 138, 145).

3. An appeal to save the collection for the nation

Sadly, Hugh Miller did not long enjoy his new museum, for he died by his own hand during the night of 23-24 December 1856. What was to happen with the collection? One obvious repository, which seems to have been the family's choice, was the Natural History Museum of the University of Edinburgh (Anon. 1857d). This was in the process of merging with the Government's new Industrial Museum to become a new national museum, precursor of today's National Museums Scotland, as the result of campaigning by such as the Rev. John Fleming (1785-1857), Professor of Natural History at the Free Church College, Edinburgh, in his 1849 presidential address to the Royal Physical Society of Edinburgh. This society was Edinburgh's main forum for the natural sciences, outside the more exclusive Royal Society of Edinburgh and the soon to be extinct Wernerian Society, and one of its more active members was Hugh Miller, who publicised Fleming's arguments in *The Witness* (Traquair 1903b; Waterston 1997, pp. 85-86).

When Miller died, Fleming immediately wrote to Edinburgh Town Council, then still patrons of the University and its Museum, to suggest that 'steps should be taken to secure for the National Museum the remarkable collection of Scottish fossils made by the late Hugh Miller', in time for the Council to discuss the matter on their 13 January meeting (Anon. 1857a). The Council indeed sent a submission to the Government on 3 February, and John Melville (1802-1860), the Lord Provost, and another Bailie followed it up in person when on other business to do with the University and Museum (ECA, Council Record, volume 270 from 19 December 1856 to 24 March 1857, ff. 107, 257-259; Provost and bailie: Scots, mayor and alderman).

Lord Palmerston was then Prime Minister, but Edward J. Stanley, second Baron Stanley of Alderley (1802-1869), dealt with the matter as President of the Board of Trade. This English peer had no obvious Scottish affiliations or geological interests (as described by Newbould 2008), so one might think it jolly decent of him to observe 'that, having been collected in Scotland by a Scotchman, he thought [the collection] ought to be retained in Scotland' (Anon. 1857c). Indeed, in discussions of the collection's fate at this time, 'national' was evidently a near-synonym for 'Scottish', with the emphasis on Miller's collection having been made largely across Scotland and on preserving the collection in Edinburgh as the capital of Scotland. The Royal Physical Society spoke of 'Mr Miller's very valuable and national collection' (Anon. 1858m), and the *Caledonian Mercury* noted that the Council had stressed to the Government the role of the new Museum as a 'national Institution' of benefit to the 'whole country' (Anon. 1857b). In those, 'nation' obviously meant Scotland, just as Miller's collection was rich in Scottish fossils. Yet, in 1859, Scotland was not - in one sense - a nation; or rather it was, as often described, a stateless nation. There was neither a separate Scottish Government, nor Parliament, nor civil service. Indeed, the United Kingdom was arguably more centralised than ever before or since, with government run from London. Part of the answer to this apparent paradox, of course, is that 'nation' has been an ambiguous word in Scotland since the 1707 Union of the Scottish and English Parliaments. In the 1850s, many Scots were keen supporters of the United Kingdom (and Imperial) project, riding on the North British Railway, using 'N.B.' to indicate their North British location in Scottish postal addresses, and so on. But at the same time they knew perfectly well from which side of the border they came, and were proud of their Scottish culture and heritage. Interestingly, however, a *Caledonian Mercury* editorial went further and linked the questions of the Miller collection, and the Edinburgh Museum in general, to the still wider question of Scottish rights, mentioning the National Association for the Vindication of Scottish Rights, of which Miller had been a member (Anon. 1857c; Taylor 2007, p. 89). The Association sought not so much to dissolve the Union with England but to ensure that Scotland's special situation, as agreed in the Treaty of Union, was respected by the Government in London. This was not a trivial issue, for the break-up of the Church of Scotland in the Disruption was seen as a direct consequence of Westminster's interference in spite of the Treaty's guarantees. Those issues of Scottish rights, if sometimes simply dissatisfaction with the level of government resources and services allocated to Scotland,

influenced the question of what was often called Edinburgh's new 'national museum', a description which neatly makes our earlier point given the prior existence of a national 'British Museum' in London (Waterston 1997, esp. pp. 81-107; Swinney 2013, pp. 362-366). So we suspect that Palmerston's administration had particular political motives for making the grant for the Miller collection, which was in any case a logical follow-on to the establishment of the national museum - which, after all, had to acquire collections. This was seemingly not the last time the Chambers Street museum was used to make minor concessions in the apparent hope of heading off the more obstreperous Scots. For instance, the Museum's transfer to the Edinburgh-based Scotch Education Department in 1901 (Swinney 2015) was part of a general programme of administrative devolution to try and fend off demands for a more radical form of home rule, Irish style. And, more specifically, its 1904 renaming to the Royal Scottish Museum was reportedly to mollify the deep offence caused by the newly crowned Edward VII's adoption of an inappropriate English regnal name, he being, of course, correctly Edward I of the United Kingdom (Swinney 2006, 2015).

Whatever their motives, the Government made an offer of a grant, apparently by mid-February if this is accurately reported (Anon. 1857d). They had had the Miller collection valued at £300 and £400 by 'disinterested persons, competent judges - a Parisian and an Englishman', and their offer of £500 was, on that basis, generous (Anon. 1858l). How did the original source, the *Arbroath Guide*, came up with this remarkably detailed information, if belatedly, in September 1858? One wonders if Charles Peach was the source; the editor of the *Guide*, one D.M. Luckie, had recently been editor of the *John O'Groat Journal* in Wick where Charles Peach lived. The link is reinforced by the fact that Luckie's successor at the *Journal*, George Hay, married Charles Peach's daughter Elizabeth in 1860 (and also moved to the *Guide*) (Cowan 1946, pp. 295-299; Anderson and Taylor 2008, p. 425). We do not know who the valuers were, but another report alleged that they were based in Edinburgh (Anon. 1858c). This would rule Peach out as being the 'Englishman', as he did not move there till 1861.

However, the Government offer was now overtaken by an offer of £1000 by a 'Scottish Nobleman'. This offer itself was in turn trumped by one of 1000 guineas [£1050] from an 'American College' (Anon. 1857g, 1858b, 1858c, 1858d; Taylor and Anderson 2017a). Who were those bidders? The most likely candidates for the nobleman are George Campbell (1823-1900), the geologically inclined 8th Duke of Argyll, who had a great regard for Miller, and Lord Kinnaird, Miller's mantrap-giving friend (Campbell 1906, I, pp. 356-359, II, p. 184; Millar and Martin 2004; Matthew 2009). Initial checks in the respective archives have yielded no evidence either way, though this can only be preliminary (Ishbel MacKinnon, Archivist, Argyll Estates, pers. comm. 2015; Sarah Wilcock, Culture Perth and Kinross, pers. comm. 2016). As for the American college, one possibility is Yale, where Professor Benjamin Silliman (1779-1864) was short of fossils, but the Peabody Museum proper had not then been founded, and the timing seems unconvincing (Fisher 1866; Narendra 1979). Harvard University seems more likely, for Professor Louis Agassiz (1807-1873) had used Miller's specimens in his own work on fossil fishes, and was there amassing collections in preparation for the 1859 opening of the Museum of Comparative Zoology (Andrews 1982; Lurie 1988, pp. 236-238). However, again, there is no surviving evidence in the Agassiz archives at Harvard (Robert Young, Special Collections Librarian, Ernst Mayr Library of the Museum of Comparative Zoology, pers. comm. 2008). In any case, Yale and Harvard were not the only American colleges, and the matter remains open.

Any bid by Agassiz might have had an added complication, for, two years before, the Lord Provost had proposed Agassiz as the council's favoured candidate for the then vacant Professorship of Natural History at the University (and de facto keeper of the Natural History Museum), only to have to withdraw when some other members objected to Agassiz's polygenism, the idea that human races were separately created (Anon. 1855a, 1855c). The reason given was that it contravened the Biblical doctrine of the common origin of humanity from Adam and Eve. This surprised the *Scotsman* as the objectors had been previously against any sort of test of religious orthodoxy for University professorships (Anon. 1855b). But the slavers of the United States had for obvious reasons been delighted with Agassiz's argument that white Europeans and black Africans were, in effect, different species (Desmond and Moore 2009, esp. pp. 232-233, 263-265). So one wonders whether another reason for the councillors' opposition was a loathing of slavery, cunningly dressed as religious orthodoxy to avoid getting side-tracked by economic arguments over whether one could afford not to trade with the American slave states. It seems unlikely that Agassiz actually wanted the job (Sheets-Pyenson 1992, pp. 462, 466 and 466fn). But the potential insult is obvious.

One wonders if the nobleman's offer, at least, was put in as a gamble to increase the proceeds for the Miller family. Perhaps those outside offers had an element of the modern charity auction about them. Even if the public appeal now had to pay a sale price well over the valuation, people might not have worried, so long as the money was going to a good cause. The family certainly needed the money, with their main breadwinner gone. Moreover, it was routine to sell natural science collections after their original collector had died, so there was no opprobrium attached, whether or not the collector had been an 'amateur' (on which loaded word see Torrens 2006; cf. the sale of Charles Peach's remaining fossil collection, Anderson and Taylor 2008). But these new offers posed a problem if the collection was to go to the Edinburgh museum. It was in part held in trust as the inheritance of Miller's underage children, and executors were legally required to accept the highest bid (see below). Yet, although these bids by definition demonstrated the market value of the collection, it was clear by May that the Government would not increase the grant, leading to public criticism, but also support for its fiscal probity (e.g., Anon. 1857g, 1858b, 1858f, 1858l).

There now seems to have been an impasse for some months, till an appeal was launched to cover the difference. This was not all necessarily due to slow Government decision-making. The separate appeal for a memorial to Hugh Miller at Cromarty reportedly found 1857 a bad time to launch a fundraising appeal, with a major banking crisis damaging confidence, as did the outbreak of the Indian Rebellion, which itself led to a demand for humanitarian relief and competition for charitable giving (Taylor and Morrison-Low 2017). At any rate, the question of the collection came back to life in Edinburgh on 23 February 1858, when Lord Provost Melville proposed an appeal to raise £600 to cover the shortfall. He suggested limiting subscriptions to £1 each, to recruit more people presumably to show the wide support for 'preserving to the country this museum, which was really a national treasure' (Anon. 1858c). A pamphlet, *Proposal to Purchase the Museum of the Late Hugh Miller*, was printed and issued in late April or early May, and is republished in this issue in facsimile (Taylor and Anderson 2017a; Anon. 1858g, 1858h, 1858n; Smith 1858, 1863). The matter was now handled by a committee of civic and scientific worthies, including the two directors of the combined Museum, George Wilson (1818-1859), first director of the Industrial Museum and Professor of Technology at the University of Edinburgh, and George Allman (1812-1898), Professor of Natural History at the University and Keeper of the Natural History Museum. It also included 'Jas. Burness' who must have been the Miller family lawyer James Burness S.S.C. (*c.* 1799-1861).

The pamphlet noted the 'strong desire felt and expressed in many quarters', and Miller's own family, that the Miller collection should be 'secured for Scotland, and deposited in the new [...] Museum'. It went on: 'no more suitable Memorial of the genius and scientific labours of Mr. Miller could be erected and preserved; that a Collection so distinctively illustrative of the Geology of Scotland, made by one of whom Scotland had such reason to be proud, instead of passing into private hands, should be placed in one of the public Institutions of the country'. This seems a curious way to put it, as the collection was already in private hands: almost an unconscious assumption that Hugh Miller's collection was part of the national patrimony. But Miller had already, in a sense, shared his collection with the reading public by his use of the fossils in his books and newspaper articles. In any case, there were good practical reasons to lodge this major collection of Scottish fossils in the new national museum, whose natural history museum was only just escaping the long twilight of the later years of its former Keeper, Robert Jameson (1774-1854). The Edinburgh newspaper the *Caledonian Mercury* editorialised that, 'as it serves so well to illustrate our Scottish geology', Miller's collection would be of 'much greater value in this country than it can be anywhere else'. Indeed, it 'would be a national loss, if not a disgrace, were a collection like this allowed to go out of the country. If deposited in the […] Museum […] it will prove one of the most instructive collections in our city […] and […] an object of interest to strangers from all parts of the world' (Anon. 1858g). Similar arguments, sometimes on a county or regional scale, were important justifications for the foundation of museums, such as the Yorkshire Museum in 1830 (Knell 2000), and for individual purchases, such as the Lyme Regis plesiosaur of 1829 which would have gone overseas, had not an enraged William Buckland (1784-1856) demanded that the British Museum buy it (Torrens 1995, pp. 266-267).

The Lord Provost's suggestion of limiting gifts to £1 was set aside, and the appeal attracted donations from a wide range of people, with around £400 already pledged by people listed in the leaflet. These donors, some but by no means all in the Free Church, included aristocrats, industrialists, lawyers, medics and other professionals, and fellow geologists. Charles Peach gave 10s [= 50p], no small sum for a retired coastguard on a basic annual pension of £140 (Anderson and Taylor 2008; annotation on facsimile in Taylor and Anderson 2017a). Taylor and Gostwick

(2003) have explored this interim list, but some further comments are made here. It is rather ironic, given Miller's end, that the medical donors included two asylum superintendents who used natural history as a therapeutic pursuit for patients in their asylums, which had natural science museums of their own (Finnegan 2008): James C. Howden (1830-1897) of Montrose Royal Asylum, and William Lauder Lindsay (1829-1880) of Murray Royal Asylum near Perth. An interesting donor was Francis Close (1797-1882), Dean of Carlisle in the Anglican hierarchy, a form of church government rejected by Miller as by all Presbyterians. Close's statement that 'Scotland ought to have it' must reflect his interest in geology and in Miller's attempts to put geology into a wider Christian context (Anon. 1858g). He approved of Miller's reconciliation of geology and Genesis in *Testimony of the Rocks*, and even published and lectured on *Testimony*, notably on 12 January 1858 at Exeter Hall in London. This was a major centre for evangelical Christianity, where Miller had lectured on geology and religion a few years before - though Close's friend Adam Sedgwick was not wholly convinced by Miller's approach (Miller 1857; Anon. 1858a; Munden 2004; Roberts 2009, esp. pp. 160-161; Finnegan 2011, pp. 55-58; Close n.d.). Another donor, of a substantial £100, was Angela Burdett-Coutts (1814-1906), a fabulously generous philanthropist (Anon. 1858j; Healey 2012). Her motivation was doubtless to promote the progress of science and education, and it is likely that she was advised by her friend William Pengelly (1812-1894), geologist and correspondent of Miller's (Pengelly 1897; Davies 1964). Much better known, however, is her other benefaction, opposite the National Museum of Scotland: the canine statue of Greyfriars Bobby, famous for supposedly remaining with his master's grave, thoughtfully mounted atop a drinking fountain and horse-trough. As Taylor and Gostwick (2003) noted, the leaflet shows surprisingly few Free Kirk ministers other than Miller's friends, given that Miller and *The Witness* were widely regarded as crucial to the foundation of the Free Church. Possible reasons include low clerical salaries, and isolation in their country parishes, but it is also likely that the lack reflects hostility to the independent-minded Miller within the faction which latterly ruled the Free Kirk (Taylor 2007).

The appeal was completed by the end of September 1858, with about £600 raised (Anon. 1858l). The final price of £1025 0s 6d [£1025.03] was equivalent to about £100-200K in 2017 money (oddly, it was omitted from Miller's executry accounts, perhaps because it had been paid straight to Lydia, though annotated in pencil later in NLS Ms. 14248, f. 23). The minor shortfalls below the previous best offer, and the total of some £1100 raised, may represent expenditure on costs such as removal to the museum (Anon. 1858i), and/or an allowance for the family's retention of some specimens (see below).

The Rev. Alexander Duff (1806-1878), Free Church missionary and educator in Calcutta (now Kolkata), had made a different proposal, to endow a named Hugh Miller Professorship of Natural Science, and to purchase the Miller collection, both for Fleming's own Free Church of Scotland College in Edinburgh (Anon. 1857e, 1857f; Ross 1857; Blaikie and Savage 2004; Peach *et al.* 2017). The College, informally called 'New College', trained ministers for the Free Church, and natural science was taught so that students could understand arguments from natural theology, and cope with atheistic transmutationist notions (Fleming 1851, p. 231). New College therefore already had a chair of Natural Science, held by Fleming, and its own natural science museum (part, at least, of this collection is now in NMS; Stace *et al.* 1987, pp. 123-124). Duff's proposal was perhaps made in ignorance of the Edinburgh museum scheme, thanks to postal delays, and seems to have been soon dropped. It should not be confused with the fund in memory of Hugh Miller later, in 1890, given by the wealthy physician Dr Robert H. Gunning (1818-1900), to be used for student prizes and other purposes at the disposal of the Professor of Natural History (Anon. 1890a; Baillie 2003). Gunning had also, in 1888, donated a bust of Miller by D. W. Stevenson (1842-1904) to the pantheon of Scots heroes in the memorial hall of the Wallace Monument near Stirling (Anon. 1888c).

4. The collection is divided

The April 1858 appeal leaflet stated that the collection had to be 'removed from its present site before Whitsunday' (Taylor and Anderson 2017a, p. 370). 'Whitsunday' was not the English religious festival, but the usual Scots term day for letting or selling property, 15 (or sometimes 28) May. It is not easy to be sure when the family vacated Shrub Mount, as opposed to being away at school, health cures, and so on (Sutherland and McKenzie Johnston 2002, pp. 116, 118). Lydia Miller was recorded as occupier as well as proprietor of Shrub Mount at Whitsun 1857 in the valuation roll for 1857-1858, and as of 'Shrub Mount' when she bought 27 Ann Street, Edinburgh, commencing legal occupation on 22 April 1858 (NRS, Register of Sasines, 27 2137 ff. 163-165, 14 June 1858, sale by Alexander Monro S.S.C. to Lydia Miller), and in a list of charitable donors when it was published in March 1858 (Anon. 1858e). But those were apparently slightly out of date, or simply indi-

cated her status as a property owner. A more direct source is the surviving account books, evidently for the administration of Miller's estate held in trust by his executors (NLS Ms. 14248, and another, copy held by MAT, courtesy of Marian McKenzie Johnston). They are hard to interpret in detail, but a comparison of known rental payments against likely annual rent indicates that Shrub Mount was let for much of 1857, perhaps as early as Whitsun if not even earlier. So it seems likely that the family moved out early in 1857, in the aftermath of the suicide, and that Shrub Mount had been let out almost immediately, except for the garden museum in which the collection was left with obvious implications for its security, though the unexpected delay in settling matters was hardly the family's fault. Suggestively, the accounts also show Portobello tradespeople's bills being paid off, presumably in arrears, at the start of 1858, and Shrub Mount was indeed let to a Mrs H. Wilson by Whitsun 1858 at the latest (1858-1859 and 1859-1860 vrs).

The estate accounts mention an 'AW' who must be Andrew Williamson (1825-1880), son of Miller's mother Harriet and her second husband Andrew Williamson. He worked for *The Witness* for 22 years, almost the whole of its 24 year existence, latterly as office manager; it is clear from the correspondence in NLS that he also did odd personal jobs for Miller, such as checking on the museum roof fittings (see above). When Miller died, his share in the newspaper firm was retained by Lydia, so that Andrew was effectively (if partly) Lydia's employee at this time. He died prematurely of scalds suffered while later employed by an insurance company, falling into a tank of hot water while inspecting the site of a fire (Anon. 1880a, 1880b; Sutherland and McKenzie Johnston 2002, p. 78; NRS, dc and Register of Corrected Entries, 685/04 003 219; 1861 census, 2 Roxburgh Street, Edinburgh).

The accounts, in particular, show Miller's daughter Harriet and 'AW' making a number of trips to Portobello, presumably from Edinburgh, in February-April 1858. They went to Portobello variously by coach, railway or cab, doubtless depending on how much they had to carry, with some stuff carted separately to Lydia Miller's new house. It is impossible to work out from the cash sums how many trips they made, but they plainly made several at the least. It is of course possible that they were simply retrieving family property temporarily stored in the museum. But the timing suggests that they were regularly meeting Archibald Geikie at Shrub Mount to work through the geological collection, sort it out and present it for his inspection, and pack it, while representing the family's interests. This is consistent with Geikie signing off his summary listing of the collection on 14 June 1858 (Geikie 1858 Ms.), and with our own experience of collection audit and removal, even at the most basic level, which certainly suggests he would need much more than a day, even with help. Geikie's 1858 list did not say where the collection then was, but a reading of the document (discussed further below) strongly suggests that the collection was still in the garden museum, being removed from its display and storage furniture and sorted out ready for packing, given references to such things as specimens which 'were in wall case'. A separate summary list of the 15 crates exists, now bound with the document. Geikie's writings do not mention this episode (e.g. Geikie 1924), so we do not know if he was helping the family, or acting for the museum, perhaps on loan from the Survey, to check the collection before it was crated up ready for transport to the Museum (where it would have gone straight into storage; see below). Geikie would have been as familiar with the collection as almost anyone else, and he was known to the family. However the job was done, it seems that the collection was moved without more than a few weeks' delay beyond the Whitsun deadline. We do not know whether the collection was moved to interim storage, or directly to the museum in anticipation of the appeal's likely final success (however, the late September report, which we suspected above of being informed by Peach, said that the collection 'is at present in the Edinburgh Museum'; Anon. 1858l).

A 1902 guidebook to the Cottage in Cromarty stated that the Hugh Miller specimens in the Cottage came from a selection kept back by the 'Hugh Miller Trustees' - i.e., Miller's executors - when the collection's sale to the Museum 'was contemplated' (Goodchild 1902b, p. 5). Many surviving Cottage specimens indeed bear a light blue paper dot with a handwritten M (Figure 10), which was presumably used to mark specimens for retention. Perhaps M stood for 'Miller family'. The selection must have been after Miller's death but before the collection was packed up around May 1858. Our preliminary impression is that whoever chose the specimens was familiar with Miller's works and with Scottish geology, picking out representative specimens but not usually the best, though several figured fishes were included, admittedly leaving counterparts in the main collection (Figure 10). The family did not have the expertise to do this. We had suspected Archibald Geikie given his known association with the collection in 1858, and his presence in Lothian (Geikie 1924), but acting for the family would raise a conflict with his employment under the same government department as the Geological Survey. However, there is no need to invoke him as there exist two letters

Figure 10. **Diplacanthus striatus*****, Old Red Sandstone of Cromarty: 'First specimen of Diplacanthus ever found' as Miller himself labelled it. This specimen was figured in Miller's book*** **The Old Red Sandstone** ***(Miller 1841, pl. 8, figs. 2, 4). It shows the 'M' on a blue paper dot which is believed to be the marker to indicate specimens retained by the family after Miller's death. It was (presumably) put on display in the cottage museum in the 1880s and in 1953 was transferred by the National Trust for Scotland to the (then) Royal Scottish Museum (NMS.G.1953.4.4). Copyright and courtesy of the Trustees of National Museums Scotland.***

from Lydia Miller to Geikie of 16 and 18 February 1857 (EUL-SC Gen 525/16; dated day and month only, but plainly sent before the Government valuation of spring 1857). Lydia expressed her anxiety that the collection should be disposed of quickly, commented on possible problems with the Edinburgh Museum, and sought Geikie's views on valuers, her own suggestions including Murchison and Bowerbank. In the second letter, she asked if Geikie had organised one Mr Hardy to 'take the measure of the cabinet […] before my friend leaves that she may help me to select the fossils'. From Lydia's references to the collection elsewhere in the letters, the 'cabinet' seems to have been an actual piece of furniture, rather than the collection or museum. Perhaps a problem such as a jammed lock called for a cabinetmaker or locksmith, of which there were several called Hardy or Hardie in the Post Office Directory. It suggests (but does not quite prove) that the fossil-choosing was done as soon as possible after Miller's death, and much earlier than the packing in 1858. This is entirely consistent with her evident anxiety to get the collection off her hands as soon as possible, and with the family's impending departure from Shrub Mount.

Who was Lydia's geologically knowledgeable female advisor? She seemingly resided some way from Edinburgh, and our best bet is therefore Miss Catherine Allardyce (1813-1895), Cromarty resident and long-standing friend of Hugh and Lydia Miller. She was a keen geologist who discovered a new species of Old Red Sandstone fish which Hugh Miller had missed at his own Cromarty locality (Anon. 1895a; Miller 1892, pp. 361-362; L. Miller 1902, p. 371; Sutherland and McKenzie Johnston 2002, pp. 19, 96, 172). She sometimes advised geologists visiting Cromarty, and Miller recommended her to inquirers as 'intimately acquainted' with the local geology (Symonds 1860, p. 100; Collie and Diemer 1995, p. 199 and footnote; NLS Ms. 7516 ff. 79-80, 119-124, Lucius H. Spooner, Assistant Drainage Commissioner for Ross-shire and Sutherland, letter to Miller of 9 December 1847, seeking information on local clays for making tile drains, and Miller's undated draft reply).

What was described in family memories as Hugh Miller's collection of 'polished stones' went with William Mackay (b. 1884), son of Miller's daughter Bessie and her husband Norman Mackay, to Malaya. It was said to have been looted by British troops from its hiding place, during the Malayan campaign in 1941-1942 (Marian McKenzie Johnston, pers. comm. 1998). This is not otherwise documented and might have comprised purely ornamental samples of no interest to the museum in 1857.

The appeal was successful in saving the collection for the newly established national museum, and as a monument to Hugh Miller as a great Scot, complementing the pillar and statue at Cromarty. But the family retained a small selection for a future museum at Cromarty. We now explore how those two threads played out.

5. The Edinburgh Museum's organization and staffing, 1857-1911

Hugh Miller's collection was not, strictly speaking, the founding fossil collection in the new national museum of the 1850s, as is sometimes implied. That comprised the inadequate and badly neglected collection inherited from Jameson, plus whatever Edward Forbes had added in his brief tenure. In 1858, however, the official museum directory spoke of its fossil collection as still very deficient in some areas (Anon. 1858n, p. 13), and the Miller collection was undoubtedly a major boost.

When it came to fossils, the Edinburgh Museum of the later 19th century had a remarkably arcane structure (Allan 1954b; Waterston 1954b). The Department of Technology, derived from the original Industrial Museum, was essentially responsible for the fine, decorative and applied arts, and therefore

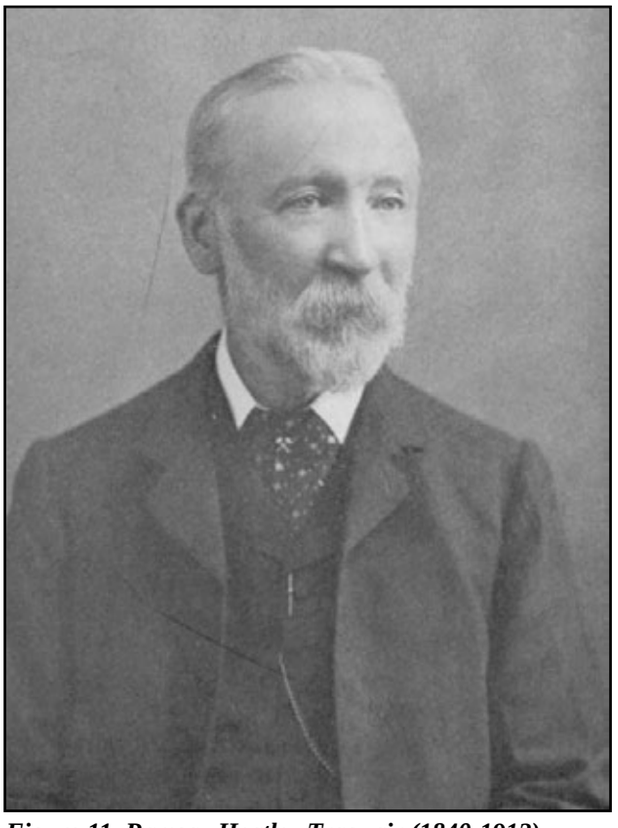


Figure 11. Ramsay Heatley Traquair (1840-1912), Keeper of Natural History in the Edinburgh Museum of Science and Art from 1873 to 1906. After Anon. (1909).

for technology, including raw materials and some minerals and fossils such as coal. (Curiously enough, its curator, effectively assistant to the Keeper, Alexander Galletly (1829-1894), was a self-educated stonemason turned accountant who was said to resemble Miller in this and other ways; Anon. 1894.) The Department of Natural History, derived from the University's Natural History Museum, dealt with zoological material and fossils. The Keepership of Natural History was an ex officio role of the Professor of Natural History at the University of Edinburgh. Not surprisingly, managing this side of the museum's work, with the split responsibility involved, could be problematical, as amply shown by the tenure from 1870 of Wyville T.C. Thomson (1830-1882) (Swinney 1999). In 1873 the Museum gave up and appointed its own Keeper of Natural History, Ramsay Heatley Traquair (1840-1912) (Figure 11; Anon. 1909; Paton 2004). Traquair was a leading palaeontologist and here, at Edinburgh, he became the world authority on Palaeozoic fossil fishes. According to his obituary in *Science*, Traquair was regarded as 'the founder of modern paleichthyology, and his name […] will stand next to that of Louis Agassiz, as the most illustrious in the history of this science' (Hussakof 1913, p. 509). For such a man, the Miller collection would have been highly relevant, with its Old Red Sandstone fishes.

Figure 12. The Scottish geological displays in the West Wing of the Royal Scottish Museum, based on the collections of the Geological Survey, but with an admixture of Museum specimens. Undated but probably early 20th century, from the electric lighting. Together with the photographs of original labels later in this paper, this gives an excellent impression of the specimen-dense display style that would have been used for the Hugh Miller display in the East Wing. Copyright and courtesy of the Trustees of National Museums Scotland.

The Geological Survey housed its collections, and later systematic displays, of Scottish geology, including fossils, in the Museum under what one might call a franchise agreement. The Survey began in Scotland by sharing the Museum's accommodation, but from 1869 housed its geological collections at the Museum (to be withdrawn in stages during the 20th century), and its staff in offices nearby. In 1889, it also created a display of Scottish geology in the new west wing of the Museum, maintained by a Survey officer assigned to the Museum. None of this caused as much of a bureaucratic problem as one might expect, for the Museum and the Survey were both run by the Science and Art Department in London until the 1904 administrative devolution of the Museum to Scotland (Figure 12; Murdoch Smith 1889, 1890, p. 301; Waterston 1954b, p. 51; 1997, pp. 106-107; Wilson 1977, pp. 17-19; Oldroyd 2004a). The Survey collections were withdrawn from the Museum during the 20th century.

This Curator of the Scottish Geological Survey Collection, from 1889, was John G. Goodchild (1844-1906), and we outline his career briefly as he plays a part in the Miller museums story (Figure 13; Gregory 1909; Oldroyd 2002; bound sets of his published papers in NMS Library). Originally an engineering apprentice and amateur geologist, he carried out mapping for the Geological Survey in 1867-1889, mainly in northern England. Apart from his Survey work in northern England and his work on glaciation in the Lake District (Oldroyd 1999, 2002), his main claim to academic fame is perhaps for los-

Figure 13. John G. Goodchild (1844-1906), from 1889 curator of the Geological Survey collection in the Edinburgh Museum of Science and Art, and author of the first guide to the Hugh Miller Museum at Cromarty. British Geological Survey copyright photograph P575822. Reproduced by permission of the British Geological Survey. CP17/044.

ing an argument with William Thomson, Lord Kelvin (1824-1907), over the age of the Earth. In fact, Kelvin's estimate, based on the geothermal heat gradient, did not allow for radiogenic heat and Goodchild's estimate from geological evidence is remarkably accurate by modern standards (Wyse Jackson 2006, pp. 188, 194). More widely, Goodchild was active in working-class education at Toynbee Hall in London and then at Heriot-Watt College, opposite the Museum in Edinburgh. An interest in increasing access to geology is also suggested by his encouragement of the research of Jane Donald (1855-1935; married surname Longstaff), and Goodchild's formal communication, to the Geological Society of London between 1887 and 1902, of seven papers by Donald, who was unable to present them by virtue of her gender (Herries Davies 2007, pp. 158-159; Wyse Jackson and Spencer Jones 2007, p. 106).

A draft Confidential Report of Goodchild's mapping work, probably by Andrew Ramsay (1814-1891), has accidentally survived: 'Work of late [very *deleted*] of more than doubtful value. At present no dependence can be placed on it [in Howell's opinion *deleted*] & it must be gone over again & tested. Subject to congestion and a martyr to rheumatism' (BGS Library Archive). Perhaps Goodchild was moved sideways to the Museum to get rid of him; but he evidently fell on his feet there. He was formally a Survey rather than Museum employee, but the distinction must at times have been blurred (as it would, of course, have been to the general public). The Museum Directors' Annual Reports repeatedly and approvingly noted his activities in displays, lectures, gallery talks, and public handling sessions, and he himself published on such matters (e.g., Goodchild 1901a, 1901b, 1902a). A curator could have a worse obituary than that in the Director's Annual Report: 'Mr Goodchild possessed an intimate knowledge of the collections under his charge, and an extensive practical acquaintance with the geology of Scotland, more especially with that of the neighbourhood of Edinburgh. His facility in imparting information, and his unfailing courtesy to those who sought his advice, will be remembered by many visitors […]' (Dobbie 1907, p. 2).

In 1906, Traquair's departure and Goodchild's death offered a chance for an administrative tidy-up, but the opportunity was not fully taken. Traquair's replacement as Keeper of Natural History, W. Eagle Clarke (1853-1938), was a fine ornithologist and an equally fine example of nominative determinism, but, so far as we know, no palaeontologist (McGowan and Clugston 2007). On the geological side, the Museum took over responsibility for the Scottish geological display from the Survey and established a Geological Department. However, this was staffed only with Samuel J. Shand (1882-1957) who ranked only as geological curator (but not Keeper); he left in 1911 for a fine later career at Stellenbosch and Columbia Universities (Martin 1912, p. 19; Waterston 1954b; Chayes 1958). The Annual Reports show that new acquisitions of fossils now often went to the geology side (e.g., Dura Den fish slabs; Dobbie 1908, p. 6), and that Natural History showed little interest in acquiring fossils, apart from some fossil vertebrates and related items such as casts, which must have been intended for display in the new Extinct Animal Hall that opened in 1931. Even so, there was no systematic attempt to transfer fossils to Geology from Natural History, which retained, amongst others, the Miller collection (Anderson and Taylor 2008 discuss the resulting curatorial problems). The organizational anomaly of two fossil-holding departments was reduced in 1939 when the Geological Department (such as it was) was absorbed into Natural History (Rowatt [1940], p. 4; [Rowatt] Director, Minute to all RSM Staff, 13 July 1939, Directors' Papers, box 8.1, NMS Library Archive). It was only after the war that the fossils and other geological material held by various departments were taken over and fully merged under a Department of Geology still within the Natural History Department (Allan [1952], p. 10). Charles Waterston was appointed in 1950 as Assistant Keeper of Geology, and was latterly in charge of a fully independent Geology Department from 1953 till 1985 (initially as Assistant and then full Keeper).

6. The collection's documentation: from Miller to the 20th century

6.1 Miller's original practices

Originally, Miller did not use a numbering system, except in the special case of sets of specimens sent to correspondents, so that each specimen could be linked to its discussion in the associated letter, such as those sent to John Fleming in 1838 (Absalom 1933; EUL-NC Mil 1.1 main series 201) and George Anderson (1802-1878) of Inverness in 1834 (Anon. 1873, 1874b; EUL-NC Mil 1.1, main series 116, NLS Acc. 13256 and INVMG.000.532).

Miller himself often labelled specimens in his characteristically minute script in ink on small slips of paper, with the locality and, on occasion, other comments (Figures 10, 14A). Unfortunately, some examples suffer from ink fading. Miller's labelling seems at best sporadic rather than systematic, even allowing for the possibility that somebody along the line unhelpfully removed those seemingly untidy scraps of paper. When the collection was unpacked at the Edinburgh Museum in the mid-1860s, it was found that 'a large number of the specimens had never been named', which presumably meant that they lacked identifying labels (Allman 1867, pp. 261-262). This report does not mention provenance information (perhaps locality and horizon data seemed less important to a biologically inclined Natural History Department). It is nevertheless our decided impression that Miller was casual about labelling specimens with localities. Those problems of labelling, and the introduction of inferred data by later curators, were also noted by Peach *et al.* (2017).

Before his move to Edinburgh in 1840, Miller could routinely collect from only a few localities. He would have been familiar with the individual specimens as well as the subtle differences between the Old Red Sandstone nodules from Cromarty and those from Eathie. A *Cheiracanthus* from Eathie is labelled 'The chemistry of this deposit is considerably different from that of the Cromarty beds. HM.' (NMS.G.1859.33.743). After 1840, he perhaps relied more on his published output to waymark particular objects. But even then his use of the fossils in story-telling is often generalised, rather than specific to the object, an exception being when a unique find such as the Eathie 'lobster' was being discussed (Figure 14D). There are plenty of *Calamites*, *Rhizodus* and *Megalichthys*, for instance, but often no one specimen seems to be a stand-alone in his descriptions of the Carboniferous swamps and forests. Miller did, to be sure, discuss individual specimens at length, such as Thurso fossils from his friend Robert Dick (1811-1866) in *Footprints of the Creator* (Miller 1896). But his interest in fossils was as fossils, rather than as detailed stratigraphical labels. This might underlie his failure to go for highly detailed provenance labelling. John Phillips (1800-1874) had regarded such labelling as vital for serious geological mapping as early as the 1840s, and his finding that private collections were generally defective in this respect was a factor in the decision of the Geological Survey to do its own fossil collecting (Knell 2000). Miller's standards of labelling were perhaps not unusual for his time, but they were certainly growing out of date in his later years. Miller was surely putting too much faith in his ability to remember - and also his own continuing existence.

Some of Miller's Old Red Sandstone placoderm fishes bear painted letters on the individual elements of their skeletons: direct evidence of Miller's own

Geological stratum (as understood by Miller)	Colour of dot
Boulder Clay and Raised Beaches [and evidently also other Quaternary beds, such as glacial marine clays]	pink [in fact deep salmon]
Weald (e.g., Linksfield near Elgin)	[white?]
Oolite of Brora and Eigg	yellow
Oolite of Helmsdale	white with small written ×
Lias of Eathie	white
Lias of Pabba [i.e., Pabay] and Skye	light blue
Carboniferous	green
Old Red Sandstone	orange [in fact brick red]
Silurian	deep blue

Table 1. Colour coding of numbered dots in the Miller collection, summarised from notes made by Archibald Geikie (1858 Ms; modern comments in brackets). It is possible that some colour tones have shifted with age. The geological age is as understood by Miller; for example, the 'Lias' of Eathie is in fact Kimmeridgian, and 'Silurian' includes the modern Ordovician. A similar table, but with minor differences and a more anachronistic treatment, is given by Peach* et al. *(2017).

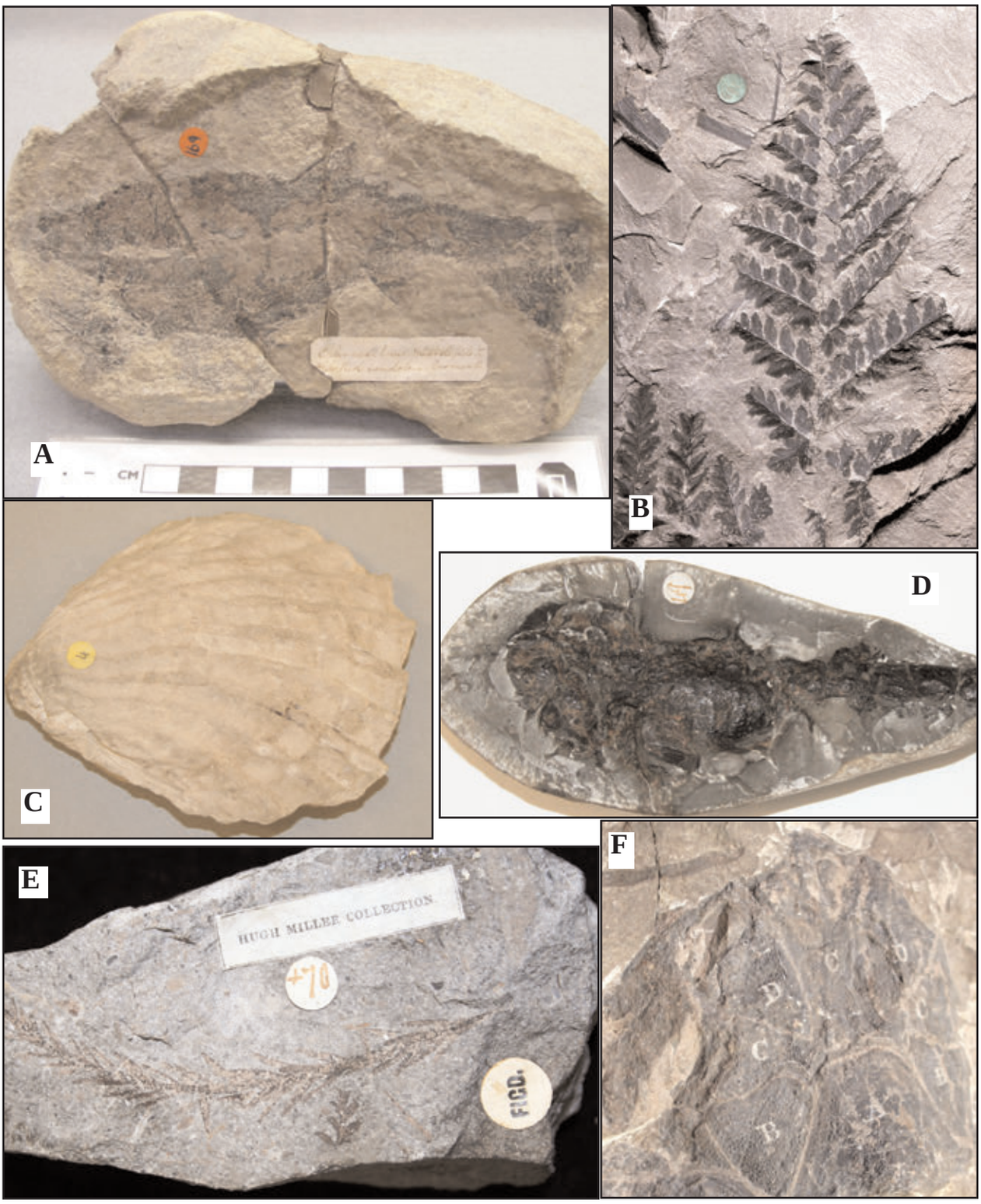


Figure 14. Early labelling systems believed to be used by Miller. (A), A specimen labelled by Miller '*Cheiracanthus microlepidotus*' with its Cromarty locality, showing the red dot, colour-coding for Old Red Sandstone, and number 169 within that group (NMS.G.1859.33.767). (B),* Sphenopteris latifolia*, Coal Measures, Musselburgh, showing the green dot for Carboniferous. (C), bivalve* Ctenostreon proboscidium *from the Oxfordian of Clynelish Quarry, Sutherland, showing the yellow dot for the 'Oolite' of Brora and Eigg (NMS.G.1859.33.4011). (D), a unique example of a decapod from the Upper Jurassic of Eathie near Cromarty, probably* Pseudoglyphaea*, showing the white dot for the 'Lias' of Eathie (NMS.G.1859.33.4008). (E),* Elatides curvifolia *from the Upper Jurassic (Kimmeridgian) of Helmsdale, Sutherland. This shows the white dot with little cross for the 'Oolite' of Helmsdale. The specimen was figured in* The Testimony of the Rocks *(Miller 1857, Fig. 130, right-hand figure) as 'conifer' (NMS.G.1911.9.15). (F), detail of a* Coccosteus cuspidatus *from the Old Red Sandstone, lettered by Miller to indicate the various bony elements of the head (NMS.G.1859.33.1050). All copyright and courtesy of the Trustees of National Museums Scotland.

research into the correct anatomical reconstruction of those forms (Figure 14F).

6.2 Colour-coded numbered dot

This system is present on many Miller collection specimens, but not all. It uses a small paper dot about a third of an inch (8mm) in diameter, colour-coded for geological age, with a simple specimen number written on it, in one number sequence for each colour (Figure 14A-E; Table 1). Some of the 'Silurian' fossils however bear cut squares rather than discs of deep cobalt blue paper (Figure 3). Many discs have suffered light-fading or other discoloration. The system's early age is shown by the dating of the wood from the Isle of Eigg as 'Oolite', that is, later Jurassic, under the colour coding system, as opposed to the more modern Tertiary or Paleogene. It must in any case predate 14 June 1858, the date on Geikie's summary listing, which uses that system and gives an explanation of the colour coding (Table 1), slightly different from that in Peach's *Guide* (Geikie 1858 Ms.; Peach *et al.* 2017).

Oldroyd (1996, pp. 109, 117, note 67) stated that Geikie 'catalogued' the Miller collection in 1858. This was only a brief comment and the sources are not given, but presumably included museum staff and, from the 1858 date and details of colour-coding, Geikie's 'Reference catalogue' of 1858 (Geikie 1858 Ms.). Our own reassessment of this manuscript is that it is not a full specimen-level catalogue, but a summary list of groups of specimens of similar type and age which appears to record the sorting out of the collection before packing for removal from Shrub Mount. The document is effectively a rather cursory inspection or packing list. The main exception is a long list of some Miller specimens, virtually all from Carboniferous localities in Midlothian (as it then was, including Edinburgh, Leith and Musselburgh). But even then it does not count as a catalogue, as they are largely recorded as number and locality, without taxonomic identifications. This is easily explained as Geikie was then mapping the Lothians for the Geological Survey, and was evidently taking the opportunity to note information of relevance. It would have been the locality that was important; the taxonomic identification would be left to the Survey specialist (Knell 2000). In the event, however, the specimens were not obviously used in the final sheet memoir (Howell and Geikie 1861).

It is unlikely that Geikie actually implemented the coloured dot system in 1858, even with help (which was not readily available with the Miller family out of the house). He was busy as a full time field surveyor for the Survey, which would not have allowed work time to be spent on improving a private collection. Moreover, he would almost certainly have used the Survey's standard system, which was alphanumerical without colour-coding (EUL-SC, A. Geikie Papers, Gen. 523/5/3, printed two-page sheet, *Instructions to the officers engaged in the collection and determination of fossils*, formally promulgated by Roderick. Murchison on 15 November 1858 but confirming a practice which had been in operation for some, unspecified, time).

Ben Peach himself stated in his *Guide* that Miller implemented the system (Peach *et al.* 2017). It is not clear whether Peach, born in 1842, knew this from visits to Miller's collection during Miller's life. But his own father Charles was an established contact of Miller's and (as we see below) curated the Miller collection in the Museum. Also, Ben's colleagues in the Survey included Miller's son Hugh the younger, and Archibald Geikie who often visited Miller and his collection (Geikie 1924, pp. 24-25; Oldroyd 2004b, 2004c; Anderson and Taylor 2008). It would not be surprising if a point of such geological and personal interest was passed on to Ben to remember decades later when writing the *Guide*. A press report claimed of the collection that 'all the specimens were marked by the collector's [Miller's] own hand', but no source is given and it is not clear what this meant in terms of the actual markings (Anon. 1857d).

A handwriting study might be helpful in tackling these problem, but needs to allow for amanuenses such as Harriet. Another approach is to seek numerical patterns. The NMS palaeontologists used Excel spreadsheets on laptop PCs when preparing parts of the collections for their recent move. This was primarily for movement control and on-site data input. But it had the bonus that we could informally sort the data to detect patterns and test possible explanations, as with the Charles Peach collection (Anderson and Taylor 2008). This audit happened to include some Miller material, and examination of the data and the Geikie list yields several conclusions:

1. *Packing sequence*. Geikie's 1858 list suggests a strict numerical order of specimens within each category, perhaps when packed into the 15 crates containing the Miller collection. This suggests either that the dots were applied at the same time as packing, or more probably that the collection was checked over and sorted into good order before packing in sequence.
2. *Multipart specimens*. The way in which split specimens, perhaps part and counterpart, or just broken into two, are documented can illuminate their curatorial history (Donovan and Schoor 2016). In the Miller collection, the spreadsheets shows that such pairs sometimes bear numerical-

ly widely separated dots. For instance, the part of NMS G.1859.33.4008, a crustacean, probably *Pseudoglyphaea*, bears 'white 49' [i.e., '49' on a white dot] and the later label G339 (from Charles Peach's curation, see below), but the counterpart carries 'white 209' and G340 (Figure 14D). Evidently the specimens were not given the dots at the time of original acquisition by Miller, but at some later time when they had become separated. Yet Charles Peach later spotted their relationship and applied consecutive G-series numbers. This suggests that the collection was in a little disorder when the coloured dots were applied, or simply that a part was on display and the counterpart stored in a drawer. Perhaps someone unfamiliar with the collection applied the dots sequentially, without sorting it out in detail: maybe one of Miller's children such as Harriet.

3. *Locality sequence*. A sample (of plants) shows no obvious overall relation of numerical sequence to taxonomy. However, there is a dramatic clumping of fossil specimens from certain localities. 'White', or 'Lias', 1-347 are from Eathie near Cromarty, and 348-513 are from Shandwick not far away. Yet it is improbable that Miller collected all his Eathie specimens before his Shandwick ones. For instance, he was evidently geologising at a trial for coal at Eathie as late as 1852, when he found some ichthyosaur bones in the upcast, almost certainly the several fine bones in the collection today (Miller 1892, pp. 371-372; Torrens 2003, pp. 149-150). Likewise, a clump of 'Oolitic' specimens from Brora (etc.) clump together in the yellow dot sequence, followed by a run of specimens from Eigg; but Miller is only known to have visited Eigg in 1844 and 1845, and visited the Brora area before and after that, in 1842 and 1852, and probably much more often, for he was in Helmsdale nearby in 1844 and 1849, and in the 'habit of spending a day in that neighbourhood every season' from about 1843 to 1852 at least (Miller 1858, 1859, p. 146; Bayne 1871, II, p. 432; Taylor 2003; letter from Cromarty 16 July 1842 to Andrew Williamson, NLS Ms. 7516 f. 51). This strongly indicates that the coloured dot system was implemented very late in the growth of the collection: in other words, near the end of Miller's active collecting life.

4. *Cottage collection*. The dot system appears to be present on some of the specimens retained by the family and put in the Cottage museum, such as a fish specimen numbered 'red 820'. Indeed, the 'M' on a dot, probably marking specimens for retention by the family, can be seen as an extension of this system. The dot system was therefore in use before the split of the collection, probably in early 1857 (see above).

When those conclusions are put together, they strongly suggest that the dot system was implemented by Miller, perhaps under his supervision, but also that this was quite late on in his life, during the 1850s, depending on how much collecting he did during his last few years. Perhaps he had finally realised he needed to do something about his collection's documentation. And, from 1854, he had a whole new museum in which he could spread out his collection and work on it. Perhaps he sorted and numbered his collection as he unpacked it. It is probably no coincidence that this was a time when Miller was intermittently unwell, and sometimes unable to work for months on end, and, stuck at home, he might have found light activity on his collection positively therapeutic (Taylor 2007, pp. 141-142; unwell in early 1852, letter, 17 April 1852 to Robert McKenzie, NMS Library SAS Box 616-628 MSS 1929-1; in 'very indifferent health' 'for the last twelvemonth', and at one point unfit for work for months, letter of 14 May 1855 to Roderick Murchison, GSL LDGSL/838/M/15/4, also draft in Archibald Geikie papers, EUL-SC Gen 523/4/60 and 60x).

As part of curation of the Old Red Sandstone fossils in the collection by several members of RSM staff in the 1970s and 1980s (Waterston 1977, p. 41, 1980, pp. 40-41; Macpherson 1986, p. 27), Roberta Paton prepared a cross-checklist of specimens listed by their red dot numbers (listings in HMSO notebooks AI and AII). Further investigation is required to trace the original register, if any, corresponding to this numbering system, and to decide if this, or the Geikie 1858 list, was the supplementary register mentioned in the entry for the Miller Collection in the working copy of the accession register held by Natural Sciences, and made at an unknown date from the original accession register held by NMS Library.

Ben Peach asserted that 'a point of great interest to us is that the colour of this disc lets us know at once what Miller considered to be the Geological Formation from which the fossil had been derived' (Peach *et al.* 2017, p. 382). Yet it seems slightly odd for Miller to do this in the first place, for he would know perfectly well which fossils were from which stratum. Also, Miller owned a half-share in a steam printing workshop. In theory he could easily have generated sheets of pre-printed numbers (much as the Geological Survey did), although the balance of initial costs versus final time saved would not be nearly as favourable as it was for the Survey, which could spread it over dozens of collectors. Perhaps the coloured dot method was simply less bother to implement at home. Moreover, it was not unique to the Miller collection, for Charles Darwin used a sim-

ilar (but not identical) system for his *Beagle* collections, in which the colour of the label was again an integral part of the unique object identifier (Porter 2010). We found this rather surprising as we discovered during our own audit how unwieldy the system is. It comprises parallel runs distinguished only by the colour of the dot (which was unhelpfully apt to fade). We found it annoying to record specimens with such circumlocutions as ‘green 42’ and ‘red 23’, and so too must previous generations of curators working with pen and paper - or sometimes they didn't bother, in which case the recorded number was ambiguous. This objection would not apply if a single numbering run had been used to give an unique number independent of the colour of the label. Also, the number element to the 'label' is a subset of all fossils from that particular geological division, which seems to our eyes a very strange way to go about the listing. The only advantage of such a system is that it gives a physical colour coding to help put collections visibly back in order. That is why, in the first issue of this journal, its founding editor, Brian Page, recommended this system for a teaching collection (Page 1974). It makes good sense when undergraduate stu-

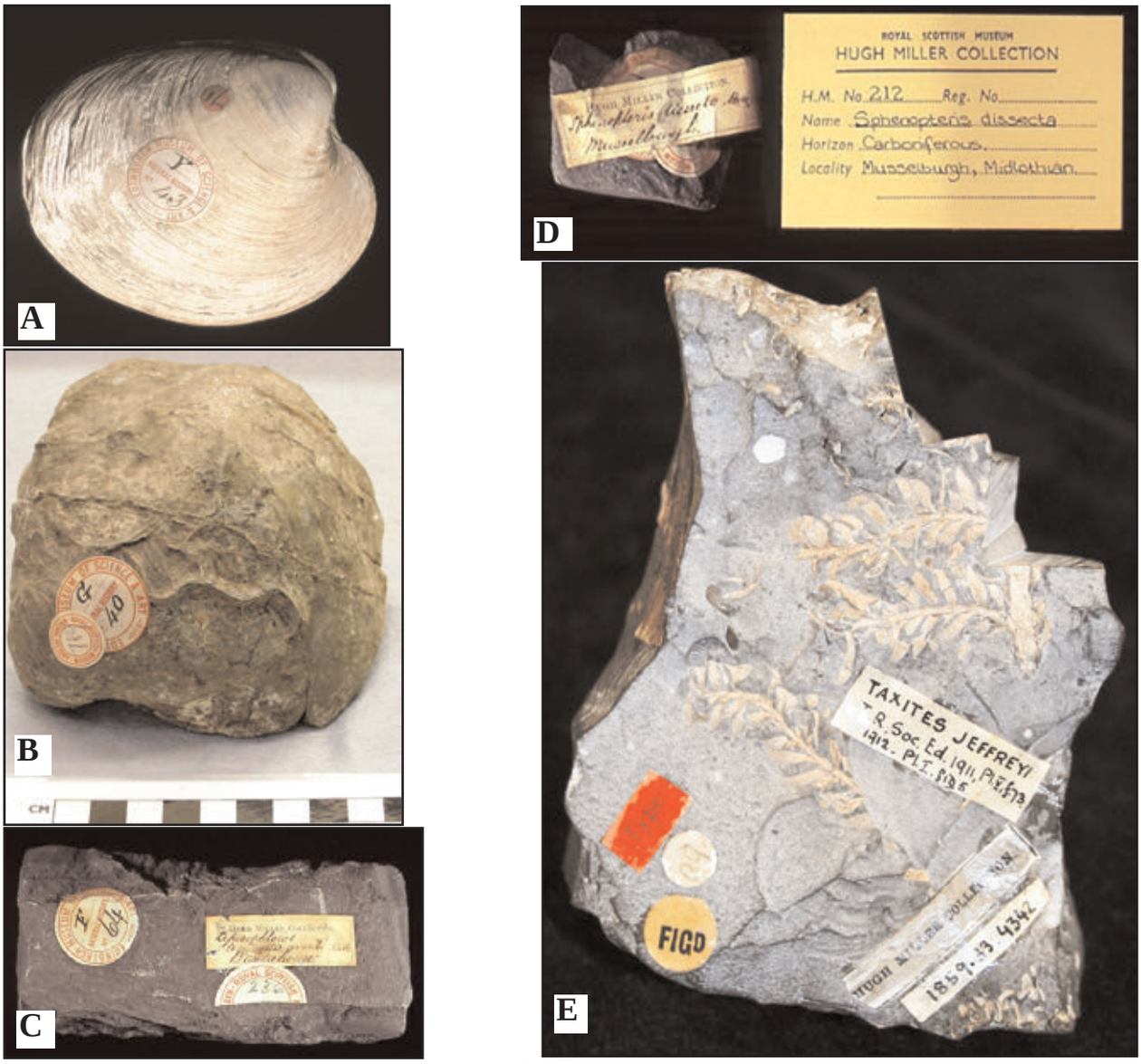


Figure 15. A-E, various numbering systems and label styles within the Hugh Miller collection applied by successive curators in the Museum at Edinburgh. (A), Example of alphanumeric label applied by Charles Peach in his distinctive script about 1866-1867, to a cold water 'clam' **'Astarte elliptica'**, ***now*** **Arctica islandica**, ***Clyde glacial shell beds (NMS.G.1859.33.5007). Note the use of the Edinburgh Museum of Science and Art title, current from 1864 to 1904, and the numbered paper dot, 'pink' for this geological age. (B),*** **Gryphaea dilatata**, ***example of simple numerical number on Royal Scottish Museum label, origin and rationale unknown but obviously after the Museum's name change in 1904 (NMS.G.1859.33.4058). (C, D), further examples of these labels on Carboniferous plants, and an example of the pale butterscotch labels specially printed for the Miller collection post war. (E), the modern tripartite number on the holotype specimen of*** **Taxites jeffreyi** ***Seward, 1911 from the Upper Jurassic (Oxfordian) of Brora, figured as 'conifer twigs' by Miller (1857, fig. 131A) (NMS.G.1859.33.4342). All copyright and courtesy of the Trustees of National Museums Scotland.***

dents get their paws on a collection and instil their own brand of not-in-the-right-box chaos. But it hardly seems necessary for a personal museum. Add the dots' fragility and susceptibility to loss, and the need for a formal printed label for legal status, and it is easily seen why the system was dropped after the Museum acquired the collection.

6.3 Alphanumerical code on EMSA label, mainly 1866-1867

A second system uses labels bearing a single letter indicating geological age (e.g., J for Jurassic) and a running number for the specimen (Figures 15A-D). Those are on labels bearing the Edinburgh Museum of Science and Art, the new name given in December 1864 to the combined Natural History Museum and Industrial Museum. There is no doubt about who did this work and little about when, because of Charles Peach's characteristic script, familiar from his own specimens in NMS, in the labels and associated catalogue, recording also his typical outbreaks of enthusiasm over particularly interesting or pretty fossils (Peach Ms. [1866-1867]; Anderson and Taylor 2008; Taylor and Anderson 2015). He was recruited to curatorial work on the Miller collection in 1866: 'Most of the species have accordingly been now determined and named by Mr Peach' (Allman [1867], pp. 261-262). Allman mentioned only the fishes but Peach also covered many (though not all) other specimens in his catalogue. Peach's strong friendship with Miller meant that he must have been a good man for the job, whether paid or not.

6.4 Simple number on RSM label, 1904-?

Some specimens bear a simple number on a Royal Scottish Museum label, evidently postdating the 1904 change of name (Figures 15B-D). It is not known who did this work and no corresponding register has been found, if one existed, although in the 1970s or 1980s Roberta Paton prepared a retrospective checklist for what appears to be this numbering system for the Old Red Sandstone fishes in particular (in HMSO notebooks, BI and BII). We suspect that this system was applied relatively soon after 1904, if only because of the Natural History Department's later apparent loss of interest in palaeontology. We considered whether Ben Peach applied the numbers around 1916-1920 to identify specimens used in the new displays, but there is no mention of such curatorial work in the museum reports, and also some specimens with these numbers already bore older numbers which adequately identified them uniquely (e.g., Figures 15B, C).

6.5 Modern tripartite number, c. 1950-present

This system comprises elements for the year of accession, number of accession within year and specimen (Figures 15E, 17). Its usual form is now NMS.G.1859.33.1234 where NMS is the Museum Documentation Association code for the institution, 1859.33 is the accession number for (most of) the Miller collection, retrospectively created from the sequence of acquisitions within the year 1859, and G the prefix, retrospectively added even later, for Geology. The final number is a modern specimen number. As the accession number was often retrospectively inferred from the old registers for older collections, it is not always clear when any given number of this kind actually came into use, bearing in mind that the bipartite accession number could be used independently from the full tripartite number (Figure 17C shows an example where the suffix has been added later, and separately, in pencil). A further complication is that a similar tripartite system appears to have been used for a while in the later 19th century to denote subcategories of large acquisitions, such as all fossils of a given species. The result is that all individual specimens in that grouping bear the same tripartite number (e.g., annotation by Charles Waterston, records for accession G.1887.35). This is different from modern practice and obviously potentially confusing. Fortunately, it does not seem to affect the Miller collection.

The tripartite system is doubtless that reported for 1951 when the system of registration of fossil specimens was reorganised, and a start made on material from the Hugh Miller and Neilson collections (Allan [1952], p. 10). The stored part of the Miller collection was merged into the main run of the newly unified Geology collections, if it had not already been. Even then, it still retained some separate identity. Specimens of a given fish genus from a certain locality were normally stored together, but the Miller specimens were separated out if there were enough to fill a separate drawer. Special specimen and drawer labels were printed on distinctive butterscotch-coloured card stock, using the Gill Sans type acquired in 1946 to replace older typefaces in the Museum printer's shop (Figure 15D; Allan [1947], p. 3). Those distinctions continue today (2017) (Sarah Stewart and Stig Walsh, pers. comm.).

Initially, curatorial work by Charles Waterston and his staff focussed on published type, figured and cited specimens, of which there are many, but as time went on other specimens were registered for specific purposes such as loans and displays, and as part of wider curatorial projects, especially the Old Red

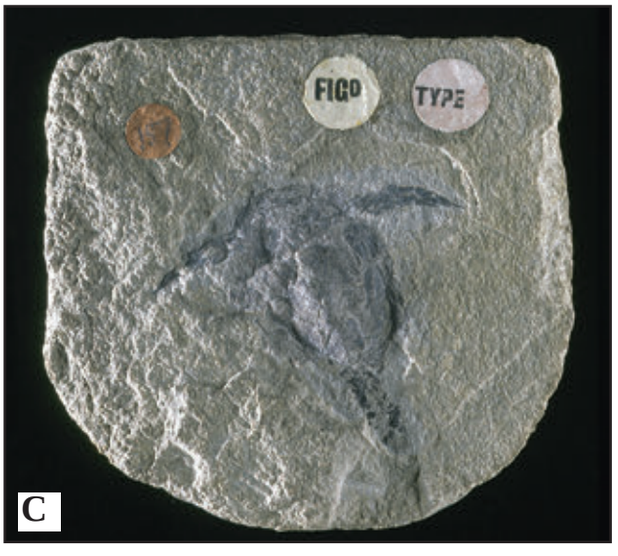


Figure 16. Examples of status labels and specially printed labels. (A), the plant* Milleria thomsoni *(Dawson) from the Middle Old Red Sandstone of Cromarty, figured as 'vegetable impressions' by Miller in his* The Old Red Sandstone *(1841, plate 7, figure 3) and as 'fucoids' in* The Testimony of the Rocks *(1857, figure 119) (NMS.G.1859.33.2102). This is not one of the more impressive specimens, but it shows that Miller could hardly have originated the longer label himself, as it cites his last, and posthumous, work. This points to an Edinburgh Museum origin for the label. (B), the body and tail of a* Pterichthyodes *from the Middle Old Red Sandstone of Cromarty (NMS.G.1859.33.652). Surprisingly, the label bears the old Lower Old Red Sandstone dating for the Cromarty (and similar) fish beds. This Lower ORS dating was looking shaky even before Miller died, and was soon rejected in favour of a Middle Old Red Sandstone age. Charles Peach himself found the clinching fossil evidence in 1861, before curation started on the Miller collection in the Museum, and Ramsay Traquair and Ben Peach would also have been well aware of the correct dating (Murchison 1859; Peach 1883; Oldroyd 1996a, pp. 91-92; Taylor and Anderson 2015). So this could be interpreted as an original Miller label. On balance, however, it seems more likely that this was a museum staff error caused by copying from one of Miller's books, as the label margin style is similar to that in (A). (C), the classic eponymous Miller fossil, lectotype of* Pterichthyodes milleri *(Miller ex Agassiz 1841) (NMS.G.1859.33.5). All copyright and courtesy of the Trustees of National Museums Scotland.

Sandstone fossil fishes. There were sporadic disposals over the years, usually on account of deterioration. There was at least one transfer of a few specimens to another institution, the Paleontological Research Laboratory of Statesville, North Carolina, in 1961. Some fossil fishes were considered to be of such poor research value that they did not justify modern registration or storage in the main collection, then very short of space. They were therefore packed up in boxed storage in an outstation. The display and curation of the Miller collections was not affected by the merger of the Departments of Geology and of Natural History in 1996 to form the Department of Geology and Zoology, renamed in 2005 the Department of Natural Sciences.

6.6 Special labelling

As usual in museums, additional labelling was applied to specimens to indicate their published status, if any (Figures 15E, 16; Peach *et al.* 2017). Some specimens have specially printed 'Hugh Miller Collection' labels (Figure 16), sometimes with added information to suit an individual specimen. These are presumably Museum labels, but this needs further investigation, given Miller's co-ownership of a printing works.

6.7 Problem areas: palaeobotany

One of the most important parts of the Miller collection, perhaps surprisingly to some, comprises the fine Jurassic plants from the shores of the Moray Firth (Figure 17; Anderson 2005). Part of this material falls under the accession NMS.G.1911.9.1-24, 'Fossil

Figure 17. Jurassic plants. (A)* Sagenopteris phillipsi *(Brongniart) from the Upper Jurassic of Helmsdale, Sutherland, figured by Miller (1857, figure 141) (NMS.G.1911.9.9). (B, C). Thin sections from the 'cones'* Conites juddi *Seward & Bancroft, 1913 (NMS.G.1859.33.4344) and* Williamsonia scotica *Seward, 1913 (NMS.G.1859.33.4350), from the Jurassic (Kimmeridgian) of Eathie, giving a sense of the wonderful three-dimensional preservation of those petrifactions. The first was evidently contracted out to be prepared by the palaeobotanist Walter Hemingway (1859-1947) (Liston and Sanders 2005). All copyright and courtesy of the Trustees of National Museums Scotland.

plants from the Hugh Miller Collection, some figured in the "*Testimony of the Rocks*"; revised and named by Professor Seward, Cambridge, 1911' (acquisition register, NMS). No vendor or donor is recorded. The reference is to the Cambridge University palaeobotanist Albert C. Seward (1863-1941), a major researcher on such fossil plants (Wilding 2005). The 1911.9 specimens comprise almost, but not quite, all those figured in the last run of illustrations in *Testimony*, and Miller died just as he completed the proofs (Miller 1857, p. [xii]). We wondered if those fossils had been with the engraver for the preparation of illustrations and then become separated after Miller's death, ending up being retained by the family and passed to Seward through his Geological Survey contacts such as Hugh Miller the younger, for later transfer to the museum (Taylor and Anderson 2015, pp. 172-173). However, from contemporary reports, and Peach labels from the 1866 curation on some specimens, it seems that the plants, or at least many of them, were in the museum all along (Hislop 1861; Richards 1885, esp. p. 116; Seward 1911, p. 649, 1912, p. 102; Anon. 1912d). We conclude that the 1911.9 number has no significance and was probably allocated in error on the return of the specimens. There is nevertheless a distinctive style of numbering in dribbly red gloss paint and orange crayon which we provisionally associate with Seward, as some of this is only seen, at least in NMS, on specimens which he published (Figure 17A; Anderson 2005). An apparently similar style can be seen on at least one Moray Firth Jurassic plant in NHM, a 'cone' of *Williamsonia scotica* from the Upper Jurassic of Eathie, purportedly collected by Charles Peach, but figured in *Testimony*, but we leave these matters for further investigation (Taylor and Anderson 2015, pp. 172-173).

There is a report of specimens in family hands in 1907, when Marie Stopes (1880-1958), a fine palaeobotanist, and David M.S. Watson (1886-1973), then a student, visited the Brora area (Falcon-Lang 2008). The Rev. James Joass (1830-1914), Church of Scotland minister of Golspie and keen if then lapsed geologist, advised Watson to visit Miller's daughter, Mrs Bessie Mackay of Lochinver on the west coast, as she still had important fossils of her father's. It is hard to know what to make of Joass' statement. The visitors' interests suggest that Joass had Jurassic plants in mind, but this is not certain and he might have been thinking of Moray Firth fossils in general (Howard Falcon-Lang, pers. comm. 2010). Perhaps he simply meant the fossils in the Cottage in Cromarty, which were partly owned by Bessie (see below) or less probably the ‘polished stones’ (see above). In any case Joass' lead is not known to have been followed up. Stopes soon went off to Japan (and later fame as a birth control pioneer), and Watson switched horses to become a noted vertebrate palaeontologist (Parrington and Westoll 1974, p. 490; Falcon-Lang 2008).

6.8 National Trust for Scotland collection and transfers

Some of the specimens in the Cottage collection at Cromarty bear a number prefixed 11. This is possibly a collector's number or a NTS curatorial number. Two examples are 11.337, *Coccosteus* from Edderton, and 11.343, *Parka decipiens* from Turin Hill (both from Hugh Miller the younger's collection, respectively collected in 1870 and 1869).

As part of the 1950s and 1960s work at the Cottage, the National Trust for Scotland made several transfers to the RSM of specimens which were no longer required or were deemed too important to retain in a non-specialist institution. This was a common practice in small museums at the time. NMS.G.1953.4.1-5 comprises type and figured specimens, including four fishes from the Old Red Sandstone of Cromarty associated with Miller himself (Figure 10), and a fossil plant, *Telangium bifidum*, from the Calciferous Sandstone of Irthing, marked 'H. Miller's private specimen. Collected 1883', which must have belonged to Hugh Miller the younger (see below). G.1962.24.1-2 comprises two specimens of the fish *Coccosteus* from the Old Red Sandstone, one of which is from Edderton, Ross-shire, and therefore not from Hugh Miller's own collection (as the locality was discovered after his death). G.1963.2.1-10 comprises Old Red Sandstone fishes. G.1967.35 comprises 13 miscellaneous fossils, some evidently collected by Hugh Miller the younger (see below).

6.9 Assessment of documentation

The Miller collection still retains its separate identity to a degree which no other palaeontological collections have in NMS, though not to an extent that obstructs routine storage and curation. The specimens have received due attention over the years in the various published catalogues of different sections of the fossil collections, such as plants (Miller only, Anderson 2005), and fishes and amphibians (Waterston 1954c, now mostly superseded by Paton 1976 and companion volumes). Otherwise, the collection has never been fully curated under a single documentation system, the most complete in terms of coverage perhaps being the coloured dot system. This is doubtless due to the collection's size, varied storage, and division between taxonomic categories with different staff. Much more audit and curation work is required to complete the modern documentation and to ascertain what further evidence emerges from the older documentation and labelling.

7. Curation and display in Edinburgh, 1859-1911

It is hard to be certain how much of the Miller collection was displayed, and in what way, before the Great War. There is (so far) no full published history of the Royal Scottish Museum and its forebears, apart from a brief but useful corporate centenary account (Allan 1954b; Waterston 1954b; but see the thesis by Swinney 2013). We have found no photographs specifically of the older Miller displays, and few of the galleries as a whole. We have relied on the brief, and sometimes Delphic, mentions in the museum's Annual Reports and periodically updated guide booklets. Such things are apt to sustain unintended changes of meaning when pulled together by central staff unfamiliar with subject technicalities, and it is often unclear whether all or part of a collection was on show, especially as 'arrangement' could refer to curating a collection or putting it on display. Of course, displays were effectively open storage, so there was perhaps less difference between the two than there might seem today, as getting the specimens into a suitable sequence, and neatly mounting and labelling them, comprised the greater part of the work of putting on a display. It is not even clear how the natural science collections as a whole were stored in the early days. Some material was probably kept in under-display drawers from the start, with more added later. In 1903, for instance, drawers under new desk cases in the gallery on the second floor of the north-east pavilion were to be used to store reserve collections of fossils, though we do not know if those included Miller specimens (Traquair 1904, pp. 6-7). It is also unclear whether stored material in drawers was ever routinely viewable by the public, in the manner currently fashionable today, though this seems unlikely here from Traquair's mention of drawers with 'reserve collections' (1903a, p. 6), and his anecdote about a member of the public displeased with the notion of a drawered reserve collection (1893b, pp. 176-177).

The Miller collection was acquired at a time of chaos, when the Museum's existing natural science collections were still in the University building, often in store, pending removal to the new museum (Anon. 1858n). In 1859, it was pointedly noted in the House of Commons that the Miller material was not on display, but 'kept in boxes in a state of admired confusion', and in 1860, the Miller material was still undisplayed, for lack of space (Anon 1859c; Allman 1860, p. 207). However, in 1865 the Museum's collections were transferred to the new Museum building on the other side of West College Street. Partly because of the ambiguities of the annual reports and guides, it is not always clear whether the Miller collection was in

store or display. However, Director Allman (1866, pp. 264-265) soon reported that '[t]he collections of minerals and fossils have […] been partially displayed' and Miller's fossils 'have received special attention, and a large proportion of them is already open for inspection', whatever that meant. As noted earlier, Peach was contracted to curate the collection, and it was now possible to display 'the most interesting portions of the collections […] in such a way as to be available for inspection, not only by the Palaeontological student, but by the general public' (Allman 1867, pp. 261-262).

From Peach's catalogue of c. 1866, it is clear that some Miller specimens were in drawers, and that some at least of these drawers were in the museum cellars (Peach [1866-1867] Ms.). Others were in 'cases' designated by number, but there were so many specimens of certain taxa that they were surely in under-display drawers rather than on display. But an 'Octagon Case' housed a selection of specimens figured in Miller's books, evidently for display. One wonders if this was the fine glass-topped mahogany and glass table case of c. 1820 which had been the centrepiece of Jameson's Natural History Museum in the University (Swinney 2003, pp. 123-124). Indeed the museum guidebook of 1872 stated that 'the specimens collected by Hugh Miller, and figured by him in his various works' with 'labels bear[ing] references to the titles of his works, and the pages and figures' were on show, presumably in the octagonal case, in what became the 'Geology and Mineralogy' gallery on what must be the second floor room in the north-east corner pavilion (Anon. 1872, p. 44). This is the left corner block as one looks at the façade of the museum from Chambers Street, with the former Whale Hall behind it; the second floor is now, in 2017, the *Adventure Planet* gallery.

Evidently a display, however small, of Miller specimens, had been put together as early as possible, possibly even by Charles Peach himself. We do not know how long this display lasted, but it might have gone by the time a later Director arrived in 1911, as he was plainly wrong to assert that Miller's specimens had only been 'incorporated into the general collections according to their systematic positions' (Martin 1912, p. 12). In any case, it is possible that Miller fossils were also slotted into appropriate places in the taxonomic and stratigraphical arrangement of the Survey display, and other museum displays such as fossil fishes. They were presumably identifiable as Miller's, if at all, only by the data on their labels.

Ramsay Traquair was, as noted earlier, an outstandingly important palaeoichthyologist (though there is

Figure 18. 'The late Mr Hugh Miller, author of* The Old Red Sandstone*', with hammer and trademark maud (Lowland shepherd's wrap), sculpture by Amelia Paton Hill, late 1860s. Miller has found a specimen of the fossil fish* Pterichthyodes milleri*, doubtless on Cromarty beach, with the other half of the split nodule lying at his feet (NMS.A.1887.735). Copyright and courtesy of the Trustees of National Museums Scotland.

a hint of disagreement with management on priorities, from the fact that his retirement pension was cut on the grounds that he had spent so much time on research; Paton 2004). He undoubtedly held Miller in high regard (Peach *et al.* 2017). But there is no evidence that he initiated any display specifically about Miller, as opposed to using Miller's fossils in displays (especially if the display in the octagon case was still in use). Even the 1887 bequest, by the late Mrs Catherine Bradbury (c. 1835-1886), laird of Strathmartine, of a statue of Miller came to the arts and technology side of the museum (Figure 18; Murdoch Smith 1888, pp. 234, 236). It is not known where, or if, this charming statue by Amelia Paton Hill (1821-1904) was initially displayed - but this was not necessarily in the natural science areas (Godfrey Evans, pers. comm. 2017).

One reason for Traquair not creating a Millerian display was probably the purely practical need to focus on creating a systematic set of new displays which would, in any case, use some of Miller's best specimens. Traquair's time saw an expansion of the Museum's Natural History side, in terms of both collections (especially fossil fishes) and display space. The staff, absurdly small by modern standards, had to cope with consolidating the first phase of the new museum and then dealing with expansion as the museum building grew during the second phase, in the 1880s. Reading through the Annual Reports suggests that, to take full advantage of the new display spaces, there must have been a full programme of planning, acquisition to fill gaps, conservation and preparation of all kinds, and the writing of up-to-date and accurate labels. One key element of Traquair's display work was installed in the U-shaped second floor balcony gallery of what was often called the Whale Hall, to the south of the gallery holding the 1872 display. In 1885 and 1886, the eastern arm of the balcony was refurbished, and a start was made on creating a display of fossil fishes (Traquair 1886, p. 343, 1887, p. 282). In 1892 the fossil fish now expanded into the linking southern bar of the U to meet the Recent fishes on the western arm, in a display finished in 1901 (Ogilvie 1902, p. 2; Traquair 1893a, p. 281; 1902, p. 4). As one would expect, the fossil display drew substantially upon the Miller collection (Anon. 1908, 1912a). Otherwise only minor use seems to have been made of the collection for display. Goodchild (1902b) stated that the Miller collection at Edinburgh was 'safely stored', which could simply mean that it was safely housed in the museum, or that most at least was in off-display storage - though he did fail to mention any Miller display, so perhaps the octagonal case had been cleared by then. A few years later the Director lamented that there was not enough space for a 'suitable arrangement [presumably meaning display] of the fine collections of fossil plants from the Carboniferous and Old Red Sandstone […] includ[ing] many of the specimens figured by Hugh Miller' (Dobbie 1909, p. 8). So there is little sign that Traquair implemented a Miller display, and plenty of evidence to the contrary. This doubtless reflected his views on such displays, as set out in his 1893 Presidential address to the Royal Physical Society of Edinburgh, on the topic of what museums should be. He condemned those who

> […] seem to imagine that one function of a museum is to contain a set of little monuments to the industry or zeal of individual collectors, and refuse to give or bequeath collections except under the stipulation that, regardless of all other considerations, they be for ever kept together and exhibited as the 'Brown' or the 'Jones' collection […]. (Traquair 1893b, p. 177)

Words to gladden the sternest modern writer of an acquisitions policy!

8. Curation and display in Edinburgh, 1911-1939

8.1 A new Director arrives

A major rethink came in 1911, when a new Director decided to pull together the Miller collection, even though some of it was already on show, incorporated into the general systematic displays (Martin 1912, p. 12):

> Progress has been made in gathering together the specimens forming the valuable historic collections of the famous Scottish naturalist, Hugh Miller […] when assembled in adjoining cases they will constitute, it is believed, a particularly attractive exhibition. The ‘Hugh Miller Collection’ shown as a whole should be appreciated by all who are conversant with the writings of this great Scotsman and pioneer in the study of the fossil animals and plants of his native land.

During 1912-1913 an 'interesting and valuable exhibit', evidently in the fish gallery, was 'formed by bringing together the Vertebrates of the "Hugh Miller" collection; these have been re-labelled, and a set of photographs illustrating the scenes of Hugh Miller's life and labours has been placed side by side with them' (Martin 1913, p. 9). The member of staff who did this exhibition work was not named. We do not believe that Traquair came out of retirement to work on this gallery, as he would have been acknowledged; it seems so contrary to his views; and he was suffering from Parkinsonism, dying in 1912 (Paton 2004) - so at least was not around for long to see, and maybe complain about, what was being done to his flagship fish gallery. (One obituarist claimed that, at his death, Traquair was struggling to complete the 'arrangement of the Hugh Miller collection', but no other source backs this up and it could be a muddled reference to his work on fishes or the type and figured specimen catalogue; Anon. 1912c; Paton 2004.)

The new display stemmed from the initiative of Sir Thomas Carlaw Martin (c. 1850-1920), who had been the editor of the Radical-Liberal *Dundee Advertiser*, and was appointed Director of the Museum in 1910, starting in 1911 (Figure 19; Anon. 1910, 1920). Journalism can be useful experience for museum work, but Martin's new job was almost certainly a reward for his newspaper's political support for Winston Churchill, then a Liberal, in the 1908 by-election at Dundee, and the Liberal Government dur-

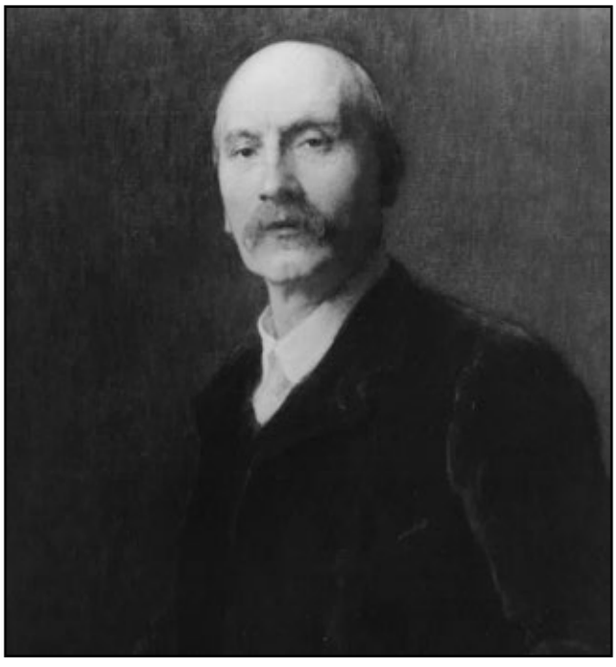


Figure 19. Sir Thomas Carlaw Martin (d. 1920), Director of the Royal Scottish Museum 1911-1916, by William Quiller Orchardson (1832-1910), detail. Monochrome copy photograph in NMS Library archives, Crown copyright.

ing the 1909 crisis over the establishment of the embryo welfare state. The Museums Association evidently thought so, without quite saying it out loud, in a hostile *Museums Journal* editorial which protested about the 'ex-editor of a provincial newspaper' depriving the poor museum professionals of a choice management post (Anon. 1911a). Perhaps this prompted the obvious planting of a Parliamentary question about Sir Thomas's qualifications by Mr Agar-Robartes, a Liberal Member for St Austell in Cornwall with no obvious interest in Edinburgh museum management (Anon. 1911b). The Lord Advocate blandly replied for the Government that he didn't need any qualifications because it was merely an administrative post!

One wonders how Martin's Keepers felt about his appointment. But his first Annual Report plainly surprised and impressed the *Museums Journal*, which 'hope[d]' that his report 'will be widely considered' (Anon. 1912f, p. 119), and in at least one later retrospect Martin was seen as having greatly improved the Museum's educational and recreational value during his tenure (Anon. 1928a). Martin's first report indeed broke somewhat with its predecessors by setting out what we should call today a strategic plan for the museum with a listing of priorities, which stemmed from - or at least was credited to - discussions with his staff. One key priority was to promote the value of the museum to the non-specialist visitor, as opposed to the specialist student who was quite well catered for. As well as an improved service to specialists, priorities for the Natural History Department included several ways of 'arresting and charming the attention of the unserious spectator and thereby of enlarging his stock of ideas', including habitat groups, thematic displays of function, geographically based displays, temporary exhibitions, and 'Collections associated with a personality' (Martin 1912, p. 11). For the first temporary 'personality' exhibition, he picked David Livingstone (1813-1873), explorer and missionary in Africa, and like Miller a self-made Lowlander Scot and moral titan, to meet Livingstone's centenary (Martin 1913, pp. 6-7). For the first permanent 'personality' exhibition, Martin chose Miller. Doubtless it helped that the 1902 centenary, with its commemoration and retrospective articles and books, had heightened Miller's profile (Anon. 1902a). But it can hardly be coincidence that Martin, former editor of a Liberal newspaper, was keen to honour a fellow editor. To be precise, Miller's *Witness* allied itself to the Free Church rather than to a political party - but, in Victorian Scotland, the Free Kirk was in large part the Liberal Party at prayer.

Another factor must have been the major programme to extend the Museum rearwards and southwards to Lothian Road, including an extension directly behind the Whale Hall, begun in the reporting year 1913-1914, and roofed over in early 1915, with interior work about to commence (Dobbie 1909; Vallance 1910, p. 3, 1911, pp. 2-3; Martin 1912, p. 2, 1913, p. 2, 1914, p. 2, 1915, pp. 2-4). This required the piercing of a new communicating doorway through the south wall of the fish gallery, and other works, with the removal of display cases and partial gallery clearances and closures. Three wall cases seem to have been permanently lost (Anon. 1912a, 1912b, 1916, 1924; Figure 22). Plainly something had to go from either the fishes or the Miller display, if not both, and it would seem that the opportunity was taken for a wider revamp of this area.

8.2 Ben Peach takes over

As any manager knows, however, there is a world of difference between a bright idea and its implementation, especially if it needs expert staff. Someone with a wide knowledge of Scottish palaeontology was really needed to tackle Miller's diverse collection, but there were no obvious palaeontologists in Natural History, whose keeper, Eagle Clarke, was an ornithologist. The geologist in post was Shand's replacement William McLintock (1887-1960). He had been transferred from the Museum of Practical Geology in London in 1911 and would return there in 1921, eventually becoming the Survey's Director who oversaw the Museum of Practical Geology's

Figure 20. Group photograph of Geological Survey staff, including two people much involved with the Hugh Miller collection, third and second from left in front row, Hugh Miller the younger (1850-1896) and Ben Peach (1842-1926). Hill joined the Survey in 1884 and Linn left it in 1888, dating the photograph to 1884-1888, the period when Hugh Miller was setting up the museum in his father's birthplace in Cromarty and arranging to open it to the public. British Geological Survey copyright photograph P008715. Reproduced by permission of the British Geological Survey. CP17/044.

move to Exhibition Road. But he was a mineralogist and, strictly speaking, in the wrong department, though this might not have mattered. In any case he was kept busy for much of the Great War, making precision gauges in the Museum workshop for munitions factories until Armistice Day (Curle 1919, p. 22; Phemister and Sabine 2004). More generally, the wider effects of the war meant that many Museum staff were away on armed service (Curle 1917, 1918, 1919). So the availability of the elderly Ben Peach, Charles's son, and now retired from the Survey, must have been heaven-sent. (Perhaps Martin and Peach had met at the Royal Society of Edinburgh, of which both were Fellows.) Peach could take into account the considerable amount of new scientific research recently done on the Miller collection, particularly by Traquair and Seward.

The Director's report for 1914-1915 accordingly noted that 'The gathering together and arrangement of the valuable and historic fossils collected by Hugh Miller has been proceeded with; and the Museum has for this work been fortunate in securing the services of Dr. B.N. Peach, F.R.S. […]. The collection is in the main displayed systematically; but a special feature of the arrangement adopted is the placing of the specimens actually figured in Hugh Miller's well-known books side by side with copies of the illustrations which were drawn from them' (Martin 1915, p. 12). The gallery guide published in 1916 omits any news on this development. Thereafter, under wartime austerity, the Annual Reports were brief, but that for 1916-1917 noted that the Miller display was 'completed' (Curle 1917, p. 21). So it is puzzling to be told again that Ben Peach had finished the Miller display in the reporting year 1919-1920 (Curle 1920, p. 6). A possible explanation is that Peach had first dealt with the wall cases, revising earlier work and sorting out the effects of the building works, and that he then started a new phase of work in the form of the desk cases, which could not be fully completed till after the war in 1919 when staff were available again to refurbish cases, print labels, and do other necessary work. Another reason was the presumed clearance of the gallery in response to German air raids on Britain from 1915. One hopes that the type and figured Miller specimens, at least, were amongst the key objects moved to the museum cellars for safety (Curle 1918, 1919). This was not as trivial as it might seem, for two Imperial German Navy airships attacked Edinburgh and Leith on the night of 2/3 April 1916, (Mullay 2016; police reports, NRS HH31/21/8, https://www.nrscotland.gov.uk/research/learning/first-world-war/zeppelin-air-raid-on-edinburgh-1916 accessed 30 May 2017). The line of one bombing run passed very nearly over the Museum, hits being made close by in Marshall Street to the south and the Grassmarket to the west. Elsewhere a warehouse full of whisky was burnt out, so the Director must have been especially relieved that the two spirit stores neighbouring the Museum had been bought up before the war to make space for the extension (Dobbie 1909, pp. 3-4).

Successive editions of the museum guides from 1916 failed to update their, in any case inconsistent, text on the Miller display till the problem was solved by

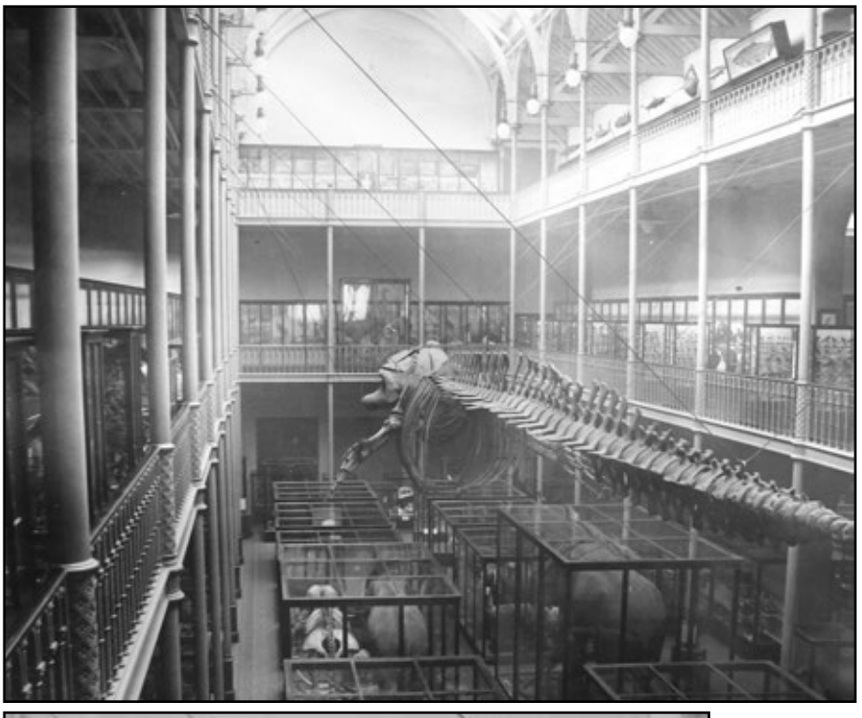


Figure 21. The Whale Hall in the east wing of the (then) Royal Scottish Museum, looking south, undated but tightly datable to 1922-1925. The life reconstruction of a Moa, visible in the middle of the distant first floor balcony, was acquired in 1922 from the taxidermists Rowland Ward, and there is no sign of the Sperm Whale skull suspended beyond the baleen whale not long before May 1925 ([Ritchie] 1925; Andrew Kitchener, pers. comm. 2017). The Hugh Miller display, revised and completed by Ben Peach, is partly visible on the distant second floor (south) balcony, with the modern fish display in (and atop) the wall cases on the right (west) balcony. It can just be seen that the left (east) balcony tapers quite sharply to the south (most clearly in the ceiling, i.e. underside of the second floor). Copyright and courtesy of the Trustees of National Museums Scotland.

Figure 22. Enlarged detail of Figure 21, showing much of that part of the Hugh Miller display that was in wall cases, with the Amelia Paton Hill statue visible in the central case, and in each case a mounted photograph at the top and shelves of specimens beneath. The desk cases are not visible behind the balcony railing and screening. The type of wall case used can be seen also on the first floor balcony in Figure 21, though partly obscured there by freestanding display cases. Note the new doorway on the second floor to the new extension beyond, evidently still blanked off. The extension as a whole was still closed at the time. It was only partly opened to the public in 1927 (Curle 1926, pp. 2, 4; 1928, pp. 2-3). Copyright and courtesy of the Trustees of National Museums Scotland.

deleting most of it (Anon. 1912a, 1916, 1924, 1929a, 1935a). However, this does not matter much as Peach completed the job by writing a detailed *Guide to the Hugh Miller Collection* - effectively a guide to the display (Curle 1920, p. 6). This was not issued, apparently because of post-war financial problems, but has now been published, herein (Peach *et al.* 2017). It gives a fine idea of the display's content when combined with the gallery guides and the one known photograph showing the display with the Miller statue, and allows a reconstructed map of the gallery to be drawn (Figures 21, 22, 23; Table 2).

The exhibition took up the south end of what was often called 'the top balcony of the whale hall' till the whale was removed in 2009, and is now occupied by the *Survival* gallery. The casing comprised upright vertical cases against the outside wall, and desk cases along the inner rail of the balcony. Those were apparently demolished around 1945-1950, though a similar or identical pattern survived until 2009 on the balcony one floor below (Figure 21; Swinney 2003). They were not the wall-and-desk cases familiar to recent visitors to the second floor gallery, till clearance in 2009, which were never used for the Miller exhibition. These seem to have been installed about 1900, on the west wall (Swinney 2003, p. 136), or moved in from elsewhere in the museum in the late 1940s and 1950s, as part of a general refit of gallery space reallocated to geology (Allan [1948], p. 2, [1949], p. 8, [1950], pp. 2, 9, [1951], pp. 2, 9). No wonder each successive generation of curators discovered, often at an inconvenient moment while moving heavy drawers of specimens, that apparently interchangeable drawers were nothing of the sort.

The width of the original wall cases presumably varied, but an average width of a round 30 inches (2.5 feet or 0.76m) fits the gallery dimensions quite well. The front to back depth was perhaps around 24 or 30 inches on the southern arm, as the statue could fit inside one, but almost negligible for the two cases on

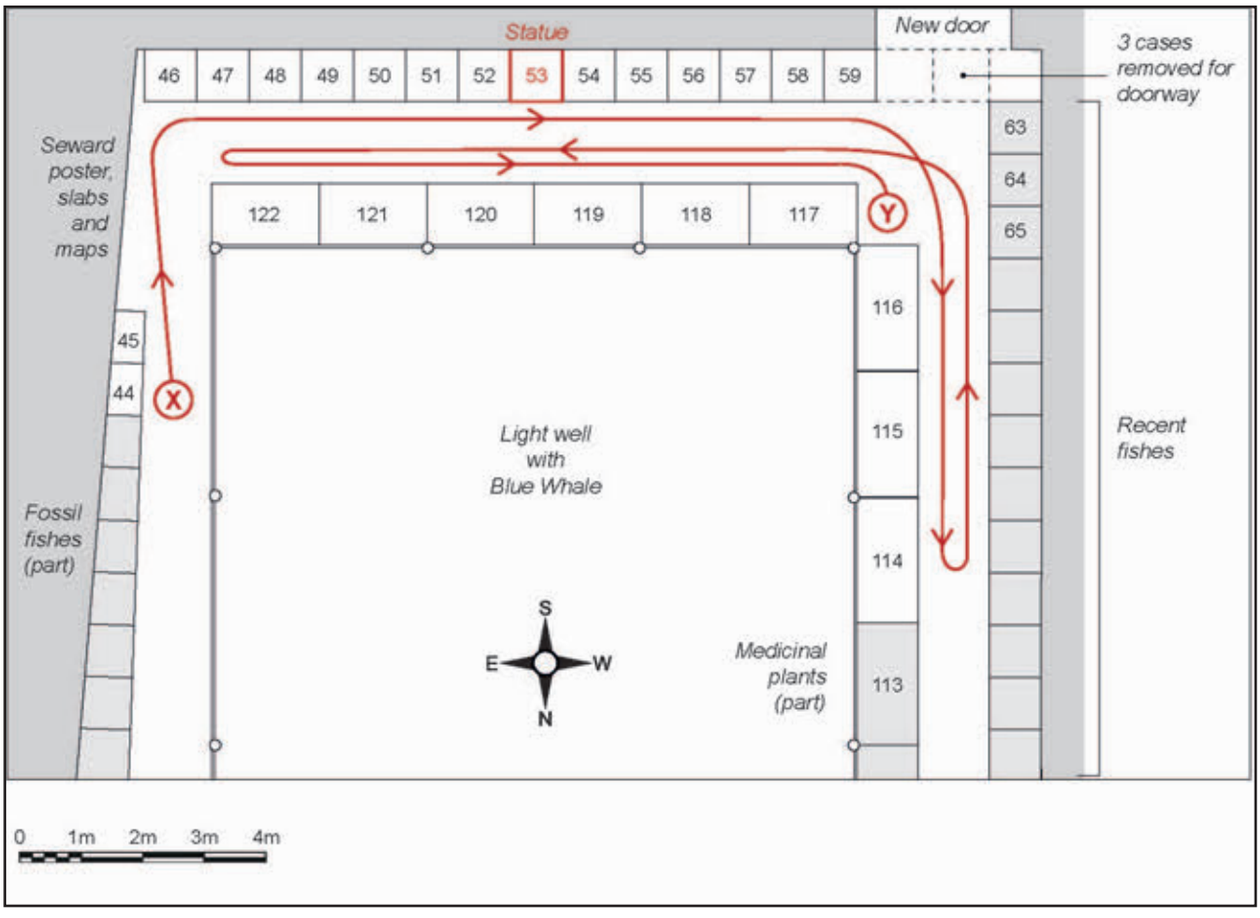


Figure 23. Diagrammatic plan of south end of second floor balcony, Whale Hall, Royal Scottish Museum, showing the inferred layout of the Hugh Miller exhibition c. 1920-1939, based on Peach* et al. *(2017) and Figure 22. (Display cases not used for the Miller displays are shaded.) The exact dimensions and locations of display cases are conjectural. The Miller displays were in wall cases 44-59 and desk cases 114-122, although what purports to be Peach's recommended visitor flow (red, beginning at X and ending at Y) did not completely follow the numerical sequence. Note the way in which the east wall tapers inward and the replacement of wall cases in this area with flat items such as posters, maps and slab fossils fixed directly to the wall. Plan by Jan Dawson.

the eastern arm, where the outside wall of the museum converges inwards, severely reducing the width of the balcony in the south-eastern corner (Figure 21; Swinney 2003, pp. 128-129). Like these which survived till recently on the balcony below (Andrew Kitchener, pers. comm. 2010), the display cases along this arm decreased in depth southwards till they could barely house even flat objects such as slab-mounted fossil fishes, at which point they simply disappeared and left an open balcony. The remaining casing comprised desk cases, perhaps with storage drawers underneath, around the inner rim of the balcony.

Room for the Miller displays was evidently made by clearing Traquair's pre-existing display of fossil fishes from the southern arm and two cases of the eastern arm, and compressing it into the rest of the eastern arm (partly compensated for by transferring some Miller fishes to the Miller exhibition). The bizarre case numbering in Peach's *Guide* was partly the result of crowbarring the Miller display into the middle of a pre-existing gallery. The visitor obediently following Peach's *Guide* started on the east balcony with Precambrian and Lower Palaeozoic material in wall-cases 44 and 45, proceeded clockwise past the narrowest part of the balcony with slabs of specimens, Seward's botanical plates, and geological maps fixed directly to the bare wall, and turned right to inspect the south wall-cases in ascending numerical sequence from 46 to 59. The conscientious visitor now resisted the temptation of the mounted sharks and lampreys in wall-case 63, turned right through 270 degrees, and shuffled sideways a little to inspect Miller's Tertiary fossils in desk-case 116, against the balcony railing of the west arm of the gallery. But from now on, as the marked route in the plan shows, either Peach had become badly muddled when planning the layout or writing the *Guide*, or the visitor's route bore little relation to numerical or physical sequence. No doubt some visitors ended up off track, or in the wrong direction. But probably this mattered less than it would today, the desk cases being more self-contained than in a modern exhibition.

Table 2. Contents of Ben Peach exhibition c. 1920-1939, case by case, as seen by the visitor. The widths of the table columns are not intended to represent the relative widths of the actual cases.

Wall cases along east wall of gallery, as seen and in recommended order of examination from left to right

44	45	Bare wall
Pre-Cambrian	'Upper Silurian'	Seward plants plates and listing
Cambrian		?geol. maps
Lower Silurian [i.e., Ordovician]		some slab fossils nailed directly to wall, including *Psilophyton* and *Homostius*

Wall cases along south wall of gallery, as seen and in recommended order of examination from left to right

46	47	48	49	50	51	52	53	54	55	56	57	58	59
Silurian [incl. Ord.?] cont.	Middle Old Red Sst	Middle O.R.S. fishes	Middle O.R.S. fishes	Middle O.R.S. fishes	Upper O.R.S. plants, fishes	Lower Carb. plants, inverts, fishes	Statue of Miller by Amelia Paton Hill	L. Carb. inverts, fishes	L. Carb. fishes, amphibian	U. Carb. plants, inverts, fishes	Jurassic plants, some inverts	Jurassic cephalopods, fishes, reptiles	Cretaceous, incl. derived in the Drift, Scotland
Devonian (marine)	large fishes				Carb. plants overflow		fish 'restorations' (i.e. life reconstruction models)						
Lower Old Red Sandstone													

Desk cases along rail of central well, west arm of gallery, as seen (but reversing recommended order of examination from right to left)

114	115	116
25' Raised Beach of Firths of Forth and Cromarty	100' Raised Beach	Oligocene, Miocene, Pliocene
Portobello nuts	Firth of Clyde glacial shell beds	glacial and drift deposits
Meadows postglacial lake, Edinburgh	Portobello *Scrobicularia*	
Cruise of the Betsey relics, esp. Uamh Fhraing [Massacre Cave], Isle of Eigg		
Recent fishes		

Desk cases along rail of central well, south arm of gallery, as seen (but reversing recommended order of examination from right to left)

117	118	119	120	121	122
Special topics incl. concretions, belemnites, fish and reptile vertebrae, bog iron, Jurassic wood, fossil borings, 'violent death' and *Cruise of the Betsey*	Left side: special topics incl. fish coprolites, fish crania, C. W. Peach fossils from Cornwall, insect, rolled trilobites, *Archaeocidaris*, pteraspid plates etc. Right side: modern research on Miller's plants, esp. *Williamsonia* and *Conites*	Specimens used in *Testimony of the Rocks*, especially Jurassic plants	Specimens used in *Footprints of the Creator*, esp. 'Asterolepis'	This section is missing from the Peach TS, but from other mentions it included at least some plaster casts of Miller fishes and intestinal contents in *Coccosteus*; more generally, specimens used in *The Old Red Sandstone*, and figured *Pterichthys milleri* and *Pt. oblongus*	Type specimens of fishes (including taxa erected after Miller's death)

Figure 24. Quaternary marine molluscs in the Hugh Miller collection, some still in glass-topped boxes and with printed labels, believed to be those used in the Hugh Miller displays of 1912-1950. The display would have comprised many specimens in such boxes and on tablets, all arranged closely together, with some general texts and diagrams. Close packing enabled the exhibition to display around a thousand specimens or groups of specimens (Peach* et al. *2017). Copyright and courtesy of the Trustees of National Museums Scotland.

The wall-cases were high and continuous (Figure 21; compare the first floor balcony in the same image). The same image and Peach's *Guide* together indicate fixed shelving about middle height, with space for photographs and large specimens above, and large specimens below. The design of the wall-cases posed real constraints on displaying the larger specimens. Some objects just had to be put out of sequence, wherever there was room, and one rather drastic solution was to nail some of the larger and thinner slab specimens directly to the wall in the south-east corner. Peach's *Guide*, and the surviving labels of many specimens, make it clear that the smaller specimens were fixed to the usual paper-covered wooden tablets or kept in glass-topped boxes which were fixed to tablets (Figure 24). All specimens seem to have been given new printed labels in a uniform and distinctive serif style, often fixed to their tablets (Figure 25). Other tablets carried drawings, often cut direct from Miller's books. Some specimens are still stored with what must be those labels and drawings. In principle, this is not greatly different from the labelling generally used in 1858 when the fossil labelling sometimes included also a short descriptive note and sometimes, for small items, an enlarged drawing (Anon. 1858n, p. 13).

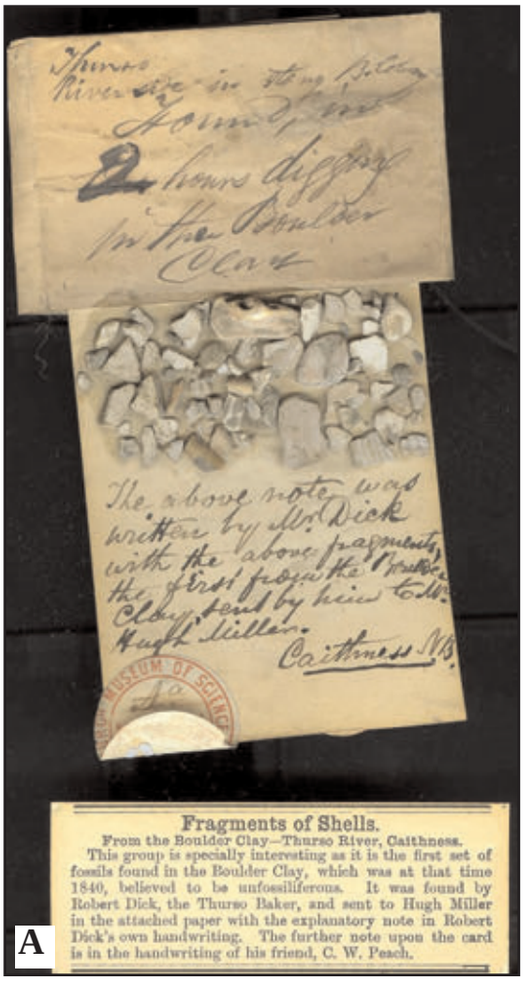


Figure 25. All specimens in the exhibition seem to have been given new printed labels in a uniform and distinctive serif style, pasted or pinned to wooden tablets (these have been removed from their tablets). (A), Material from the first known find of shells from the boulder clay of Caithness, with labels by Robert Dick (top) and Charles Peach (middle). Peach used this in the exhibition to highlight Miller's connections with these fellow collectors. (B), nodules formed around fish fragments in the Old Red Sandstone. Copyright and courtesy of the Trustees of National Museums Scotland.

There was evidently no attempt to display the entire Hugh Miller collection, though the display had a fairly generous proportion of the collection on show by modern standards. The *Guide* lists just over a thousand discrete specimens or groups of specimens, whereas it is believed (pending complete curation to specimen level) that there are at least five times as many in the collection as a whole. Moreover, the *Guide* explicitly noted that significant numbers of some specimens such as belemnites were stored elsewhere, contrary to various mentions in the Annual Reports and general guides which appear to imply that the entire collection is on show. Evidently one should not rely uncritically on the precise wording of such publications, however politically judicious it might have seemed at the time.

8.3 Strategy and content

The Director set the rationale of the exhibition to display a collection which was not only scientific, but also historical, as Martin's original report made clear when it spoke of 'valuable historic collections' (Martin 1912, p. 12). Peach created an exhibition which in part looked back to Miller as a great hero, centred on the statue, and focussed on Miller's fossils and books. This was perhaps an exhortation to the public to achieve what this untrained collector managed to do under his own steam. Visitor, go thou and do likewise! But the exhibition also sought to display something of the history of research, for instance in the section on the North-West Highlands, dealing with Miller's and Charles Peach's early work there. Ben Peach also emphasised the latest research, using Miller's specimens to illustrate then current geology and palaeontology, and stressing their actual use in that research. Peach made much of Traquair's recent work on fossil fish. His display also strongly emphasised Miller's Jurassic plants in the recent work by Seward and others. A framed and glazed poster board, titled *Use made by specialists of the Jurassic plants collected by Hugh Miller*, turned up during the clearance of the old Royal Museum c. 2009. It is evidently from this exhibition, for it includes actual pages from Seward's paper of 1911 on the Jurassic flora of Sutherland, illustrating and listing some of the specimens on display (Figure 26).

The decision to go for a stratigraphical layout for part of the exhibition, which Peach termed the 'General Collection', evidently allowed the display of a good range of Miller's fossils in a coherent manner. The thematic layout for the remainder, the 'Special Collections' in the desk cases, allowed the exploration of topics such as the formation of nodules around fossil fishes. This thematic area was also 'historical' in that Peach structured some of this section

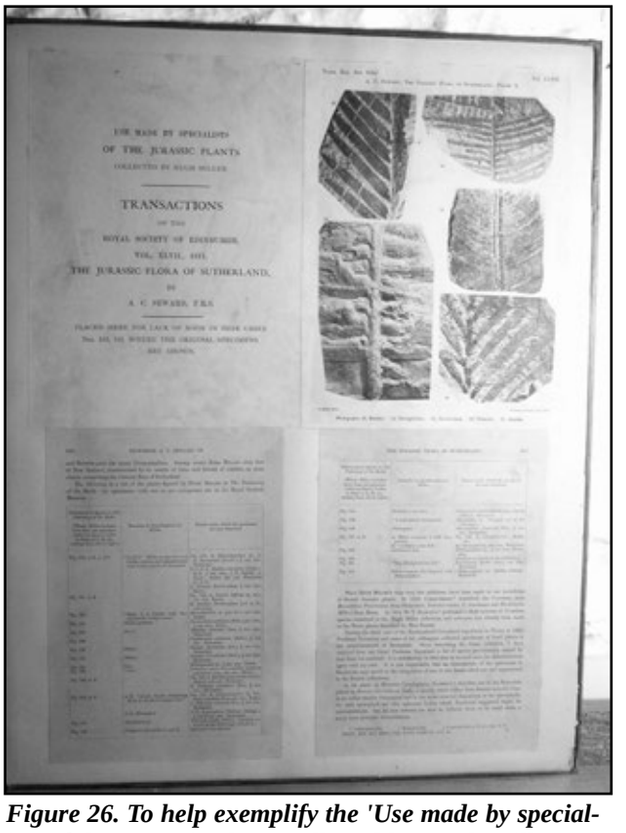

USE MADE BY SPECIALISTS
OF THE JURASSIC PLANTS
TRANSACTIONS
THE JURASSIC FLORA OF SUTHERLAND.
A. C. SEWARD, F.R.S.

Figure 26. To help exemplify the 'Use made by specialists of the Jurassic plants collected by Hugh Miller', a mounted compilation of three pages from a paper by A.C. Seward (1911) was framed and put up in the otherwise unusably narrow part of the east balcony. It was recently found, with the paper somewhat browned with age, on the clearance of the geology stores in the Royal Museum. Copyright and courtesy of the Trustees of National Museums Scotland.

around three of Miller's key books (and, in part, a fourth), and included many extracts, mainly pictures, from them. This arrangement could even be called 'bibliographical', which makes one wonder if Peach's term 'special collections' had anything to do with librarians' use of the same words (we are grateful to Geoff Swinney, pers. comm. 2017, for raising the issue of the various possible arrangements discussed here). Evidently it was expected that a significant proportion of the audience, and not just geologists, had read his books and wanted to see specimens discussed in them. There was a small archival element if only in the form of the old Millerian labels and coloured dots, but this was random, and little more was done in this line; there were generally no manuscripts, with only the odd exception (Figure 25A).

Indeed, apart from the statue and a portrait calotype photograph, and various remarks on Miller's importance as a collector, there was very little content relating specifically to Miller's personality, let alone anything that could be considered hagiographical, unless, of course, that was understood from the very existence of the gallery. It so happens that Martin's departure in 1916 coincided roughly with the appar-

ent change of tack in that year, when a finished display was suddenly deemed unfinished. This raises the question of whether Martin had intended a more personality-led and overtly historical gallery, with a wider range of content, and whether, on his departure in 1916, the new director had instructed that the gallery be reworked in a more strictly geological manner. There is, however, no evidence for such a dialling down of the historical side, and Martin's own statements focus on the geological collection, while, as noted earlier, there are other explanations for the 1916 hiccup. Our own immediate reaction is strictly practical, as befits curators of the 2002 exhibition: where would the museum have obtained the necessary personalia and papers? They were largely in private hands in 1916, and unlikely to be available for a permanent exhibition.

Practicalities aside, how far was Peach actually being 'historical'? There was no apparent effort to cover Miller's life beyond his fossils, apart from odd items from the Eigg massacre cave, and a row of enlarged postcard-type photographs along the top of the display cases on the south balcony, presumably inherited by Peach from the 1911-1912 display. Those really were postcard photos. What must be the complete set of 13 mounted prints has been located in the Palaeontology Section files, Dept. of Natural Sciences, NMS (A. Ross, pers. comm. 2017). Unfortunately the photograph of the Whale Hall is not clear enough for more than a few vague matches, but the 13 extant pictures would fit into the south arm of the gallery, with a portrait calotype (also located with them today) behind the statue. They were evidently drawn largely or wholly from the photo library of J. Valentine and Co., Dundee, who published very many postcards, souvenir books of photographs, and the like. Valentines indeed supplied some of the same images for a souvenir book published by John Bain, a Cromarty merchant, in 1900 (Alston 2006, p. 286; cf. Cromarty Image Library, www.thecromartyarchive.org, and Am Baile, www.ambaile.org.uk). This was no doubt a practical and economical solution, though the photos were apt to be touristy rather than specifically geological in focus. The subjects included Miller's birthplace cottage and Miller House, the monument, a very new-looking Hugh Miller Institute taken evidently around 1904-1905, and other Cromarty scenes, and various views of local scenery including the Cromarty bay where Miller found his fishes, and Eathie Burn. However, in general, the exhibition seemingly lacked any reference to *The Witness*, the Free Kirk, and all but the barest tinge of Miller's self-help story except insofar as a picture of the cottage or monument might trigger the appropriate associations in a visitor's memory.

Two books featured were *Testimony of the Rocks* and *Foot-prints of the Creator* (Miller 1857, 1896). Yet, if Peach's *Guide* is any indication, one would never guess from the exhibition that the specimens on display were deployed in those two books as ammunition *against* evolutionary thought (more correctly, pre-Darwinian transmutationism). This focus on Miller's fossils and scientific work was apparently conscious, and not by default, for the section by Traquair in the *Guide* was almost certainly edited to suit (Peach *et al.* 2017). Indeed, an incautious reader of Traquair's first paragraph might conclude that Miller positively agreed with Darwin's *Origin of Species* - which, of course, he did not live to read, let alone judge. On the face of matters, Peach was guilty of deliberate suppression. However, we favour a subtler interpretation. This was an exhibition about science, in a Department of Natural History. From our own experience (and particularly LIA's in the 2002-2009 'permanent' exhibition discussed below), Peach's approach seems logical given the limited space and the exhibit-heavy, interpretation-light style of the day. It might, in any case, have been beyond his formal remit to do otherwise. More specifically, Peach focussed on Miller's contribution to geology and palaeontology, and therefore to modern science as Peach understood it. He would not waste space and confuse the visitor by putting forth obsolete and wrong ideas. Miller's anti-evolutionary arguments were, in part, scientific ones which were out of date, as Peach and Traquair were careful to explain, and that was all the justification one needed to drop them forthwith. No doubt Peach was happy to avoid having to mention Miller's well-known opposition to transmutationism in almost the same breath as portraying him as a hero of Scottish geology. And failing to represent Miller as a hero of the Free Church avoided problems with those visitors who did not like Presbyterianism, whether in general or of the Free Kirk variety. But the point is that Peach's approach meant that he never even had to get as far as worrying about such things. This was, of course, anachronistic in the sense that it viewed Miller's time from the hindsight of Peach's own. But such an approach was then usual, and very similar issues are raised by Geikie's own writings on Miller, and on the history of geology more widely (Geikie 1902, esp. pp. 58, 60; Oldroyd 1980).

Peach's display marked a much more substantial approach to Miller than the single octagon case. Miller was no longer a recently (and prematurely) deceased writer, but had become 'historic' (if with the caveats expressed above) in a display overtly devoted to natural science: in Peach's words, 'this great man whom we reverence' (Peach *et al.* 2017, p. 381). All the same, the Miller display must have seemed

aberrant. There was already a fine display of Scottish minerals, rocks and fossils in the west wing of the Museum, partly thanks to the Geological Survey, and there were also fossils in the Natural History galleries, as in Traquair's fine display of fossil and living fishes (although this had been partly gutted for the Miller display). The overlap was somewhat reduced by Goodchild's emphasis on the stratigraphical rather than biological aspects of fossils in the west wing gallery (Goodchild 1902a, p. 220). Even so, it was one thing to incorporate Miller's specimens in a display of fossil fishes, but quite another to use them to set up what was effectively a second display of Scottish geology and palaeontology. To be sure, the Millerian display was not enormous, but it did occupy scarce display space, and this was justified only by the connections with Hugh Miller's life and works. It is a revealing pointer to the importance placed on them by the then management. One wonders what the staff thought, especially as an outsider had been brought in to implement the gallery; though probably the then Natural History staff were not nearly as bothered as Traquair would have been. The Hugh Miller exhibition was not a full exhibition on the man, his life and work. It focussed on his fossils and their ongoing relevance. But it paid tribute to Miller and his historical importance in a way which was, as far as we know, unique within the natural science displays in the Royal Scottish Museum, and rare, founder's galleries and the like apart, in British museums generally.

9. Curation and display in Edinburgh, 1950-2001

In September 1939, war came, and the Museum was (mostly) closed to the public till December 1943. One hopes that Miller specimens were amongst 'the more valuable specimens' and 'type and irreplaceable specimens' evacuated to storage in castles and country houses outside Edinburgh. The remaining material on display was seemingly packed into the cellars, and the galleries used for more urgent purposes such as storing medical equipment and issuing ration books (Rowatt [1940], pp. 4-10; Allan [1946], pp. 3-4). To begin with, many displays were simply replaced as they were before, as an interim measure (Allan [1946], p. 4). Peter Friend (pers. comm. 2017) recalls the Miller displays as also having been reinstated, at least partly, in the immediate postwar years. However, during the museum's slow recovery from this second war, the opportunity was taken to implement a major reorganization of the galleries in a coherent layout. It was decided to centralise the geological displays in the east end of the top floor, 'gather[ing] together the extensive fossil material distributed throughout the various galleries' (Allan [1948], pp. 8-9). But the concomitant moves and reinstallations of display cases (see above) would make it impossible to replace old displays exactly as they had been, even in the same galleries. The Whale Hall balcony was seemingly cleared in 1956-1957 (Allan [1956], p. 9, [1957], p. 10), so Peach's display must have gone by then. During the postwar decades, there seems to have been little in the way of Millerian exhibitions, though the statue of Miller was now adopted by the Department of Geology and apparently remained on open display in the geological galleries in the east wing up to 1998 (MAT, pers. obs.). A temporary sesquicentenary exhibition, 'Hugh Miller', in October and November 1952 attracted 12,069 visitors over 20 days (Allan [1953], pp. 2, 3). No script survives, but the exhibition used a 'small selection of choice specimens from the Hugh Miller Collection', books, letters, maps, and 'photographs of Cromarty and district' - we suspect the same photos previously used in the pre-1939 display. The NMS also lent specimens and the statue to the National Library of Scotland for their *Hugh Miller* exhibition in 1974, for which the script and labels were, happily, recorded (Anon. 1974). It combined manuscripts, books, photographs old and new, and fossils. Each fossil was shown with an appropriate quotation from Miller's writings. Interestingly, the display cases were draped in a modern reproduction of the greyish woollen check used in Miller's maud or wrap. The exhibition was presumably timed to coincide with the opera *Hugh Miller* by Reginald Barrett-Ayres and Colin MacLean, put on at that year's Edinburgh Festival (copy in NMS Library). Miller also featured in *The Enterprising Scot* exhibition of 1986, to mark the formation of the National Museums of Scotland (Waterston 1986), and the *Wealth of a Nation* exhibition of 1989 to highlight the National Museums' treasures (Calder 1989). Otherwise, so far as we are aware, the only specifically Millerian display in the Museum complex was a small exhibit of the statue and some other items in the (then) Museum of Scotland in 1998, removed a few years later as part of the routine changing of that display case.

The main use of the Miller collection in post-war displays was, rather, to be drawn upon for systematic or thematic displays, as well as for research of course (Figures 27, 28). Originally, any display of Scottish fossil fishes would come close to being in part a display of Hugh Miller fossils, for few others had previously collected with such thoroughness across so many different Scottish localities. But the situation had changed by the 1990s, when one of us was assigned to work on the *Beginnings* gallery of the Museum of Scotland, which opened in 1998 (now part of the National Museum of Scotland; Taylor and Kitchener 2007; pers. obs.) The big surprise was that

Figure 27. The giant trilobite* Illaenus *from the Silurian of Ayrshire: a Miller specimen doing duty as part of the general systematic display of invertebrate palaeontology set up in the Royal Scottish Museum in the post-war years (NMS.G.1967.58.46). Copyright and courtesy of the Trustees of National Museums Scotland.

Figure 28. Part of a 1950s or 1960s display of glacial molluscs from the Drift of Gamrie, Banffshire, which drew on the Miller collection, held by Yves Candela. Copyright and courtesy of the Trustees of National Museums Scotland.

we did not use any of Hugh Miller's Old Red Sandstone fishes. This was because of major space constraints in the evolving building design. On the one hand, ambitious early proposals of historical accounts of Scottish palaeontology, Miller, and so on, had to be dropped. On the other, the main exhibition brief was tweaked to focus on the Scottish environment through time, without regard to who collected the specimens displayed. We chose the best and clearest specimens from the NMS collection, which is of course a pool of specimens from Miller's time and since. Many specimens come from newer sites such as Achanarras where the fossils are apt to be better preserved than Miller's localities, and some more recent finds are simply better because they are inherently rare. (Another factor is that type and figured specimens are apt to be kept in store for researchers to examine, if they can be replaced by an equally clear display specimen.) However, Miller's collection was very useful in providing fine specimens of Jurassic and Quaternary age, and we commissioned a new life reconstruction model of the Inner Hebrides plesiosaur which Miller discovered. Their display is strictly subordinated to the thematic aims of the gallery, but the specimens are still visibly labelled as being from his collection.

10. Curation and display in Edinburgh, 2002-2010

Hugh Miller's bicentenary in 2002 was, happily, marked by a temporary exhibition in the Royal Museum, in the smaller of the (then) two central temporary exhibition galleries, from 9 March to 3 June 2002 (Figure 29). This was a cooperative project with the National Galleries of Scotland and National Library of Scotland. It also included exhibits from the National Trust for Scotland, Inverness Museum and Art Gallery, the Free Church of Scotland College, Falkirk Museum, Isle of Eigg Historical Society and private collections and the family. The core team comprised lead designers Jacqui Duffus and Kimberley Baxter, educator Christine Thompson, and the authors as curators, with the support of many colleagues in the three key institutions.

The resulting exhibition, *Testimony of the Rocks*: *Hugh Miller. Stonemason, Writer, Geologist 1802-1856* (Figure 30), was multidisciplinary in content, and broadly modern, though conventional, in style, based on text and graphics in a way to suit its fairly special interest nature. We found that Hugh Miller was difficult to cover in a single storyline because of the range of topics and subjects, which included, for instance, personal biography, social history, church and political history, and palaeontology. So a broadly tripartite spatial and conceptual structure was adopted, the timeline running to some extent in parallel in each of the three main elements, matching the

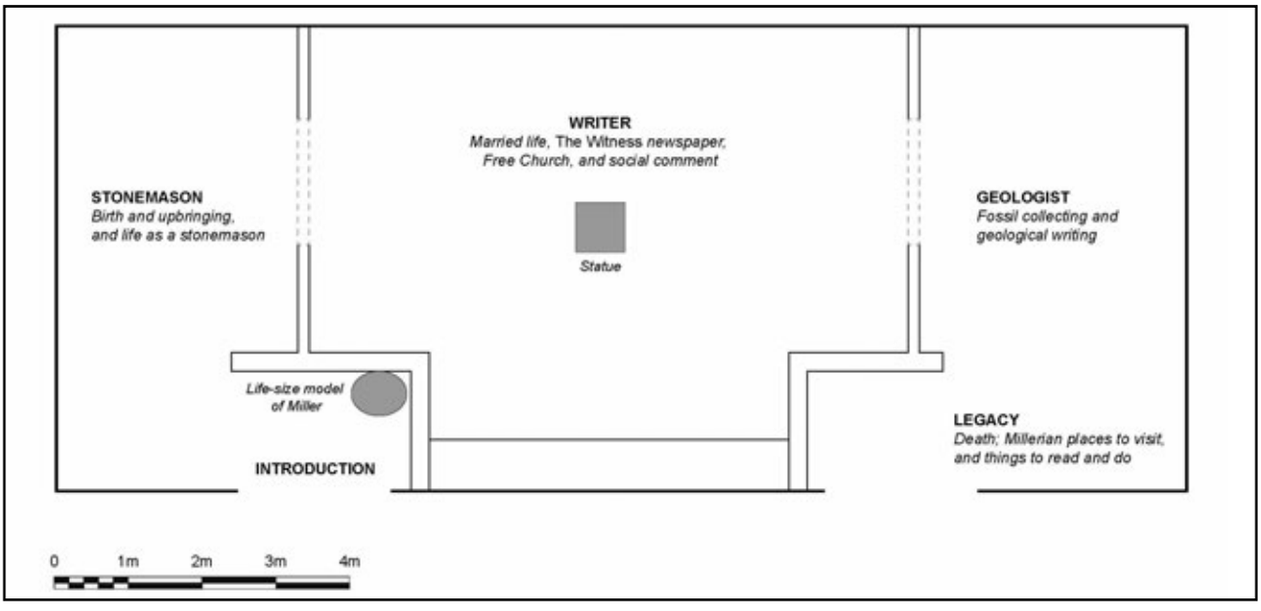


Figure 29. Diagrammatic outline layout of* Testimony of the Rocks: Hugh Miller. Stonemason, Writer, Geologist 1802-1856*, temporary exhibition in the Royal Museum of Scotland, 2002. Plan by Jan Dawson.

exhibition's subtitle:

- Introduction
- Main element 1: Upbringing, working life and self-education to 1840
- Main element 2: Edinburgh editor and writer from 1840
- Main element 3: Geology from c. 1830 onwards
- Conclusion - suicide and legacy; and further things for the visitor to do

This was the best compromise between a purely chronological and a purely thematic approach.

The exhibition was broadly conventional, but care was taken to maximise access. The exhibition was enriched with such things as touchable blocks of carved stone, to demonstrate techniques, and feelable fossils (using modern specimens). Facsimile pages of *The Witness* newspaper were produced as a handout; selected passages from Miller's books were available on audio recordings; and transcripts of all recordings and large-print copies of the entire exhibition script were made available. The visitors were encouraged to go and do things as a result of the exhibition - perhaps to try fossil-hunting, or visit Cromarty.

For the opening, as one would expect, the Museum invited members of the family, colleagues from cognate bodies, those who had helped us, and so on, but the Public Affairs department also took the imaginative approach of inviting all the members of the public who had attended the linked Hugh Miller conferences. The result was an excellent turnout. The formal opening was memorably conducted by the Reverend Professor Donald Macleod, Principal of the Free Church College, with his trained preacher's voice filling the main hall of the Museum. The exhibition was successful and well-received, with 8908 visitors over some 9 weeks. Interestingly, a visitor survey (Amjad 2002) showed that less than half of visitors came specifically to see it, and of all visitors about two-fifths had not heard of Miller beforehand (though this does not take into account how recently those who had heard of Miller knew about him, for instance from press reports of the bicentenary more generally). Key areas of prior interest that prompted a visit were in his life story (self-help, and so on) and in geology. Those confirmed our intuitive predictions that the audience would be a mixture of those with a prior special interest, and those unfamiliar with Miller.

The bicentenary exhibition's only run as a full display was in Edinburgh. But later in 2002 one of us (LIA) adapted some elements to a display in the much smaller Groam House Museum at Rosemarkie near Cromarty, in collaboration with its curator, Susan Seright (Figure 31). The selection of geological specimens was, for instance, modified to focus more on local sites, such as Eathie, Killen Burn, Cromarty and Helmsdale. In her final report Susan Seright commented on the reaction, for instance amongst schoolchildren (pers. comm. 2003): 'When I explained that these [local fossils] were […] on loan from NMS and part of our National Collection there was a sense of pride that their local history was that important - and a sense of delight that they could see it in their local museum.' When that exhibition closed, the remaining display elements, such as the carved stonework, were passed to the Hugh Miller Cottage at Cromarty, for possible reuse. We also advised Portobello Library (Edinburgh Council) with

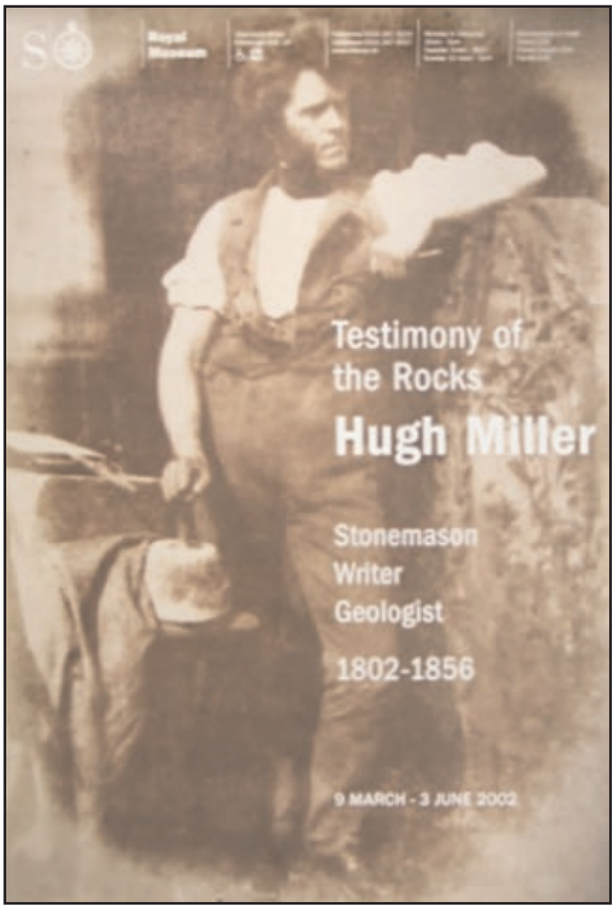


Figure 30. Poster of* Testimony of the Rocks: Hugh Miller. Stonemason, Writer, Geologist 1802-1856*, temporary exhibition in the Royal Museum of Scotland, 2002. Copyright and courtesy of the Trustees of National Museums Scotland.

Figure 31. Groam House Museum, Rosemarkie, near Cromarty. The Edinburgh exhibition was partly shown here, adapted to suit the local theme of the museum, particularly in the choice of geological specimens. Copyright and courtesy of the Trustees of Groam House Museum.

Figure 32. Part of the small permanent display of Miller fossils set up in the Royal Museum, Edinburgh, in 2002. Copyright and courtesy of the Trustees of National Museums Scotland.

a temporary exhibition to mark the bicentenary.

At about the same time LIA prepared a small permanent display of a selection of Miller's fossils, highlighting the range of the collection, in several bays of the *Fossils* gallery in the Royal Museum in Edinburgh (Figure 32). This display was constructed without prior knowledge of the Ben Peach '*Guide*', but in retrospect it can be seen that both LIA and Ben Peach - perhaps, not coincidentally, both invertebrate palaeontologists - emphasised the broad range of material in the Hugh Miller Collection, and focussed on Miller's geological doings, for much the same reasons of limited space in a dedicated science gallery. This display was swept away for the full redevelopment of the Royal Museum ca. 2009.

All those exhibitions were contributions to the Hugh Miller bicentenary year of 2002 coordinated by Lester Borley, Secretary of the Cromarty Arts Trust and editor of the proceedings of three conferences linked to the centenary, two being held at the Royal Museum (Borley 2002, 2003).

11. The birthplace cottage in Cromarty, 1819-1883

We do not know when the family decided to establish a museum in Miller's birthplace cottage in Cromarty. The *Guide* of 1902, written by J.G. Goodchild (Goodchild 1902b, p. 5), gives the impression that the family had always intended to do this from the time of Miller's death, retaining the specimens in 1857-1858 with this in mind. But Goodchild's wording is not as clear as it might be, and he was writing long after the event (though possibly informed by his colleagues Archibald Geikie, Hugh Miller the younger, and/or the Peaches). Be that as it may, the decision to preserve the cottage out of sentiment is logically separate from, and need not have taken

place at the same time as, the decision to open it to the public as a museum with displays. A further complication is that 'visiting' Miller's 'birthplace' covered a wide range of visitor experiences. It could mean at one extreme a trip simply to Cromarty town, through inspecting a semi-derelict cottage from the street, and possibly being let in informally by the tenant, to a proper museum with caretaker and displays (see below and Taylor and Morrison-Low 2017). We now outline the history of Miller's birthplace since he left it about 1819 on his mother's remarriage, and its subsequent development as a museum. This extends and modifies the history set out in the attractive guidebook by Gostwick (2005), especially concerning the establishment of the museum in the 1880s.

Hugh Miller, in fact, owned two houses in Cromarty, next to each other in Church Street (Figure 4; Gostwick 2005, 2016; survey drawings, SC 1133043 and SC1133087, HES):

1. 'Hugh Miller's Cottage', the original and famous birthplace, a humble thatched two-storey building, probably built as an open hall house c. 1700 and with a first floor later inserted in the main room, giving three rooms on each floor; gable-end on to the street.
2. 'Miller House', a more modern and prestigious building with four main rooms and two attics, built next to the Cottage by Miller's father c. 1800.

Both today (2017) form a single museum complex, the Hugh Miller Birthplace Cottage and Museum, held by the National Trust for Scotland. Alix Powers-Jones, the Director, has observed to us that the Miller buildings at Cromarty are museum objects in their own right (pers. comm. 2015). They are certainly displayed as part of the NTS collection (which acts as a distributed national collection of buildings and landscapes). They also pose their own collections history problems, so to speak, in the changes to the buildings.

The buildings' setting is important to our story (Figure 33). Church Street runs along the main raised beach a little in front of Kirkie Brae, the degraded fossil sea-cliff at the head of which the Miller Monument stands. The old road into Cromarty, the Paye, runs past the Monument and down the brae to meet Church Street. The birthplace's original garden, on the narrow burgage plot behind the cottage, met the Paye at its end. Here was, it is believed, the little house which Hugh built with his own hands for his Aunt Jenny, more formally Janet, Wright (*c*. 1779/1781-1858) who was still living there in the 1851 census (Miller 1854, p. 238; as 'Pey' in Cromarty census book 061/1/25, almost overlooked

Figure 33. Map of the cottage area of Cromarty in the 1870s, north to top. Church Street runs from north-west to south-east, on the raised beach under the fossil sea headland ('Brae') on which Hugh Miller's Monument stands (the base of the degraded cliff is marked by lines of trees). Hugh Miller's birthplace cottage is clearly marked. The Paye is the old road which runs near the monument and down the slope from bottom left to middle to join Church Street close by. The house on the west corner of this junction is Paye House. Note the houses and sheds on the garden plots behind the two houses, today largely demolished. Aunt Jenny's cottage is presumed to be the building at the very end of the Cottage plot, with access to the Paye. Miller House is on Church Street proper (just below the Gothic 'Cross' lettering). Next to it, to the west, is the Courthouse, set back from the road, and then the houses owned by Lydia Miller's mother. It will be seen that the Courthouse yard occupies most of the ground behind Miller House. The fishertown can be discerned as the irregular rows of small houses and cottages to the north-east of Church Street, such as in Manse Lane and Fish Lane. Detail from Ordnance Survey 25 inch to the mile 1st edition, Ross and Cromarty Sheet LXVII.9 (Cromarty), surveyed 1871 and published 1880. Reproduced by permission of the National Library of Scotland; http://maps.nls.uk/index.html

by the enumerator who added it to the very end). On the corner of Church Street and the Paye, and sharing a side courtyard with the cottage, is the house now called Paye House. This was not owned by the family, but has since come into NTS hands. Its garden is now merged with that of the cottage. The Courthouse (including police station) is next to Miller House. Beyond the Courthouse is Braefoot Cottage, the former home of Lydia's mother Mrs Elizabeth Fraser. Those of a romantic cast of mind will be charmed to learn that this is where Lydia was living when Hugh was courting her. Mrs Fraser left it and the house next door to her daughter when she died in 1865, but these houses do not play much part in the story presented here.

We have, as best we can, reconstructed Miller's houses' occupation from Scottish statutory records (NRS).

Censuses, decennially from 1841, simply listed who slept in a particular property on census night. Valuation rolls seem a valuable and underused resource for the history of museums. Starting in 1855, they recorded the assessment for local property tax; that for 1855-1856, for instance, nominally recorded the situation at 15 May 1855, the Whitsun term day. Valuation rolls were annual, and valuably focussed on property rather than people, though the owner was recorded as well as the tenant (unless, sometimes, too poor to qualify for the vote, which was then based on a property qualification). We do not attempt a full schedule of occupation over the years as there remains considerable uncertainty in detail. Perhaps inevitably in a small burgh where everyone knew who lived where, the records were often unclear where the properties in question were. Even when street numbering was introduced, it was apt to change with time. We worked backwards from the relatively well-understood period of 1891-1911, which included the major Inland Revenue audit of 1909 and its annotated map (NRS, IRS 80/31). Useful landmarks were Miller House with four rooms with windows and two attics, the Courthouse often with its policeman, and a well-off family in Bellevue House on the other side of the Paye. However, Miller House, and seemingly also the cottage, were often in multiple occupation, changeably subdivided into different 'houses' in the Scots idiom, which could apply to a single-roomed tenement, analogous to a modern bedsit. This was practical enough, with an open fire to boil a kettle, cook potatoes, and toast oatcakes, but can make the records hard to interpret, particularly when multiple members of the Williamson family were involved. Another complication is the early presence of several very cheap houses in the Paye, at least one of which was in the cottage garden, evidently the little house Miller built for Aunt Jenny. (An additional house held by Miller's mother on Church Street is irrelevant, as it disappears from valuation rolls on her death, so was presumably held for life as widow's rights from her second husband.)

One obvious reason why the cottage did not become a museum much earlier, after Miller's death in 1856, was that Miller's mother Harriet and her second husband (and Hugh's stepfather) from 1819, Andrew Williamson (bap. 1781-1854), were living in it, evidently under her widow's rights in law. Andrew was a 'nailer' in the 1841 census and a 'stone engraver', evidently following his stepson Hugh, in the 1851 census. With a son of the same name (see above), he must be the Andrew Williamson 'senior', 'nailer', who died reportedly aged 62, on 22 or 24 March 1854 (Anon. 1854, 1859d; dc; mistranscribed as 'Wiliamson' on some computer databases). From his age of 25 in the 1814 militia list, however, he is identifiable as the son of Andrew Williamson and Ann Ross, baptised 8 July 1781 (David Alston, pers. comm. 2016).

The Williamsons appear to have rented out those parts of the cottage and Miller House which they did not occupy, as a means of eking out a living (and, even then, depended also on cash subventions sent by Miller, e.g., in letters of 1845, 1847 and 1852 to Harriet Williamson, NLS MS. 7516 ff. 60, 62, 64). One Daniel Williamson (d. 1865) was seemingly renting part of the cottage (or an outhouse?) in the 1841 and 1851 censuses. Andrew and Daniel, and Daniel's father also, were 'nailers', blacksmiths practising a long-standing local industry turning imported Swedish iron into nails, spades, and other items for local consumption. We appear to be dealing with a family trade, and in fact censuses and militia lists show that Andrew and Daniel were the last 'nailers' in Cromarty, while a David Williamson (d. 1776) was also a nailer, though the interrelationships of those people remain to be sorted out (dcs; grave 79 in East Church kirkyard, Cromarty Courthouse 1993; David Alston, pers. comm. 2016).

These Williamsons evidently modified the cottage into their workplace, the smithy mentioned in the first valuation rolls from 1855-1856. This throws a new light on Miller's remarks when he saw nail-makers near Birmingham in 1845, on how the Cromarty trade had failed thanks to competition from the Birmingham area: 'the Cromarty nailer wrought alone, or, if a family man, assisted but by his sons', and how '[t]here was a nail-manufactory established about seventy years ago [about 1775] at Cromarty […] after a protracted struggle of rather more than half a century' [so some time after about 1825] it failed. 'There is now only a single nail-forge in the town; and this last of the forges is used for other purposes than the originally-intended one' (Miller 1847, pp. 175-176). The 'manufactory' was elsewhere in Cromarty, near the junction of Church Street and High Street, as shown by the remains of a massive masonry chimney (David Alston, pers. comm. 2016). So the 'single nail-forge' must be that at the cottage, presumably built by the Williamsons when they were thrown out of work at the factory, and now (in 1845) used for other, perhaps more general work such as Hugh Miller's geological hammers (see below). A letter of the 1880s (quoted below) by William Miller (1842-1893), Miller's eldest son, placed the 'smithy' in the 'end room'. He had made childhood visits with his father (Anon. 1893c, 1893d; [Taylor] 1900), so would have been familiar with the cottage during the smithy era. It is just possible he meant a store or workshop associated with a forge outside the cottage

proper. We think he meant the garden end room: bigger than that at the street end, and more obviously demarcated structurally by a masonry partition wall; and with a larger and lower fireplace and chimney in the gable end (but it would still need a proper smithy hearth). Moreover, it has an independent doorway to the outside, then furnished with a stable type split door with upper and lower leaves, unlike the main door to the cottage (Figure 34). This would make sense in a smithy, to control draughts and ventilation. Such a smithy would have been sufficient for small metalwork. Perhaps Daniel lived in the room above. He died in 1867, which was also when the smithy disappears from the records (1867-1868 vr).

Miller's 1851 sketch (Figure 34) seems to show a thatched outbuilding in the cottage garden, not

Figure 34. Drawing of the birthplace cottage and Miller House by Miller himself, 1851. Note the stable door in the presumed smithy at the left end of the cottage, and the puzzling thatched building apparently in the Cottage garden, to the left. Original in HMBCM. Courtesy National Trust for Scotland.

recorded in the 1823 Cromarty estate map (David Alston, pers. comm. 2011) or the large scale Ordnance Survey (6 inches to 1 mile, 1st edition, surveyed 1871-1872, published 1880; 25 inches to 1 mile, 1st Edition, surveyed 1871, published 1880, NLS). It is hard to know whether it is not simply Aunt Jenny's cottage or something belonging to Paye House or the Courthouse and suffering from Miller's artist's perspective. However, something similar can be seen in a painting datable to c. 1859-1865 on internal evidence (private collection; MAT pers. obs.). Perhaps it was Miller's stonemason's store or workshop, or the Williamsons' (though the actual forge was *in* the cottage if William Miller was right). We wondered if it was the long-lost, but necessary, latrine whose absence has occasionally mystified visitors (Gostwick 2016; Martin Gostwick, pers. comm. 2016), but it seems over-engineered for this, and its apparent disappearance in the 1870s raises the obvious question, unless the necessary was moved to the former smithy, or to Aunt Jenny's former cottage at the end of the garden. It is a pity that one cannot see the throne on which Miller imagined past ages, like the earth closet in the garden of the cottage at Higher Bockhampton in Dorset, where the writer Thomas Hardy (1840-1928) doubtless first contemplated the existential nihilism of being. On the other hand, even if we knew how to replicate it, such an installation would seem out of place today. The garden has expanded also into the back plot of the neighbouring Paye House, and is a fine example of modern horticulture. And if one were to bring back the earth closet, for consistency one should logically also replace the flowers with the leeks, potatoes, and kail of a typical kitchen garden - which would in some ways be a shame.

Mrs Williamson was still in the cottage in 1859 (Taylor and Morrison-Low 2017). But by Whitsun 1860, presumably too infirm to live on her own, she had moved next door into Miller House to live with her daughter, and this must explain the wording of reports of her demise in 1863 'within a few yards of the spot where Hugh Miller was born [i.e., next door in the Cottage]' (Anon. 1863; 1860-1861 vr). Two stereophotographs newly discovered in NMS give a remarkable impression of the cottage in spring 1859, with the new monument to Hugh Miller under construction on the hill behind. Combined with drawings and paintings, and visitors' reports, they document the deterioration of the cottage from mid-century to the 1870s (Taylor and Morrison-Low 2017). This decline was partly alleviated by remedial works around 1864 which included general renovations and a railing across the front of the yard, probably to control access, give tenants privacy, and discourage souvenir hunters (Anon. 1864a, 1864c). By Whitsun 1868 the cottage was occupied as a 'house, shop and garden' by a Mrs Ann McLeod, 'merchant', who remained till some time in 1874-1875 (1868-1869 to 1874-1875 vrs; 'grocer' in the 1871 census; 'small shop', Allan 1873). A gable end shop doorway, of the kind seen elsewhere in Cromarty, was cut into the street-facing wall, presumably as part of the mid-1860s renovation works, or when McLeod took the lease (Figure 35; Gostwick 2005, p. 7; Taylor and Morrison-Low 2017; the door is absent from images which do not show the railing of c. 1864).

Sometime between 1868 and 1873, a lettered granite plaque was inserted on the street gable end (Figure 36). This simply stated that the building was Miller's birthplace, and gave his dates. It was useful to tourists who wanted to be sure what they were seeing, no small thing in itself. One wonders if the plaque was prompted by the report of an 1871 visitor who had had great difficulty in finding the cottage despite local inquiries (Alston 2006, p. 266). But it said nothing more, such as whether the interior could

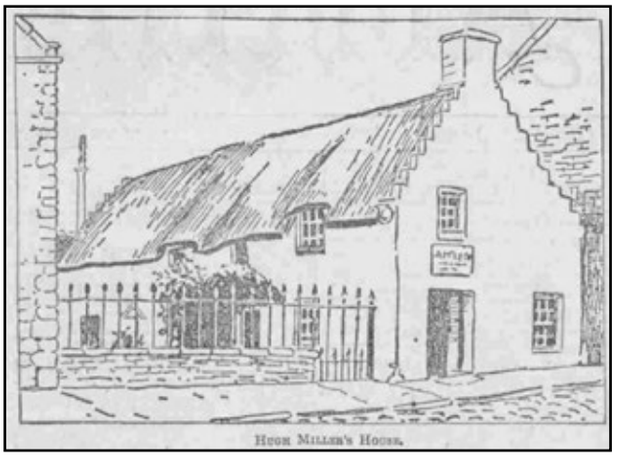


Figure 35. Probably around 1865-1868, the cottage was converted to a shop and house, with the insertion of a shop door in the street gable end. Such shop doors were common in Cromarty; another one existed in Paye House (whose corner is just visible on the left of this drawing: Malcolm 2003, p. 112). Although published in 1883, the drawing must originally date to 1868-1873 as it shows a signboard with 'A. McLeod', the grocer who leased the cottage from 1868, but lacks the plaque on the gable end which was installed no later than the early summer of 1873 (Allan 1873, p. 324). The monument to Hugh Miller is visible in the distance. After Anon. (1883a).

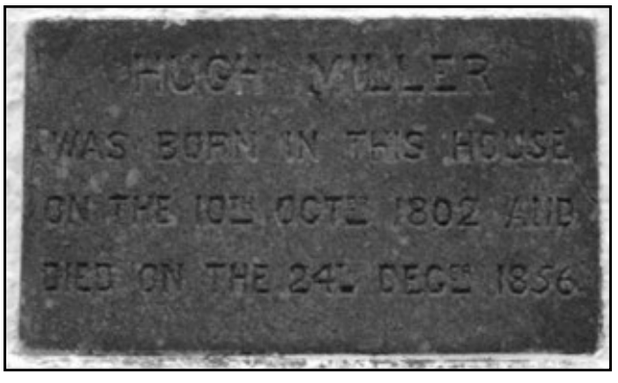


Figure 36. Commemorative plaque on the gable end of the cottage, inserted around 1870 (see also Figure 4). Copyright and courtesy of the Trustees of National Museums Scotland.

be visited. We have found no indication that the cottage was routinely accessible to visitors after Mrs Williamson died. In theory, a visitor could bargain for access with the tenants who intermittently occupied the cottage. However, the cottage fell largely empty from 1875 onwards, unsurprisingly so, as Cromarty was in severe economic decline and many buildings were unoccupied (Alston 2006, p. 248). It has been suggested that the cottage was rented by the Dorcas Society, a charitable organization to help the poor by such things as distributing free clothing (Gostwick 2005, p. 10). However, the Society's room was in fact in Miller House (William Miller's letter cited below; 1881-1882 and other vrs). The family did let the cottage garden to George Skinner, a fish-curer who lived in Paye House, from about 1882 (1882-1883 vr). One hopes that he used it as a garden rather than additional workspace.

The cottage remained one of the sights of Cromarty, if an increasingly dismal one, and not only literally overshadowed by the Hugh Miller Monument. A visit was apt to be a brief and disappointing inspection of the exterior, in an ambience derived from the burgh council's failure to provide proper sanitation, and further flavoured by the rotting bait and fish-guts from the nearby fishertown, and latterly by Skinner's fish-packing yard on the other side of the street (Taylor and Morrison-Low 2017; NRS, IRS 80/31, Inland Revenue audit of local valuations, c. 1909; David Alston, pers. comm. 2011). By 1882, the cottage was tenantless with broken windows, the roof thatch 'mossgrown' and the garden overgrown, and in 1883 it was 'ruinous, windowless and apparently neglected' (Anon. 1882, 1883b, p. 2).

12. The family background, 1856-1883

What happened to the cottage up to now, and thereafter, is explained by what happened to Miller's family. Miller's widow Lydia moved to Drummond House in Inverness in 1864, but she soon shifted in 1867 to one of the two houses at Cromarty, probably Miller House (Anon. 1867; Sutherland and McKenzie Johnston 2002; vrs). However, she soon had a mental breakdown and was hospitalised. It is not clear whether she returned to Cromarty. She did keep a room in Miller House (vrs), presumably for storage. Maybe it was here, or the attics, that the retained fossil collection, and perhaps some display furniture, were lodged. This occupancy disappears in the 1874-1875 valuation roll, presumably linked to her move to the remote north-west of Sutherland in 1874, where her daughter Bessie's husband Norman Mackay had been called to the Free Church parish of Lochinver (Sutherland and McKenzie Johnston 2002). Lydia died there in 1876.

Marian McKenzie Johnston once suggested to us that Lydia - a great enthusiast for memorials to her husband, at least in the form of the books she saw through the press (McKenzie Johnston and Taylor 2002) - would jump at the suggestion of preserving her husband's birthplace cottage as a museum. Yet the only evidence for her interest in keeping a house in the family pertains to Drummond, which had once been in her family, and which she had apparently bought with the notion of restoring family glories (Sutherland and McKenzie Johnston 2002, p. 131). Perhaps this apparent lack of evidence can be ascribed to the loss of family papers, and to Lydia Miller's unsettled life. A will can be evidence for

someone's wishes and concerns, but the Cottage is not mentioned in her will of 1875; however, for one thing, it was not hers to leave anyway, as will be seen below, and for another, at least one codicil was plainly compiled in a state of mental confusion, and indeed she had spells in mental hospitals and under medical supervision, perhaps in reaction to the opiate painkillers which she was prescribed (Sutherland and McKenzie Johnston 2002, pp. 156-158; NRS, Wills and testaments, SC9/36/6 Dornoch Sheriff Court, Lydia Falconer Fraser or Miller, 22 October 1877). This doubtless explains why Lydia left £300 - not then a small sum - to be spent on draining fields 'according to the pneumatic system', whatever that was, on the Tomnahurich side of the River Ness at Inverness after it had been left in the Chartered Bank of India for 21 years. Presumably there was some notion of improving public amenity in a popular area for walks. When the 21 years were up, the family rather ingeniously offered the burgh of Inverness, in Lydia's memory, a drinking fountain in Victoria Park - which was in the right area, and involved water and, one presumes, a drain, however small (Anon. 1897a, 1897b). The burgh gladly accepted the offer, but we have not found whether the fountain was actually installed, and the Park itself is long built over (Sue Skelton, Inverness Library, pers. comm. 2010).

What happened to Hugh Miller's family after his death can only be understood if one appreciates that one of the earliest acts of the Scottish Parliament, after its recall in 1999, was to abolish feudal tenure of land. Until then, for instance, Scots house-owners had to make an annual payment to the local laird in lieu of military service (or buy him out with a lump sum). Another dubious benefit of William the Conqueror's world-view was male primogeniture, to avoid subdivision of estates and ensure that land-holders could afford the best possible weaponry and warhorses. This rationale was rather past its sell-by date when primogeniture was (mostly) abolished in 1964. But it explains why, in 1856, William Miller inherited all his father's land and buildings, known as the 'heritable' property or 'heritage': Shrub Mount, Miller House and the Cottage, except that Lydia as the widow retained certain life rights in them - while Miller's mother Harriet Williamson already had life rights to the Cottage and Miller House from his father, the sea-captain drowned in 1807. Lydia also got a share of the 'moveables', those being cash and other items such as the half share in the firm of Miller & Fairly which published *The Witness*. The other siblings made do with what was left; and even then their eldest brother had the right of 'collation', throwing the heritage into the same pot with the moveables and taking an equal share with the others, if this suited him better. In any case, like his siblings, William was under 21 and legally a minor (Figure 37), so that Lydia, as her husband's executor-dative, held the heritable property in trust for William, and two-thirds of the moveables in trust for his three siblings. One key rule was that decisions could not be made to the detriment of beneficiaries who were minors. This is why, in 1858-1859, Lydia had no discretion to accept a lower bid for Miller's fossil collection even if she had wanted to, in order to keep it in Scotland. One hopes that the family lawyer, effectively the other executor, kept her on the rails most of the time, given her evident ignorance of the rules or unwillingness to follow them (Sutherland and McKenzie Johnston 2002, pp. 154-155).

It can now be understood why there was such a shake-up in 1863-1864. Firstly, the family lawyer

Figure 37. The Miller siblings, 1860. From left, Hugh, William, Bessie and Harriet Miller (INVMG.1992.224). Courtesy Inverness Museum and Art Gallery, High Life Highland.

James Burness had recently died and been replaced by his (presumed) nephew William Burness S.S.C. (c. 1834-1889). Secondly, on 14 April 1863, Miller's daughter Harriet married John Davidson (1834-1881), a minister of the Free Church. This brought into the family a male adult of some authority whom, we suspect, Lydia could not push around as easily as she could her children. He took a role in such matters as Lydia's temporary committal to a mental hospital in 1863 (Sutherland and McKenzie Johnston 2002). Thirdly, Miller's mother Harriet died on 6 June 1863, extinguishing her legal rights in the cottage and

Miller House. And finally, Miller's eldest son, William, became 21 on 28 October 1863, and could take control of his inheritance, probably with Davidson's and Burness's active support. Decisions could now be made, and were. *The Witness* was closed down - surely long overdue given the loss of Hugh Miller (always its unique selling point) and the obsolescence of its business model in a time of rapid change in the industry - and the printing partnership of Miller & Fairly was evidently dissolved (Anon. 1864b; Cowan 1946, p. 281; Taylor 2007). Shrub Mount was sold on 6 June 1864 (NRS, Register of Sasines, 9283 for 1864 and 2453.108, Davidson and Burness acting for William Miller then with 'Her Majesty's 22nd Regt of Native Infantry in Bangalore'). It fetched only about £875 and the Cromarty houses were of minimal value, so William now collated after, presumably, settling with his mother over her life-rights (Sutherland and McKenzie Johnston 2002, pp. 154-155; estate valuation, NRS, Edinburgh Sheriff Court, Inventories SC70/1/93, pp. 907-912, freely available on https://www.nrscotland.gov.uk/research/learning/hall-of-fame/hall-of-fame-a-z/miller-hugh; the documents omit heritable property, as often in Scotland).

The four siblings now held equal shares in the birthplace cottage and Miller House in Cromarty, as well as the moveables, including the retained fossil collection. Meanwhile, until the youngest, Hugh, reached his 21st birthday on 15 July 1871, and possibly also until Lydia died in 1876, there was at least some presumption against disposing of the houses. Harriet's death in December 1883 would leave only William, Bessie and Hugh, who was, in any case, financial guardian of Harriet's three daughters (see below).

As already noted, some money was now, around 1864, spent on the Cottage on works that could be put down to making it lettable. This cannot be said for the installation of the gable end plaque, which is positive evidence that the family were minded to preserve the cottage. Further evidence is that, especially from the mid-1870s, the cottage was apt to be a financial drain, an antiquated dwelling and hard to let, though rates had to be paid, empty or not (vrs; William Miller's letter quoted below). Did the family retain the cottage for its garden, and to control some of the immediate surroundings of Miller House? It only had a small back space (today, 2015, a sculpture garden, 'Miller's Yard', Figure 38), because the normal long plot was truncated by the Courthouse yard. This was a time when privacy was increasingly fashionable, as reflected by the trend to higher garden walls in Cromarty (Alston 2006, p. 235). But, if that

Figure 38. 'Miller's Yard', the small yard behind Miller House, now a sculpture garden. Prominent in this photograph is an ammonite-inspired sculpture by Helen Denerley. Note the cottage seen from the other direction from that in Figure 4, and before its recent rethatching. The skylights were presumably inserted in the 1880s renovation, as part of the conversion of the upper storey rooms to a museum. Copyright and courtesy National Trust for Scotland.

was what the family wanted, it would have made still better sense to demolish the cottage to save money on rates, and extend the garden. Examples can be seen elsewhere in Cromarty. What might have been the house of Miller's uncles, famous from his autobiography, further along Church Street towards the East Church, was demolished to extend a garden, its façade incorporated into the garden wall (Miller 1854; David Alston and Martin Gostwick, pers. comms. 2011). So the family were evidently loath to demolish the cottage, even after Lydia's death, though they do not seem to have used Miller House much. But little was actually done for a long time, unsurprisingly so as the family were away from Cromarty except for any brief visits. Harriet and Bessie were with their families in remote Australia

and Lochinver respectively, William in the Indian Army, and Hugh on fieldwork for the Geological Survey in the north of England.

13. The cottage in Cromarty, 1883-1899

What happened next is shown in an important but undated draft copy of a letter from William Miller to 'Mr Williams', evidently Joseph Williams, Cromarty bank agent, and property agent for the family, to follow up a meeting with him the year before (vrs; INVMG.1992.230.6). This letter can be dated to about 1882-1883 as William's only known furloughs Home from India during the 1880s were about 1881-1882, and (sick) in 1888-1889, and only the first one fits the known building work, or his mention of a squatter in Miller House, one Margaret Macintosh or McIntosh (d. 1886), daughter of the deceased tenant Isabella or Elizabeth McIntosh (d. 1880) (*The new annual Army List, Militia List, Yeomanry Cavalry List, and Indian Civil Service List* [… by] *Lieutenant General H.G. Hart*, 1882 edition, p. 503, and 1889 edition, p. 502; vrs; dcs; 1881 census).

The letter concerned repairs to 'the Big House', obviously Miller House, and the 'Little House', obviously the birthplace cottage:

> […] Of late years house property in Cromarty has been giving a very poor or no return so that many good houses have fallen into a ruinous and uninhabitable state - until at last the demand for the supply of the better class of houses is only equal to if not less than the demand. My brother Mr Hugh and myself therefore think that there are fair grounds for supposing that if the big house is put into good order there is every prospect of its securing a tenant paying such rent as will yield a fair [*word omitted* - rent *or* return *perhaps intended*] and pay for the future upkeep of the property.
>
> It will be in all respects most beneficial for the property to let the big house as a whole and not in single tenements [*i.e. flats or rooms*] and with this object in view the museum will be removed to a room in the little house to be prepared for its reception and ultimately the Dorcas Society - when you see the certain prospect of securing a tenant - would require to receive due notice. […]
>
> I have received the enclosed estimates from my brother [...] To complete what is required to put the Big House in letting condition and the little house in order the following will require to be estimated for. […]
>
> In the little house plastering of one room only on the ground floor has been provided for. - The end room formerly Smithy sh[oul]d be plastered also and both rooms white washed. The door in the gable of the little house had better be built up as provided for in the Estimate - The cost of providing and putting up a new lintil [*lintel*] stone for the mantlepiece of the little house should be specified in the estimate. […]

Frustratingly, William's draft listed only additional work, and we do not know what was in the main schedule of work. However, the 'door in the gable' was presumably the shop doorway, which was indeed blocked up some time before 1889 (photograph of that date attributed to George Washington Wilson (1823-1893) in HMBCM; Gostwick 2016; M. Gostwick, pers. comm. 2016). Perhaps the 'new lintil stone for the mantelpiece' was for the former smithy, to recreate a domestic fireplace in place of the forge hearth. Moreover, the 'museum' was to be removed from Miller House to a 'room in the little house to be prepared for its reception'. 'Museum' here must be intended in the sense of 'collection', for we have come across no report of public access to Miller House, where the collection had been stored. This can be interpreted as showing that William and Hugh had decided to bring the cottage closer to its state in their father's youth, and enable its use as a museum with a resident caretaker; the letter implies that the cottage was not to be rented out. This would date the decision to go ahead with the museum at about 1883. The obvious trigger is the transfer of Hugh the younger to the Geological Survey in Scotland in 1884, to help complete the primary mapping of Scotland, for which he was initially allocated the Cromarty area at his request (Anon. 1885b, 1896a; Gunn 1897; Horne 1897; Goodchild 1902b). The original meeting and the letter antedate the 1884 transfer, but our timings are sloppy, and Hugh would have had advance warning, very possibly as early as 1883. A further factor in the decision might be the start of a new coastal steamer service in 1882, making Cromarty more accessible to tourists and day-trippers and improving the rationale for opening the cottage (Alston 2006, pp. 266-267).

A campaign of works did indeed take place, for the 1884-1885 and 1885-1886 valuation rolls declared the cottage uninhabitable on account of ongoing repairs (and Miller House also in 1884-1885). It is likely that the skylights in the cottage, on the Miller House side, date from this renovation (Figure 38);

they were certainly there in 1902 (Goodchild 1902b) and it is hard to see how the museum rooms could function with the small original windows.

Hugh the younger seems to have taken the main role in maintaining the museum and was now official occupier of the cottage (1888-1889 vr, though Skinner the fish-curer still rented the garden). It is hard to be sure when the cottage became routinely open day in and day out, in the absence of any reported formal opening (but see below). Newspaper reports and coastal shipping advertisements often refer to visiting the 'birthplace' of Hugh Miller, but some evidently apply to Cromarty as a whole, and those which are obviously about the cottage tend not to make it clear whether it was actually open to visitors. The cottage was still uninhabitable due to building works at Whitsun 1885 (1885-1886 vr), but it was evidently soon finished, for 26 August saw the first opening known to us of the birthplace museum. Hugh the younger, then 'stationed at Cromarty', showed a special excursion by the Nairn Literary Society round the 'interesting little museum of geological fossils and manuscripts arranged inside the house' and took them to other Cromarty sights (Anon. 1885b). On the face of it, this is surprisingly early. David Alston (pers. comm. 2001) has pointed out that the general tenor of a number of articles and letters about Cromarty in the *Invergordon Times* in 1885-1886 is of concern over the lack of visitor facilities, repeatedly mentioned as unworthy of the birthplace of Hugh Miller, and that this is prima facie evidence that the museum was not then open. The apparent contradiction is most simply resolved if, to begin with, the cottage was only open by advance arrangement for particular groups when Hugh the younger was around, either resident at Cromarty on his mapping work in the years immediately after 1884, or on summer holidays in Cromarty (as in 1885-1887 with his family and Davidson nieces, as shown by family correspondence; Marian McKenzie Johnston, pers. comm. 2001, and letter of 22 November 1888 to William, NLS Acc. 13364). A group of excursionists from Buckie certainly visited the cottage in July 1887 but it is not confirmed whether they went inside (Anon. 1887d).

Routine access probably began with the installation of a resident custodian by Whitsun 1888 at the latest. This was one Alexandrina or Alexina Wright (1826-1901), an elderly widow and, apparently, sempstress (maiden surname Ross; 1887-1889 vr; 1891 census; bc; dc). She could of course have been a non-resident custodian earlier; she lived a few doors away in one of Bessie Mackay's houses in 1885-1886 (vr). But it is noticeable that reports of visits to the cottage become commoner from 1888 on. One of August 1888 noted manuscripts and fossils in display cases, and commented that Hugh Miller 'sees that the house is kept in order and takes special care that all the relics are preserved and that everything be nearly as possible in its original state' (Anon. 1888b); another, of May 1889, noted the small museum of geological specimens in the upper rooms (Anon. 1889b, 1889c). A visitor in, presumably, the summer of 1890 noted:

> This cottage is used partly as a dwelling-house, the occupant having known intimately the various members of the Miller family. She is, though communicative, not of the type usually found in such posts, and one feels that she takes a more than commonplace, or shall we say commercial interest in the life and memory of the man whose neighbour she was for many years. The upper storey of the house is used as a museum, which, though ill-arranged and very incomplete, contains many objects of general and special interest. The embryo geologist's school-books, his early poetical effusions, some local fossils, volumes of the *Witness* newspaper, and letters from Agassiz, Hibbert, Fleming, Murchison, Robert Dick and others, all have their story to tell of the plodding and painstaking nature of the man. We leave the house feeling that we have a clearer insight into his make and manner […]. (Wardingley 1890, p. 211)

This was evidently by the geologist Charles Wardingley later F.G.S. (d. 1942) as he then went into considerable detail about how to find Miller's sites for the purpose of collecting specimens. He confirms that the custodian was resident, though his ambiguous comment about her is probably clarified by this less geologically minded visitor off the steamer from Inverness (Anon. 1891b):

> The house is in charge of an old servant of Hugh Miller's [perhaps an error, though it is just about possible]. [...] The old lady in charge speaks in an undertone, and she evidently has the greatest veneration for everything in the house, and for those whom it commemorates. She conducted us first to a room on the right up stairs, where the great man was born. [… In the first of the other two rooms] are a large number of fossils, named and classified with great care, and a number of other curiosities. In the second room is a large number of manuscripts, the chair in which he was nursed, a number of his first attempts at drawing, the first desk at which he wrote, his first spelling book, copies of letters from Charles Darwin, Richard Owen, Lord Palmerston, Dr Chalmers, Dr Duff, Thomas Carlyle, and others. There are also the

last letter written by Hugh Miller's father to his mother the day before he was drowned, a table made from one of the desks used in the *Witness* Office, Edinburgh, and a number of other articles too numerous to mention […].

It is possible, but in fact unlikely, that the cottage was formally opened on 20 May 1890, when the earliest surviving visitor's book was signed on its opening page by several clerics, including the Reverend Professor Robert Rainy (1826-1906), Principal of the Free Church College in Edinburgh (Gostwick 2005, p. 31; Martin Gostwick, pers. comm. 2016; HMBCM archive). Such a formal opening would be rather late in view of the new evidence presented here, and we have found no reports of such an opening, even in the *Inverness Courier*, which always paid attention to news about its former correspondent Hugh Miller. Moreover, the first name in the book is not Rainy, as one would expect for a Free Kirk activist's birthplace museum, but the Rev. Walter Scott, the Established Church minister in Cromarty, even if he got on well with his Cromarty Free Church colleague the Rev. John Mackay (Alston 2006, pp. 271-272, 274). Mackay would, later than month, support Rainy over two controversial issues at the General Assembly of the Free Church in Edinburgh (Anon. 1890b, 1890c). So it seems likely that Rainy was actually in Cromarty to concert plans with Mackay, and that the men of the cloth were taking time off to make an informal visit to the cottage, with Rainy's presence prompting the opening of a visitor's book, either the first or a replacement.

Hugh cannot have had much help from William, simply because William was away in India except for the sick furlough of about 1888-1889 referred to above. The furlough might have begun in 1887, as Hugh wrote on 20 September 1887, from his wife's country house in Dumfriesshire, to 'My dear William', who was seemingly in or soon to go to Cromarty, wishing 'success to the luminous painting' but recommending seeking leave of 'Provost Taylor' before proceeding (one James Taylor was then Provost of Cromarty; Alston 2006, 278-279; NLS acc. 13364). We are left in the dark as to why the luminous paint might cause civic disquiet and what it was for. Perhaps it was to mark the protruding Miller House steps, to prevent people falling over them at night? And in a letter of 22 November 1888 to William discussing how to settle up over the building works and other bills by perhaps disposing of his share of Miller House to William, Hugh stressed that 'I leave out of account entirely' the cottage and 'will not part with my share of it unremunerative as it is and always will be' (NLS Acc. 13364).

In August 1892, when a large party from Nairn visited, Hugh the younger was staying in Cromarty, and had 'rearranged' the museum (Anon. 1892c, 1892d). He died prematurely on 8 January 1896 as a result of typhoid caught on fieldwork in Sutherland (dc; Anon 1896a; Gunn 1897; Horne 1897). A report of August 1898, illustrated with a rough woodcut of the cottage, usefully enumerated some of the manuscripts in detail, though might have got the timing wrong when claiming that the display was then being enlarged with additions from Hugh the younger's collection, as this is not confirmed elsewhere (Anon. 1898a).

Figure 39. Hugh Miller does his bit for the local tourist industry, seemingly looking down from heaven. A postcard of sometime about 1910, judging from the Royal Navy warships in the Firth of Cromarty. Courtesy Garve Scott-Lodge of Cromarty Image Library.

We suggested above that the cottage's initial opening was partly prompted by improved steamer services, and it is also possible that the wider opening around 1887-1888 was encouraged by a further improvement in services, with the upgrading of the main coastal steamer, the *Earnholm*, in early 1887; indeed, within a few years, another steamer, the *New Undaunted*, was being advertised with a timetable allowing an hour at Cromarty specifically to visit the cottage and monument (Anon. 1887b, 1887c, 1893b; Alston 2006, pp. 266-267). Within a single decade, therefore, the birthplace cottage had gone from derelict wreck to a stalwart of the growing local tourist industry, featuring in local guides, such as that for the railway to Fortrose (Beaton 1894, pp. 31-32). Cromarty's 'greatest asset was its image as the birthplace of Hugh Miller' (Figure 39), and, although Cromarty has found and lost other industries since then, Miller's heritage has continued important down to the present day (Alston 2006, p. 265, 2007).

14. The cottage museum in 1902

The cottage was in poor condition in 1899 and was closed at some point for repairs, being open again

some time in or soon after June 1900 (1899a, 1899b, 1900a). Another report of poor condition was published in 1901, but we suspect that this actually referred to conditions before the refurbishment (Anon. 1901a). It interestingly commented that the 'names [i.e., labels] of the specimens had come off owing to the damp'. Mrs Wright had now died, and her replacement was one Helen Sim, widow and 'stocking knitter' (1900-1901 vr; 1901 census; dc). The geological displays were about then, or soon after, revised under the 'immediate superintendence' of John Goodchild (Anon. 1902f). All this was with Miller's centenary in mind, and a guide to the collection was prepared by Goodchild (Anon. 1902a, p. 80). Goodchild's *Guide to the geological collections in the Hugh Miller Cottage, Cromarty* (Goodchild 1902b, reprinted here as Goodchild *et al.* 2017) came to light through its mention in his obituary, but we were unable to find a copy, as so often with such ephemera, which are often the last priority for computer cataloguing if they survive at all. Happily, Michael Howe of the British Geological Survey found two copies in their archives in response to our appeal on the GCG listserver, for this basic little booklet, of 16 pages without illustrations, gives the first detailed account of the contents of the cottage. It notes the light-fading and damp which have persistently affected the cottage's use as a museum over the years.

Goodchild noted that the easternmost bedroom or 'Birth Room', where Hugh Miller was born, overlooking the street, was used for assorted personalia, including pictures, furniture, books, and a set of *The Witness*. In the middle upstairs room, a display case held various manuscripts, drawings and letters. Another had a selection of Miller's fossil fishes from the Old Red Sandstone (including actual specimens featured in the book of that name), and some Carboniferous fishes. Two more cases contained a range of other fossils from Miller's collection. Frustratingly for the modern reader, Goodchild devoted inordinate space to the anatomy and classification of fossil fishes rather than the museum itself, sensible as it might have seemed at the time to put this technical stuff into a take-away guide to be absorbed at leisure. (He also conflated the separate Old Red Sandstone sites at Cromarty and Eathie; Goodchild 1902b, p. 8).

Hugh the younger plainly took care to demarcate his father's fossils from those collected by others, which were kept in the third, garden-end, bedroom. Some of those third room fossils were his own. A preliminary examination of specimens either still at the cottage or transferred to NMS (G.1967.35) shows material dated 1868 and 1869 from the Devonian of Angus, the Carboniferous of Midlothian such as Bonnyrigg, Burdiehouse, and Whitehill coal pit, and the Jurassic of Skye, and a *Coccosteus* labelled as 'H. Miller's Private Collection 1870' from the Old Red Sandstone of Edderton, Ross-shire, a locality found only after the elder Miller's death. Those dates are consistent with Hugh the younger's career at Edinburgh University before transferring to the Royal School of Mines in 1869 (Gunn, 1896; Horne, 1896; Anon. 1914, p. 245; Reeks 1920, p. 134; Sutherland and McKenzie Johnston 2002, pp. 132-143; Edinburgh University matriculation records for 1867-1868 and 1868-1869 sessions, EUL-SC, Irene Ferguson, pers. comm. 2006; letter of 22 December 1868, from Edinburgh, to his mother, mentioning fossil-collecting at Burdiehouse, NLS acc. 13364). A fossil plant, *Telangium bifidum* from the Calciferous Sandstone of Irthing, marked 'H. Miller's private specimen. Collected 1883' matches his known mapping work for the Survey in the Wall country of Northumberland (NMS.G.1953.4.1).

Also in the third bedroom were 'some valuable geological collections' from Hugh's brother 'Colonel Miller' (Goodchild 1902b, p. 14). We wondered if those were a way to sneak in local fossils collected by Hugh the younger to get around the conflict of interest with his work for the Survey in Scotland. But a look at William Miller's career suggests otherwise. William was a brave and active outdoors type and keen climber, quite the action man, who made his career in the Indian Army (Figures 37, 40). When he was 14, on a family holiday at Burntisland, he left the family's seaside cottage way of a first floor window in the rush to save a drowning girl, as reported in the family newspaper and retold, thinly disguised, by his sister in *Sir Gilbert's Children* (Anon. 1859b;

Figure 40. William and Alicia Miller and their family and ayah, probably in India around 1880 (INVMG.1992.225). Courtesy Inverness Museum and Art Gallery, High Life Highland.

Davidson 2011, pp. 77-78). However, as quoted earlier, Harriet's novel also portrays the young William-figure with a rudimentary geological collection of his own. There is also a letter postmarked from Wick in 1849, from William's father to his grandmother Mrs Williamson, asking her to tell William to be as assiduous in his studies as he is in collecting fossils (HMBCM; Martin Gostwick, pers. comm. 2008). This should perhaps not be overemphasised, as William was then only six or seven. But this early training seems to have stuck. An anonymous obituary, surely by his brother Hugh, recalled how William made observations to test Charles Darwin's theory of the formation of coral reefs while in command of the garrison of the Nicobar Islands in the Indian Ocean, though, sadly, no paper was ever written (Anon. 1893c, 1893d). William returned Home for health reasons in 1892 or 1893 after the death of his wife Alicia on 17 May 1892 (Anon. 1892b). He soon died in Edinburgh on 23 December 1893, at 16 Dalrymple Crescent, Edinburgh, into which his mother in law had moved in 1888 - just a few doors from No 13, where Ben Peach lived from 1887 to 1891 (Lamb 2011, pp. 70, 74-75, 88, 91-92; dc; 1891 census).

Figure 41. Sir Thomas Hanbury (1832-1907), retired merchant, Quaker, noted horticulturalist and philanthropist. From Locke (1916).

There were also Old Red Sandstone fossil plants from Eathie Burn donated by Sir Thomas Hanbury (1832-1907), a wealthy retired merchant (Figure 41). Hanbury is an interesting character to find here in Cromarty (Locke 1916, II, pp. 297-300; Desmond 1994, p. 313; Cantor 2005, p. 165; McConnell 2009). David Alston (pers. comm. 2011) suggests that his connection with Cromarty was as the shooting tenant of Cromarty House (e.g., Anon. 1892a, 1903a). He is however best known as the horticulturalist who donated the Wisley garden to the Royal Horticultural Society, and his fine botanical garden at La Mortola in Italy was much visited by serious botanists. He also supported schools around La Mortola, and gave the Cromarty school a prefabricated corrugated iron gymnasium, still there in 2007 (Anon. 1903a; David Alston, pers. comm. 2007). It is highly relevant that Hanbury was a member of the Society of Friends, commonly known as Quakers. With the exception of game-shooting (not unknown amongst wealthy Quakers), all those doings of Hanbury's exemplified activities valued highly by the members of this Dissenting group. The Friends saw education as a high priority. They also esteemed botany and horticulture as useful arts, and as rational recreations giving the participant direct experience of the wonders of divine creation (Cantor 2005). For much the same reasons, many Friends also valued geology from the earliest days of the science (Torrens 2009). None of this was very far removed from the doctrines in Miller's writings of moral probity, hard work, self-help and geology as an improving recreation. So it is unsurprising to find Hanbury supporting the cottage museum and chairing Archibald Geikie's lecture at the 1902 centenary celebrations (Anon. 1902b, p. 40). Interestingly, other Quakers were prime movers in founding two other small local museums at about this time: Alfred Gillett (1814-1904), and other members of the Clark family, at Street in Somerset, and Sir Jonathan Hutchinson (1828-1913) at Haslemere in Surrey (Anon. 1887a; Woodward 1904; Swanton 1947). The Society of Friends was never a large grouping, but its role in establishing geological and educational museums seems worth further scrutiny, as we have already observed for the Unitarians, perhaps the closest to the Society amongst the various Dissenting groups (Taylor and Anderson 2015, pp. 164-166).

Goodchild's guide does not tell us what was downstairs in the cottage in 1902. This is simply because the ground floor was not open to the public, but used to accommodate the custodian (though no doubt an informal inspection might be secured with a tip). Several early reports make it clear that the museum was in the upper rooms (Anon. 1889b, 1891a, 1891b), and Wardingley (1890) confirmed the division into a dwelling-house and upstairs museum. Valuation rolls for the later part of the Great War show 'Miller Cottage' formally divided into a 'museum' and a 'house', probably to meet the wartime billeting legalities around the Cromarty Firth naval base.

15. The 1902 centenary and the Hugh Miller Institute: a potential Miller museum that did not take off

On Friday 22 August 1902 Cromarty was en fête to celebrate the centenary of Hugh Miller's birth, with a triumphal arch on the quayside to welcome those arriving by steamboat. At 12.30 there took place a great gathering of some fifteen hundred people at the Monument. After a prayer, Mr Arthur Bignold (1850-1918), MP for Wick Burghs, Provost Junor of Cromarty, Archibald Geikie, and Principal Rainy of the Free Church College all gave speeches (Anon. 1902a, 1902b, 1902c, 1902d, 1902e; [Clarke] 1902a). Another speaker was Professor John M. Clarke (1857-1925) of Albany, State Paleontologist of New York, yet another boyhood reader of Miller's works and a notable researcher on the Old Red Sandstone of North America. He had volunteered to act as the United States agent for the centenary appeal (and he later suggested the name of Hugh Miller Cliffs for the Scaumenac Bay or Escuminac Bay site in Québec, Canada, today known as Parc de Miguasha; Anon. 1902d; Clarke 1902b; Geikie 1915; Schuchert and Ruedemann 1925; Schuchert 1926, pp. 192-193, 203; Fisher 1987; Lemieux 1996, p. 14).

There was a lunch for more than two hundred in the Victoria Hall, though as many again had to be turned away. Here, further speeches and toasts were made. Amongst the speakers and guests were John Horne (1848-1928) of the Geological Survey; Professor Thomas Middleton F.R.S. (1863-1943), farmer and agronomist and husband of Lydia Miller Davidson (1866-1934), granddaughter of Hugh Miller (Russell 1944); and Andrew Carnegie (1835-1919), the expat Scots steel magnate of *Diplodocus*-funding fame, who was so fabulously rich that he owned nearby Skibo Castle for a holiday home. In the afternoon there was a fine address by Geikie, chaired by Sir Thomas Hanbury, in the United Free Church.

Those celebrations were only part of the purpose of the centenary appeal, for the intention was also to fund a 'Hugh Miller Institute' comprising a library, reading room and museum, and to make 'an effort […] to purchase the old house in Cromarty where Miller was born, with its interesting collection of scientific exhibits collected by the distinguished scientist' (Anon. 1902b, 1902c; the official circular, not seen by us, was partly quoted by Clarke 1902b). This idea had been mooted the previous December with the intent that the Institute 'might contain what remains of his fossils and manuscripts' - presumably those in Cromarty (Anon. 1901b). It is not clear whether this was with family agreement, or what would be done with the cottage once the museum was transferred to the new building. However, the proposals to build a museum, and buy the cottage, seem to have been dropped fairly early, probably because costs had to be trimmed as a result of the failure of the public appeal. This failure of funding was clear by the time of the August celebration, but, fortunately, Carnegie pledged his support (Anon. 1902d, 1902i). Already a major donor of free libraries all over Scotland, Carnegie stepped in to fund the Institute building (as well as the commemorative book for the centenary). The public appeal moneys went instead to endow the institution.

Figure 42. Façade of the Hugh Miller Institute, the local institution and library - and, at one time, a proposed Hugh Miller museum - which was funded by Andrew Carnegie and opened in 1904. Copyright and courtesy of the Trustees of National Museums Scotland.

The Institute was built to the other side of Braefoot Cottage from the Courthouse, on a site provided by Colonel Ross, laird of Cromarty. In due course the fine new Hugh Miller Institute was opened by Carnegie on 26 August 1904 with a special silver key, accompanied by suitable speeches and a bazaar sale (Figure 42; Anon. 1904b, 1904c; Carnegie 1904; the key is still preserved in the Carnegie Library of Pittsburgh, http://digitalcollections.powerlibrary.org/cdm/ref/collection/acamu-acarc/id/563 downloaded 27 June 2017).

Although the original notion of the Institute's use as a museum fell by the wayside, it did contain some Milleriana, though it was apt to be confused with the birthplace cottage and it is not always clear who had what (see below).

16. The birthplace cottage from 1902 to 2010

The cottage custodian, Mrs Sim, evidently continued resident as she died there in the small hours of the morning on 27 December 1909 (dc). It was about this time that the Inland Revenue survey noted the cottage as being 'in good order and repair' (NRS, IRS 80/31 167). Thereafter, a Mrs Margaret Watson lived there, sharing with another widow, Jane Watson. Both, not entirely inappropriately, were involved with the fish trade, though it is not clear whether they carried it on at the cottage. After a succession of short term tenants and custodians, Murdo Maclennan, a retired gamekeeper, and his wife Mary took over around 1924-1925. He died aged 79 in the cottage in 1930, but Mary carried on till she died in the cottage, again in the early morning, in 1940 (dc, on databases as 'MacLennan'). She is remembered as a 'formidable' figure with the by-name of 'Jollification' (Malcolm 2003, pp. 110-111). Such by-names or nicknames were common in Cromarty because there were so few surnames. The reason for this one is probably explained by the recollections of Cromarty people as told to Martin Gostwick (pers. comm. 2016): 'she was a character who told umpteen stories, tall or otherwise, and sent boys out to fetch her a dram from the nearest howff' (Scots; dram, a liquid measure, usually of whisky, size dependent on the pourer's mood; howff, a pub).

Figure 43. The sundial Miller carved as a young man, and now in the birthplace cottage garden. Photograph c. 1995 by MAT, copyright and courtesy of the Trustees of National Museums Scotland.

In 1926 the Cromarty Burgh Council took over the day to day operation of the cottage, by this time known as Miller Cottage, from the 'Trustees of Hugh Miller' (this last must be the original trust in executry for the inheritance of Miller's children, which seemingly survived as an instrument to hold the cottage and Miller House, and was so far as is known, distinct from that to manage the eponymous Institute and Library, sometimes called the 'Hugh Miller Trust' or 'Library Trust'). Gostwick (2005, p. 10) stated that the family retained ownership, but contemporary records and reports indicate a complete handover to the council (Anon. 1926, 1936a; 1930-1931 vr). In any case, concern arose that the cottage was a drain on the Burgh finances (Anon. 1936a). An appeal was launched in 1937 to raise £400 in part to put the cottage in good condition, and enable its handover to the recently founded National Trust for Scotland, which would add £100. As part of the campaign the Cromarty Literary Society invited Ramsay MacDonald (1866-1937), the former Labour Party leader and coalition government Prime Minister, to lecture on Hugh Miller on 4 January 1937 (Anon. 1937a). MacDonald was a native of Lossiemouth in Moray who had read Miller and collected fossils as a youngster (Anon. 1932). The appeal was over-subscribed and after the completion of renovation works the cottage was formally handed over to the Trust on 26 September 1938 (Anon. 1937b, 1937c, 1938b; [Westoll] 1938). This was part of a wider day of civic celebration in Cromarty during which the Saltire Society, recently founded to promote the arts and culture in Scotland, gave the burgh a plaque to commemorate Sir Thomas Urquhart (1611-1660), the 17th century Royalist and translator of Rabelais, about whom Miller had written. On the same day, too, the heirs of Provost Johnstone reportedly entrusted to the NTS the sundial carved by Hugh Miller for his uncles; it is today in the cottage garden (Figure 43; Anon. 1938b). Slightly confusingly, another much older sundial in Cromarty, reportedly found by Miller himself near the castle, was given to the Society by a Miss Murray on condition that it stay in Cromarty (Anon. 1938a; now in CCH).

By the 1950s the effects of economic austerity and wartime neglect were seemingly evident, and in 1952 a ceremony at the cottage on 14 October, marking the sesquicentenary of Miller's birth, launched an appeal to pay for the complete refurbishment of the building (Anon. 1953; Gostwick 2005). Edward Battersby Bailey (1881-1965), former Director General of the Geological Survey, reported on this for *Nature* (Bailey 1952). As part of those works, the exhibitions were reorganized in 1953 and 1954 by Charles Waterston of RSM who had himself been interested in Miller's work ever since doing his doctoral

research on the Jurassic of Eathie (Anon. 1953; Allan [1954a], p. 11, [1955], p. 11; Waterston 1950, 1951, 1954a; Charles Waterston, pers. comm. 2000; pers. obs.). Some natural history mounts, of the fauna of the Black Isle, but apparently not of Miller's collecting, had become faded and infested, and were destroyed. A small selection of the manuscripts was retained and the rest deposited at NLS for better long-term care away from the damp environment of the cottage. A much smaller selection of specimens was retained, supplemented by casts from the RSM collection and some models of fossil fishes. The more important specimens were donated to RSM as noted above. Waterston (1954a) noted that the older displays, still in the three upper storey rooms, had been 'designed for visitors familiar with the writings and history of Hugh Miller' and the heavy display furniture was out of proportion with the Cottage interior, which was too crowded, especially for the peaks of visitor flow seen with coach parties. A much more selective display was created, with one room of geological material, organised by sections corresponding to Miller's books *The Old Red Sandstone*, *Cruise of the Betsey*, *Footprints of the Creator*, and *Testimony of the Rocks*. Another room was devoted to Miller as man of letters, and the third, the 'Birthroom', was furnished in the style of the beginning of the 19th century. Charles Waterston noted the low visitor capacity of the cottage, especially for the tourist coach trade, and recommended at the time that Miller House, then owned by the NTS, be brought into use as a museum when the occupant's lease expired, letting the cottage be more purely restored in 1802 style. Unfortunately his prescient suggestion was not followed for financial reasons. The NTS also published an attractively designed booklet guide and account of Miller (Waterston [1961]). By now, the cottage's name seems to have been formalised as Hugh Miller's Cottage.

Figure 44. The garden end room, believed to be a former smithy, was one of the two ground floor rooms furnished in a period style and opened to the public in the mid-20th century. Copyright and courtesy of the National Trust for Scotland.

In those days the museum was still seemingly confined to the first floor. However, in more recent years, up to 2003 or so, the ground floor was also largely open to the public, the two main rooms furnished in an appropriate period style (though the middle one also housed the receptionist's table and a small sales area), and the small street end room was used as an office and library (Figure 44). This change, together with the 1953 refurnishing of the Birthroom, was important, because it shifted the visitor's overall impression from an attic museum to a furnished house with a small museum in two bedrooms. It is not clear when this change was made. There was an appeal in 1940 for period furniture, whether or not associated with the family, to fit out the 'kitchen', which we take to be the garden end room and (presumed) former smithy on the ground floor (Anon. 1940a, 1940b). Photographic evidence also shows that, perhaps in the 1950s or 1960s, a small window was inserted into the middle room on the ground floor of the cottage to improve lighting (compare Figures 4 and 34). On the other hand, Martin Gostwick noted (pers. comm. 2016) that 'I have been advised by a Crom [Cromarty inhabitant] that the custodian/janitor […] continued to reside in the cottage right into the 1960s, or even early 1970s. [The middle room on the ground floor] served as a bedsitter, with almost all the surviving exhibits crammed upstairs, hence the need for more light, rather than for visitors' benefit. But […] this has to count as hearsay'. The only way this could work, if the middle room was to remain private, was for the kitchen to be accessed independently through its own door to the yard. Be that as it may, at some point the whole ground floor was opened to the public, possibly when the Trust took over Paye House adjacent and could use it as the custodian's residence.

The displays were modernized around 1981 with the introduction of the first audiovisual programme in any NTS property (copy of contemporary handout or poster display, with partial draft brief/captions for this exhibition, in file held by Dept. of Natural Sciences, NMS). Interestingly the upstairs bed was replaced with a modern replica of a style more appropriate to 1802.

The coming bicentenary in 2002 prompted the reacquisition of Miller House, which had been owned by NTS but sold on, perhaps after renovation (a standard method by which the Trust rehabilitated a townscape). This enabled a wholesale revision of the complex by the NTS exhibition team with funding from the Heritage Lottery Fund, British Petroleum plc and the local enterprise board. The authors were amongst the conservation and curatorial staff from NMS who provided specialist advice and support, while NMS

Figure 45. (A), (B). New exhibits in Miller House, 2004, dealing with aspects of his life and work other than geology. Copyright and courtesy of the National Trust for Scotland.

lent geological specimens for the display, a few originally from the cottage. The complex, now collectively called the Hugh Miller Birthplace Cottage and Museum, reopened in 2004, fulfilling Charles Waterston's prescient suggestion of half a century before. The cottage interior was restored more closely to the former original. New formal displays were set up, instead, in Miller House (Figures 5, 45), which also enabled better storage for the archival material. The fossils are now displayed in the two attic rooms in one of which Hugh had had his 'museum' so many years before, with some hands-on material (Figure 6). The dining room is restored to how it must have looked when the young couple started married life there. An excellent full-colour illustrated booklet was produced (Gostwick 2005).

In 2009, wider financial problems within the National Trust for Scotland led the NTS management to implement a partial closure of the HMBCM, and redundancy for the Property Manager, Martin Gostwick (who had succeeded his wife Frieda in the post), and his replacement with a part-time manager. Various possible solutions were explored for the longer term. But the future of the complex looked decidedly uncertain, much to the concern of many geologists and other Miller enthusiasts, until the HMBCM received support from the Middleton Trust, whose purpose is to 'advance the social, cultural, educational, and recreational development of young people' in the Cromarty area (Scottish Charity SC043079, Office of the Scottish Charities Regulator, http://www.oscr.org.uk downloaded 9 July 2017). This fund was set up by Henry McKenzie Johnston CB in memory of three of Hugh and Lydia Miller's great-great-granddaughters, the recently deceased sisters Marian McKenzie Johnston, Bright Gordon and Lydia Clarke, all *née* Middleton, granddaughters of Thomas and Lydia Middleton, and great-great-granddaughters of Hugh and Lydia Miller.

The Hugh Miller Birthplace Cottage and Museum is now overseen by a Director, presently Alix Powers-Jones. It is supported by The Friends of Hugh Miller, a NTS supporters' group, who operate a website and newsletter *Hugh's News* run by Martin Gostwick (www.hughmiller.org). The Friends have assisted with projects such as 'Miller's Yard', a sculpture garden behind Miller House, and improvements to the cottage garden. They also arrange events, such as a lecture on Miller at their annual general meeting, and a 'Local Hero' weekend in April 2008 in collaboration with Scottish Natural Heritage and the Geological Society of London. This event followed on from the launch of the Scottish Fossil Code, which took place in part on the beach at Cromarty, showing the ongoing role of Hugh Miller as a symbol of Scottish palaeontology (Anon. 2008a, 2008b; Macfadyen 2008; Taylor 2008).

17. Hugh Miller's papers and personalia

17.1 The problem of the Miller manuscripts

Miller's papers are important. Manuscripts throw light on a collector's wider life and work, complementing printed publications in the interpretation of collections. This can be direct, as in specimen lists, and indirect, such as in wider correspondence concerning localities and collections. Simon Knell has observed that papers and publications are sometimes more useful than actual specimens in writing the history of Victorian geological collecting (Knell 2007, p. 8). Hugh Miller is no exception, for, as noted above, he did not label his specimens much, and written sources are needed to elucidate the evolution of his collecting, in contrast to Charles Peach's detailed labels (Knell and Taylor 2006; Anderson and Taylor 2008). Moreover, as historic artefacts in their own right, manuscripts are valuable display items together with portraits, photographs and other personalia. The history of Miller's papers and personalia

is therefore relevant to this study. In particular, we were concerned to resolve the apparent contradiction between the loss of Miller's papers in Australia from 1884 onwards, and their presence in the Cottage Museum from 1885. We do not give detailed listings of known repositories, as many only contain one or two items. However, the main repositories for material related to Miller and his family include EUL-NC, NLS, and NTS (both at HMBCM and deposited at NLS), with smaller quantities in AUL, CCH, EUL-SC (A. Geikie and R.I. Murchison correspondence), and INVMG in particular.

17.2 *The Life and Letters of Hugh Miller*

We see the fate of Miller's papers as stemming ultimately from the problems of the authorised biography *The Life and Letters of Hugh Miller*, a massive production of 2 volumes and 933 pages (Bayne 1871). The publisher, Alexander Strahan (c. 1833/4-1918), was the son of an old friend of Miller's, and owed his start in the trade to Miller's introducing him to his own Edinburgh publishers (Bayne 1871, I, p. 319; Srebrnik 1986; Taylor and Anderson forthcoming). The author, Peter Bayne (1830-1896), had been Miller's successor as editor of *The Witness*, before moving to London in 1860 (Anon. 1896b; Bayne 1901). Bayne apparently wrote the book under Lydia Miller's supervision (Sutherland and McKenzie Johnston 2002, pp. 150-153; Taylor 2007, pp. 146-149). He appears to have used a memoir written by her of her life up to 1840 (see below; e.g. Bayne 1871, I, p. 192 = L. Miller 1902, p. 514).

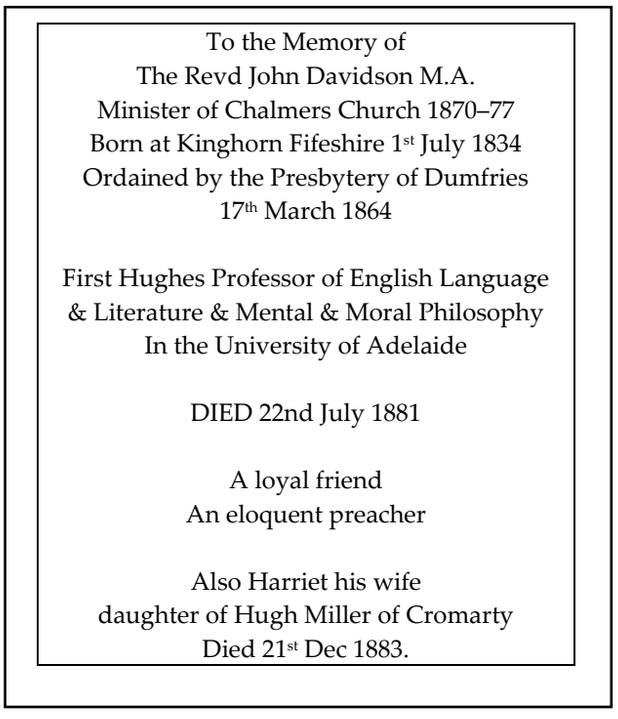
Reviewers gave Bayne's book a very mixed reception (Amos 1871; Anon. 1871a, 1871b, 1871c, 1871d, 1871e, 1871f, 1871g, 1871h; [Russel] 1871). One complained (Anon. 1871g, p. 573) that in the old days a man could be called happy when he was safely dead and buried, but now 'he may be haunted by the calamity of falling into the hands of a biographer like Mr. Peter Bayne'! The book was certainly flawed. It is hard to balance the range of topics involved in a biography of Miller, as one of us can attest (Taylor 2007). But Peter Bayne and Lydia Miller seem to have been far too close, emotionally and mentally, to their subject. Bayne was the son of a minister who came out in the Disruption, and he had already been congratulated for being that rare thing in the British world of letters, a 'religious litterateur' (Anon. 1859a, p. 340). His unbalanced coverage overemphasised the Disruption and Miller's disputes with the Free Kirk's ruling faction (cf. [Russel] 1871; Macleod 1996). The book also followed Lydia in blaming Miller's suicide on the Highland ghost and fairy stories told him by his mother, and his inheriting her weak mental constitution - nonsense which must have upset the Cromarty relatives and which littered much later writing about Miller (Sutherland and McKenzie Johnston 2002, pp. 151-152; Taylor 2007, pp. 146-149, 165-166). The only hint that other members of the family had any input seems to be a minor dispute over Miller's disagreements with the Free Kirk's leaders, in which Hugh the younger claimed that Bayne's treatment had been with his concurrence - rather unconvincingly, as he was only a teenager when Bayne was working on the book (Anon. 1870g, 1871i; Fairly 1871; H. Miller the younger 1871; Wood 1871). We suspect that this was a polite fiction to screen his mother from involvement in a public dispute, as demanded by Victorian notions of ladylike propriety. His sister Harriet was older, but she could not have enjoyed the book's portrayal of Miller's suicide as triggered by her school homework, Cowper's poem *The Castaway*. Marian McKenzie Johnston once pointed out to us that Harriet, though still a teenager, had to take on premature responsibility almost from the moment of the discovery of her father's body (though recollections vary, e.g. Waugh 1900; Moir 1901). She had to give up her education to support her mother, and cope with her breakdowns, affecting her own health and outlook (Anon. 1883c; Allen 1999, 2005; Sutherland and McKenzie Johnston 2002). Even sorting through her father's collection at Shrub Mount, as we infer earlier, would not be a happy task for someone who was still in her teens.

Bayne overemphasised Miller's earlier life, already superbly covered by Miller's autobiography *My schools and schoolmasters*, and wrote too little on Miller's Edinburgh years from 1840 and his wider journalism. We suspect that he lost interest and energy as the project wore on, distracted by his own work as an editor, during which he was bankrupted in a disastrous investment in one newspaper, and was sacked from another for being theologically unsound (Anon. 1896b; Bayne 1901). But another reason might be the availability of significant letters. This was near-total up to 1840 thanks to Miller's wonderfully convenient Letter-book (discussed below), which Bayne undoubtedly used (e.g. 1871, 1, pp. 65, 105-117, and 160). But after 1840? It is possible that Lydia had failed to provide him with materials, given her moves around the country, her intermittent illness, and the deposit of family papers in various locations (e.g. Miller 1896, p. l; Sutherland and McKenzie Johnston 2002). But there is evidence for Bayne's own mismanagement. In his biography of Robert Dick and Charles Peach, Samuel Smiles (1812-1904) publicly complained that Bayne had said 'not a word' about Dick, 'Hugh's greatest helper' who 'had given all his best fossils to Miller', although 'Dick returned to Mrs. Miller all the letters he had

received from her husband […] and more than a hundred of Dick's letters were in the possession of the biographer' (Smiles 1878, pp. 236-237). This provoked an unedifying exchange in the *Athenaeum*. In summary, Bayne whined somewhat inconsistently that Lydia had not passed him the letters *from* Miller *to* Dick, probably because the topics were already covered by Miller's books; Miller was too busy to write letters anyway; and if there weren't any letters from Miller to quote, he couldn't very well mention Dick in the *Life and Letters*. Smiles wasn't having any of it. He pointed out that many letters from Miller to Dick had been sent to Lydia for the Bayne book, and that the Dick biography had been held back while Hugh Miller the younger searched for those letters for more than a year, but they were still missing (Bayne 1879a, 1879b; Smiles 1879; this little spat did however turn up further Dick-Miller correspondence; Anon. 1889d). And when, in 1871-1875, Archibald Geikie was writing his biography of Roderick Murchison, Hugh the younger had difficulty locating Murchison's letters written to his father as Bayne had claimed that the letters did not even exist and had 'throughout shown himself exceedingly careless as regards the papers entrusted to him' (EUL-SC, Gen 525/16, Geikie Correspondence, Marr-Neaves, Miller to Geikie, 5 December 1874; the sole Murchison to Miller letter printed *in extenso* is in fact that for 23 June 1838; Geikie 1875, 1, pp. x, 259-260, 1924, p. 160).

17.3 The Davidsons in Australia

It is therefore not entirely surprising that Harriet Davidson and her husband John decided to write a new biography of her father, given the problems with the official one; presumably it was intended to cover the years after 1840 in particular. Both had literary careers to develop, and Davidson had already edited *Leading articles*, a selection of Miller's work from the *Witness*, for publication (Miller 1870; McKenzie Johnston and Taylor 2002). However, in 1869, Davidson was sent to the Chalmers Free Church (now Scots Church) in Adelaide, South Australia. The Davidsons left London on the clipper *Carnaquheen* on 19 March 1870, arriving on 25 June, and John was inducted as minister of Chalmers Church on 2 August (Anon. 1870a, 1870b, 1870c, 1870d, 1870e; Walker 1972; Sutherland and McKenzie Johnston 2002, p. 153). Inside the church today is a memorial plaque: (see next column).


To the Memory of
The Revd John Davidson M.A.
Minister of Chalmers Church 1870–77
Born at Kinghorn Fifeshire 1st July 1834
Ordained by the Presbytery of Dumfries
17th March 1864

First Hughes Professor of English Language
& Literature & Mental & Moral Philosophy
In the University of Adelaide

DIED 22nd July 1881

A loyal friend
An eloquent preacher

Also Harriet his wife
daughter of Hugh Miller of Cromarty
Died 21st Dec 1883.

The plaque rather meanly describes Harriet merely as daughter and wife, when she was an important early Australian woman writer in her own right (Allen 1999, 2005; Blaikie and Perkins 2004). But it is a testimonial to Hugh Miller's reputation to the furthest ends of the Earth, albeit in a Free Kirk corner of the Scottish diaspora.

The Davidsons left for Australia in March 1870, but Bayne's book only appeared in 1871, with proof corrections completed in December 1870 (Anon. 1870g, 1871i). We do not know if the Davidsons took the papers with them after (partial?) retrieval from Bayne, or if the papers were sent out later on retrieval from Bayne. The known evidence for what happened next is as follows:

1. In 1874 Hugh the younger retrieved correspondence between his father and Murchison from Harriet in Australia, for Geikie's memoir of Murchison. He had to apologise to Geikie for her dilatoriness and the confusion caused by Bayne (EUL-SC, Gen 525/16, Geikie Correspondence, Miller to Geikie, 31 November and 3 and 5 December 1874).

2. Smiles, in his biography of Dick and Peach, noted that Hugh 'kindly sent me Dick's letters to his father; though Hugh Miller's letters to Dick […] are supposed to be in Australia' (Smiles 1878, p. viii). The missing letters were apparently taken out to Australia by Harriet Davidson, but were absent from a parcel of letters which she sent, presumably to Hugh the younger, 'in August last [presumably 1878]' (Smiles 1879).

3. Hugh wrote on 6 October 1878 to Professor Thomas McKenny Hughes (1832-1917) of the University of Cambridge, to offer him, doubtless in connection with Hughes' biography of his predecessor Adam Sedgwick, a number of

Sedgwick's letters to his father which had just come into his hands, presumably in the 1878 parcel. He confirmed that his father's correspondence had been with his sister in Australia for several years and had been 'singularly slow' in coming despite requests - the letter leaves it open whether he actually received the correspondence as a whole (CUL Add. 7652, VB.11). It is possible that Hugh had specifically asked for the Sedgwick letters and waited till he had actually received them before contacting Hughes, given his previous embarrassment over the Murchison letters. Clark and Hughes (1890, II, pp. 89, 147-149, 159-162, 288) did use some letters sent to Miller.

4. W. Keith Leask, a later biographer of Miller, was informed, presumably around 1894-1895, by Bessie Mackay 'that the letters and materials sent out to Australia to form the basis of the projected biography by his son-in-law and daughter disappeared, and have never been recovered' (Leask 1896, p. v; Taylor 2016). Marian McKenzie Johnston (pers. comm. 2000) suggested to us that Bessie's comments should be taken seriously, as family correspondence showed that she was evidently the most practical and efficient of the four siblings.

5. At the 1902 celebrations at Cromarty, Arthur Bignold M.P. commented: 'I have been told that the materials and documents which he [Miller] left behind him were sent to Australia for the compilation of a projected biography by his son-in-law, and that they have, for the time, disappeared; but the late Mr Christie, the famous auctioneer, once said to me that he did not much believe in things being lost, and that he fully expected, sooner or later, that the stones out of Aaron's ephod would pass through the King Street salerooms [i.e., Christie's]. So, may be, those papers will be recovered, and the world know more of Hugh Miller' (Anon. 1902a, p. 8). Family members, friends and colleagues were present, and could have corrected him if need be. (Any Bible-literate Scot would instantly recognise the aptness of the reference to Aaron's ephod, by someone speaking on the hill above the graveyard with some of the slabs lettered by Miller himself. *Exodus* 28: '11. With the work of an engraver in stone […] shalt thou engrave the two stones with the names of the children of Israel […] 12. And thou shalt put the two stones upon the shoulders of the ephod [priestly robe] for stones of memorial unto the children of Israel […].')

Old plans are apt to be overridden by new priorities when one moves to a new life, and there is no evidence that the Davidsons actually started their biography. In 1876, Davidson became a founding professor at the new University of Adelaide, resigning his Chalmers Church living in 1877, but remaining an active preacher and lecturer. He moved away somewhat from the strict doctrines of the Free Kirk (Walker 1972), which perhaps made writing about the Disruption less attractive. In any case, he seemingly had other things to do in the evenings, for he died in his forties from a liver complaint on 22 July 1881 (Walker 1972). Family tradition blamed this on his excessive drinking, especially with fellow Freemasons, and although such things can be exaggerated, it should be noted that the impact of alcoholism on family life was a theme in Harriet's novels for adults (Allen 1999; Marian McKenzie Johnston, pers. comm. 2000; Henry McKenzie Johnston, pers. comm. 2011). Harriet herself died on 21 December 1883 after a long illness (Anon. 1883c). Her will (APR, proved 4 January 1884) throws no light on the fate of the papers, apart from a variant manuscript of 'the Traditions of Cromarty', i.e. *Scenes and Legends*, which was left to the University of Adelaide (now in AUL; Anon. 2009). Her orphaned daughters were sent to Britain where they were met by Bessie and Hugh the younger, who acted as their financial guardian (Marian McKenzie Johnston, pers. comm.; NRS, Edinburgh Sheriff Court Inventories SC70/1/347, probate inventory, Hugh Miller [the younger], 9 March 1896).

Harriet's son, John Hugh Miller Davidson (1864-1921), was left in Australia, aged just 19. He was then a Government surveyor, and later an engineer with the Great Northern Railway at Quorn north of Adelaide, and after a spell in business he returned to Government service in the department of the Engineer-in-Chief (Anon. 1921a, 1921b). He is known to have made donations of Miller family-related items to Adelaide institutions:

1. In 1886, he gave several items relating to Hugh Miller to the Public Library, Museum, and Art Gallery of South Australia (Annual Report for 1885, p. 10). This included one of his grandfather's books and two albums of articles from *The Witness*, including one of 'Leading Articles from the Witness Newspaper'. This last was surely the album used by John Davidson to produce the published selection *Leading Articles*, which was evidently signed off when the family was in London waiting to depart for Australia (Anon. 1870a; Miller 1870, p. vi). The other album was of certain editorials from 1840-1843. He also gave a statue of Hugh Miller by 'Mrs D.O. Hill', about 'two feet high'. This must be the statue of Miller 'his earnest gaze fixed upon a stone which he holds in his hand' displayed in a local exhibition

by his father John Davidson in 1870 and left to John Hugh by his mother in her will (Anon. 1870). The description of the 1870 statuette matches the 1860s marble statue by Amelia Paton Hill now in NMS (Figure 18), except for size. The statuette was almost certainly the actual maquette (initial design scale model) for the statue, or possibly a plaster cast of the maquette. The maquette had been exhibited in Edinburgh in 1869 (Figure 18; Anon. 1869; Taylor and Morrison-Low 2017). The presence of the statuette in the Public Library, Museum and Art Gallery in 1886 can be confirmed (Fine Arts Committee minutes, 15 July 1886) but its fate thereafter is unknown and it has not been located in the successor institutions (Tony Magnusson, Jin Whittington and Peter Lane, Art Gallery of South Australia; Mary-Anne Binnie, South Australian Museum; Anthony Laube, State Library of South Australia, pers. comms. 2017).

2. The Barr-Smith Library, University of Adelaide, contains a small file of papers and a scrapbook mostly on John and Harriet Davidson, donated by John Hugh in 1911. His covering letter of 17 June 1911 confirmed that the scrapbook contains the 'biographical references to my late parents which I possess […] with other matter'. The University was evidently documenting Davidson as one of its founding professors, in connection with the installation of the Scots Church memorial plaque on Sunday 18 June 1911 (Anon. 1911c).

Initial inquiries at the South Australian Museum (Mary-Anne Binnie and colleagues, pers. comm. 2013 and 2017), the Royal Society of South Australia (Kim Critchley, pers. comm. 2016), and the Central Library, Flinders University (Gillian Dooley, pers. comm. 2012), and appeals in newsletters and bulletin boards (Taylor and Anderson 2012b, 2012c, 2012e, 2012f), have so far failed to trace further Hugh Miller material in Australia. John Hugh did make a few donations, including geological specimens, to the South Australian Museum, but, from the recorded localities, they seem to be local material unrelated to his grandfather (Mary-Anne Binnie, pers. comm. 2013). Interestingly, a letter by his mother Harriet Davidson to her brother Hugh and his wife Jeannie of 27 November 1877, during a stay with the geologist and family friend the Rev. W.S. Symonds (1818-1887), in his rectory at Pendock in Worcestershire, noted how well John Hugh and Symonds got on, the 'old naturalist' patiently answering the many questions from the 'young one' (copy held by MAT, courtesy of Marian McKenzie Johnston).

John Hugh died at his home in Norwood, Adelaide, on 14 January 1921. His will (APR, proved 8 February 1921) left everything to his wife Jessie, without mentioning any papers. Jessie died in 1952, and her own will (APR, proved 23 October) also mentioned nothing of relevance except that the residue of her estate should be sold. This was perhaps the source of the Miller family material which the National Library of Scotland purchased in August 1960 from one Gilbert Ponder at an Adelaide address not far from Jessie Davidson's (Ms. 7528; NLS records). Ponder was accountant to the booksellers F.W. Preece and Sons, and the author of *Mr Goggins comes to town*, a very short book on the artist Paul Gauguin's visit to Australia in 1903 of which only thirty copies were published (Ponder 1970; Dutton 1988; Mick Treloar, Michael Treloar Antiquarian Booksellers, Adelaide, pers. comm. 2017). He also offered Miller's 'telescope', but this offer was not taken up by the National Library and its present location and nature remain unknown (though, interestingly, in *Sir Gilbert's Children*, Sir Gilbert denies wanting a telescope or at least a 'real big one'; Davidson 2011, p. 44). This NLS acquisition of 1960 comprises Davidson family papers and a relatively small and rather mixed assortment of Miller material, including some celebrity letters (from the mineralogist and art critic John Ruskin (1819-1900), for instance), but also some items from Miller's forebears. It gives the impression of having been picked out, possibly in a hurry, as of obvious sentimental or curiosity value. This could have happened at any time from even before Harriet's death in 1884 right through to the 1950s. So we are not much wiser about what happened to the bulk of the papers. But John Hugh cannot have found them convenient when he was working as a young surveyor. Perhaps his 1886 donation was the result of a sorting-out and general disposal. We do not think John Hugh would have discarded the general family papers out of lack of respect for his illustrious grandfather, for he evidently retained his full baptismal name John Hugh Miller Davidson for life, though he was known in the family as John Hugh to differentiate him from his father. One would think he was aware of their importance, certainly if Hugh the younger sought to retrieve them. Jessie later complained to a relative about the mass of papers left by John Hugh, but there is no guarantee those included the Miller papers (Marian McKenzie Johnston, pers. comm. 2008).

The Friends of Hugh Miller have recently purchased a mourning brooch inscribed and dated for Hugh Miller, with a lock of hair, from Canberra (HMBCM; Nigel Trewin and Martin Gostwick, pers. comm. 2008; pers. obs.). But it throws no light as Canberra was a new town of the 20th century and its inhabi-

tants were almost all incomers. The most obvious source is the Davidson family, but it is not mentioned in the official transcript of Harriet's will, unless 'my morning [sic] brooch with my mother's hair in it' was a slip for 'my mourning brooch with my father's hair in it', given that it was listed in tandem with 'my gold hair ring with my mother's hair' (Marian McKenzie Johnston, pers. comm. 2008).

17.4 The cottage up to 1953, and the Hugh Miller Institute

The main corpus of Miller papers at the National Library of Scotland came to NLS in 1953 as a deposit by the National Trust for Scotland during the reorganization of Hugh Miller's Cottage where the environmental conditions were unsuitable for their storage (NLS Mss. 7516-7527; NLS records; *pace* Shortland 1996b, pp. 1-2). Some items were however conserved and returned to Cromarty for display, in parallel with the fossils already discussed above, and with copies retained in NLS.

Initial inspection of the surviving documents from the cottage and now in NLS suggests a relatively small selection, often of sentimental or personal interest, such as a Civil List Pension grant signed by Queen Victoria to Lydia in recognition of her husband's services, and letters from famous names, as well as papers to do with Miller's forebears and childhood, plus a mixed bag of assorted items. This is consistent with the common-sense assumption that Hugh the younger lodged some manuscripts in the cottage displays from the start in 1885, as the visitor reports cited earlier show, and that he and other family members added others over the years (e.g., Anon. 1885b, 1889b). Some items are likely to have come through Lydia to Hugh the younger and her other children, such as letters to Miller's Edinburgh addresses and the Civil List pension warrant. Other items probably came from the Cromarty side of Miller's family, particularly the Williamsons. Those include letters to his mother and step-father, and their children, especially Miller's half-brother Andrew, a likely source for some items which probably stemmed from the *Witness* office and printshop where he worked (see below). The problematical memoir of Hugh Miller by the younger Andrew's son the Rev. Hugh Miller Williamson (1855-1922), and written about 1880-1881, plainly came from this side of the family. It contains some original letters, showing that the Williamsons retained some papers at least till the 1880s. We suspect that the memoir actually arrived at the cottage rather later, perhaps on Williamson's death in 1922, given its ferocious criticisms of Lydia, no doubt in response to her portrayal of his grandmother (Taylor 2007, 165-166).

What remains unclear is just when Hugh the younger turned his thoughts to using the manuscripts for the cottage exhibition as opposed to simply keeping them safe (for instance, in his attempts at retrieval from Harriet in Australia). He is not known to have planned a biography of his father of his own, beyond a short memoir and the *Dictionary of National Biography* entry (H. Miller the younger 1894; Taylor 2017). It is also hard to be sure in detail, unless something was mentioned in the brief press reports of the cottage, what Hugh the younger actually put on show there, and what he withdrew on occasion, or simply retained in his hands. He probably provided the Miller material in the temporary exhibition at the 1888 General Assembly of the Free Church, and certainly some at least of it at the 1893 Assembly - the latter of which, for instance, included the brown earthenware bowl used at his father's baptism (Anon. 1888a, 1893a). There might have been losses by other hands, too. These were not necessarily theft. Because the cottage and its contents were in family ownership, it is possible that a family member withdrew items which later went astray when the link was forgotten.

The Hugh Miller Institute was another potential nucleus towards which papers and personalia gravitated. Although the original notion of the Institute's use as a museum fell by the wayside, it did contain some Milleriana such as a painting of Hugh Miller made in 1902 by a granddaughter, and the desk he used in the Commercial Bank in Cromarty, donated in 1936 on the occasion of the lecture by Ramsay Macdonald (Anon. 1936b). People seem to have confused the Institute and the cottage museum over the years and it is not always clear what actually happened to donations reportedly to the Institute such as a manuscript of Miller's Exeter Hall lecture of 1854, and two Australian geological specimens, in 1904 and 1937 respectively (Anon. 1904a, 1937d). A half-sister of Miller's was reported as living in Breslau, Ontario, in 1875, with 'relics' of him (Anon. 1875). This must be Catherine Williamson (b. 1822) who married one Robert Williamson in 1848 and emigrated to North Dumfries, near Galt and Breslau (mcs of daughters Catherine, 1883, and Harriett, 1881; Marian McKenzie Johnston, pers. comm.). Many years later, a patient - presumably a member of her family - offered the choice of 'Miller's hat' or a manuscript of *Scenes and Legends* to a Canadian doctor. The significance of the hat, apart from its ownership, presumably lay in its exceptional size, though as Miller himself was wont to point out, one of the few people he had met with a head as large as his was a 'poor idiot lad' (Taylor 2017, p. 106). However, the doctor must have picked the MS, for it must be that sent to Provost Bain of Cromarty by H.E. Young, lat-

terly Provincial Health Officer in Victoria, British Columbia, in 1934 (NLS records). It was placed in what was confusingly reported as the 'Hugh Miller Institute' and Miller's 'birthplace' (Anon. 1935b). There appears to have been some rationalisation in the post-war years, with the transfer of at least one partial manuscript to NLS (now Ms. 7529; NLS records), and possibly other material to the birthplace cottage. Further investigation is needed to sort those out.

17.5 The Letter-book and documents kept by Hugh Miller the younger

Hugh Miller kept a letter-book from 1821 to 1839 in which he recorded copies of at least his more significant letters, including the two long letters that make up his 'Memoir' (Miller 1995). This most important bound volume, which throws considerable light on his early geological work and much else, is now in the Library of New College, University of Edinburgh (EUL-NC Mil. 1.1). Bayne (1871) obviously drew upon it for the *Life and Letters* and perhaps also Geikie (1875) did via Hugh the younger. It is not clear whether the Letter-book ever went to Australia with the Davidsons, but if it did, it must have been sent back, as it contains an annotation dated 1881, in what may be the handwriting of Hugh Miller the younger (EUL-NC Mil 1.1, letter 163 first series). We have been unable to find reference to the Letter-book being in the cottage museum.

Correspondence with it shows that it was offered to New College for ten guineas (£10 10s) by one Henry S. P. Hindley of Norwood, London, sometime around May-June 1936, purportedly on behalf of anonymous owners who were poorly off. This must be the businessman Henry S. P. Hindley (1870-1954) who had on 19 September 1903 married Jeanie Moffat Carruthers (bap. 1872), daughter of none other than William Carruthers (1830-1922), formerly a geologically minded trainee minister at the Free Church of Scotland College, and latterly Keeper of Botany at the British Museum (Natural History), and a noted worker on fossil plants, including those of the Jurassic (Carruthers 1870; Anon. 1912e). This explains why her brother, Dr Samuel Carruthers M.D., had suggested that Hindley try New College. How the Letter-book arrived with Hindley is not known, but it may be significant that Miller's biographer Peter Bayne died in Upper Norwood in 1896 (England & Wales, National Probate Calendar (Index of Wills and Administrations), 1896). Perhaps still more significantly, the only child of Hugh Miller the younger and Jeanie Morison, Captain Hugh Morison Miller (1880-1934), died while resident in Norbury not far away, just two years before Hindley's offer (Anon. 1934; NRS, National Probate Index, Calendar of Confirmations and Inventories, 1934, page M 62). The matter raises the question of what other documents Hugh Miller the younger might have held and whether those were placed in the cottage or passed to his descendants. However, he unhelpfully died intestate. His widow Jeanie - who was very much part of the literary scene - mentioned literary personalia from her own side only in her much later will, which might at least suggest that any Milleriana had already gone to the cottage or other family members (Taylor and Anderson 2017b; NRS, Edinburgh Sheriff Court, Wills and Testaments SC70/4/575, Jean Morison Morison, proved 10 March 1924).

17.6 Lydia Miller's 'diary' and the family papers

Lydia Miller Mackay (1873-1935), daughter of Norman and Bessie Mackay, published selected passages in *Chambers's Journal* of what was purported to be a 'diary' of her grandmother Lydia Miller (L. Miller 1902). However, Lydia Miller's original document was in fact a retrospective memoir of her life up to the move to Edinburgh in 1840. One internal reference (assuming this was not added later) indicates that it was written after Miller's death (L. Miller 1902, p. 515). Perhaps it was written for Bayne's assistance when he was working on the *Life and Letters*. He certainly used her text verbatim in places, as noted above, which helpfully confirms that Lydia Mackay had not re-edited an original diary into memoir form.

Lydia Miller's papers passed to their daughter Bessie Mackay, and then, as part of a large accumulation of family papers, to Bessie's children, first Lydia Mackay and then her brother Hugh Miller Mackay (1875-1943) (Marian McKenzie Johnston, pers. comm. 2001). This accumulation was lost when Hugh Mackay's flat at 21 Gloucester Place, Brighton, was destroyed in an attack by *Luftwaffe* fighter-bombers on 29 March 1943 and he and his wife were wounded, Hugh dying on 22 April (Rowland 1997, pp. 53-56; Sutherland and McKenzie Johnstone 2002, p. ix-x; McKenzie Johnston 2007, p. 7; Anon. 1943a, 1943b; Commonwealth War Graves Commission *Debt of Honour Register* on www.cwgc.org, as 'Miller-Mackay'). However, a small selection, used later in the biography of Lydia by Sutherland and McKenzie Johnston (2002), had already been given to Bessie's niece Lydia Middleton, daughter of John and Harriet Davidson (letter of 6 November 1934 to her sister Harriet Felkin *née* Davidson in New Zealand; copy held by MAT, courtesy of Marian McKenzie Johnston).

Much of the lost material undoubtedly related to the family after Hugh's death, rather than Hugh himself. However, it would doubtless have thrown light on the fate of the Miller collections and the origin of the cottage museum. Presumably, also, it included Lydia Miller's retrospective memoir.

17.7 *The Witness*, the printing firm of Miller & Fairly, and legal papers

The files of *The Witness*, and of its parent firm of Miller & Fairly, are not known to survive as a whole, though some surviving documents appear to stem from the company's offices. Miller's partner Robert Fairly is the known source for a brief note, now in CCH. Rather disappointingly, Fairly's manuscript memoirs with 'racy stories […] of Disruption times' were never published, so far as we know (Anon. 1885a).

Andrew Williamson the younger, being the office manager, is a likely source for some of the surviving fragments of corrected proofs and manuscripts which probably stemmed from the *Witness* office and printshop. One example is indeed annotated as being obtained from him immediately after Miller's death (now in a private collection, pers. obs., MAT).

It is possible that Williamson or Fairly, rather than the Miller family itself, was the source for several of the scrapbooks in which original *Witness* articles were pasted, either as a record or to make up the copy for the printer to typeset the books which were sometimes derived from those articles. It would be valuable today to have those back files with annotations identifying the writer, given the uncertainty over the attribution of anonymous articles, and to see how they were edited. The album presumably used for *Rambles of a Geologist* is held by HMBCM (Martin Gostwick, pers. comm. 2011). That presumably for *My schools and schoolmasters* (Miller 1854) was, remarkably, 'picked up' in Cromarty by one A. J. Stewart, an Inverness grocer (Anon. 1888d). One assumes it was bought from a local, probably a member of the Williamson family after Andrew's premature death noted earlier. It surfaced in 1892, leavening a temporary exhibition of 'dolls and toys' at the Young Men's Christian Association at Dundee, and again in 1903, owned by one Dr Forsyth of Abernethy, at the 'Jacobite exhibition' in Inverness (Anon. 1892e, 1903b). Two albums of this kind evidently went to Australia, and are now in the State Library of South Australia (see above).

No papers relating to the family and the firm of Miller & Fairly are known to survive with W. & J. Burness, the family lawyers, and the descendant firms, Burness Paull LLP and Turcan Connell (Simon Mackintosh and Ian Wattie, pers. comms. 2016; Sir Charles Fraser, pers. comm. 2017).

17.8 Miller's library

We have not investigated the dispersal of Miller's own library, except to note that some at least of his books were in property which Lydia disposed of in the 1860s in contravention of her children's rights, to Harriet's evident distress (Sutherland and McKenzie Johnston 2002, pp. 154-155). Interestingly, in 1956, the bookseller Henry Sotheran Ltd offered a copy of *Dissertation on the Antiquity of the Earth* of 1785 by James Douglas, ex libris Hugh Miller and then W.S. Symonds (catalogue 923 of 1956, item 395; Hugh Torrens, pers. comm. 2017).

17.9 Personalia

Personal objects associated with Miller have proved valuable in creating exhibitions about his life and work. We do not attempt a full listing, but give some examples to illustrate the problems involved and the need for critical assessment in the absence of contemporary documentation.

There can hardly be a more Millerian object than one of his geological hammers. Klemun (2011, p. 93) noted that the geological hammer was the 'trademark and public sign of the geologist', and that Miller himself described geologists as 'gentlemen of the hammer and chisel'. What is purportedly one of Hugh Miller's hammers is in the collection of the Sedgwick Museum, University of Cambridge, after passing through various hands, including those of the geologist Robert Elliott of Camberwell (*c*. 1826-1896), and is presently on loan to HMBCM. There is a fascinating letter in the associated correspondence by one J.W. Patterson dated Ripon on 10 July 1868 (CAMSM archives, Reference SMES DDF 393). It states that the hammer was the smallest of several made for Miller by Andrew Williamson 'nailer', who had married Miller's mother, and who 'repaired' it 'when it was worn nearly done [sic]', presumably by welding on new metal in the smithy. 'When H.M. died, his Father in Law (who generally) went out fossile hunting with me, gave it me in the presence of H.M. mother, and I have used it ever since'. One might be surprised to find a Williamson giving (or selling?) one of Miller's favourite hammers to some Yorkshire tourist. But in fact Lieutenant, later Captain, Patterson R.N. had commanded the Coastguard at Cromarty from 1844 to 1862, when he and his wife retired to Ripon (Anon. 1844, 1862, 1874a). It is very likely that they met Miller on his visits to Cromarty, for instance through Catherine

Allardyce and the middle-class social network, which Patterson's wife Catherine had mobilised to found the Dorcas Society (Alston 2006, pp. 269-270). Patterson's reference to Miller always carrying it in his pocket at Cromarty suggests that the hammer was used for geological work, rather than his earlier work as a stonemason and monumental mason, which implies that it was made sometime from the 1830s on, so at the cottage forge, and repaired there. Patterson evidently muddled his dates or his persons, for Andrew was Hugh's stepfather, and predeceased him, while the actual father in law, William Fraser (d. 1828), was long dead. Perhaps Patterson had muddled Daniel with Andrew. But the detail of a Williamson making the hammer is so unusual - and not to be gleaned from Miller's books - that Patterson's story is otherwise credible.

There is already evidence that members of the Williamson family acted as tourist guides for Miller fans (Anon. 1859d; Taylor and Morrison-Low 2017). However, Patterson would hardly need to be guided after the first visit. It is possible that he and Andrew simply enjoyed each other's company, but a more likely explanation is that Patterson was in the habit of hiring Andrew (or whoever it was) to carry his finds. This was not just to make life easier. In the mid-19th century it was a serious social faux pas for a middle-class person to be seen to engage in any physical labour, even carrying a bag of specimens, and this was a real problem for natural scientists in the field (Taylor and Levitt 2016). Dr George Johnston (1797-1855), marine naturalist of Berwick upon Tweed, was so worried about being seen to carry home an unexpected prize find of a rare ophiuroid, in view of his status as a local doctor, that he left the specimen on the beach, and thereby lost it (Davis 1995, pp. 357-358). Hugh Miller might have felt able to ignore this, especially in his native Cromarty, but Patterson could not, as he had to keep up his position as an officer in the Royal Navy.

Fortunately, the Williamsons seem to have avoided any temptation to multiply Hugh Miller's hammers in the style of mediaeval pieces of the True Cross. 'Miller's favourite hammer' in the 'Victorian Exhibition' in London in 1891 was the one Patterson had bought (Anon. 1891c; CAMSM archives, Reference SMES DDF 393). Otherwise we know of only one other soi-disant example of these particular geological relics, the hammer now in the Hunterian Museum & Art Gallery, Glasgow (GLAHM 111853). As the museum website points out, its documentable provenance is incomplete, going back only as far as 1891 to a 'Tom Hepburn', and later passing through the hands of a Madame André Breton of Paris in 1947, who might or might not be the wife of André Breton (1896-1966), the Surrealist poet and anarchist, who might or might not have been pleased with such an oddity for his collection (http://www.huntsearch.gla.ac.uk/cgi-bin/foxweb/huntsearch/DetailedResults.fwx?collection=all&SearchTerm=111853&mdaCode=GLAHM , accessed 13 June 2017). Even so, Miller has been done quite well by, in comparison with poor Mary Anning (1799-1847) of Lyme Regis, whose 'hammer' turned out to be a British Army entrenching tool of the 1880s (Bull 2013; Richard Bull, pers. comm. 2013). What seems to have happened here is that undocumented material accrued a spurious association over the years simply by being in the relevant local museum, in this case on the site of her house, and this is always risky if there is turnover of staff and volunteers. In the case of Hugh Miller, for instance, various unlabelled and undocumented fossils existed loose in the Cottage, outside the displays, when Frieda and Martin Gostwick arrived in the 1980s (pers. comm.); they were probably a mix of casual deposits from visitors and any leftovers from the mid-20th century display reorganizations, with (one hopes) few if any specimens from Miller himself. But in the absence of documentation, none were, so far as we know, officially attributed to him.

Sometimes provenance is confirmed by a contemporary inscription on the object itself, as with the inscribed silver platter given to Miller by the backers of *The Witness*, which is now in Inverness Museum and Art Gallery (INVMG.1992.190.002; Taylor 2007, pp. 140, 144). Rather trickier is the microscope traditionally ascribed to Miller (HMBCM). It is of a common and cheap design dating from around 1845 and unlikely to have been used by Miller himself, yet there might still be a link, for it is the sort of thing Miller's children might have used (Morrison-Low and Nuttall 2003, pp. 223-224). So it is interesting that Harriet Davidson's semiautobiographical novel describes her brother 'Dick's' space in the children's room: '[o]n the window sill […] stood the boy's microscope and little box of preparations' (Davidson 2011, p. 3; McKenzie Johnston 2011, p. v). Harriet described elsewhere the arrival of a far finer microscope in a mahogany box with an inscribed label reading 'Presented to Sir Gilbert Munro by a few of his friends' and a box of pre-prepared slides including 'preparations' of 'fossil and modern woods and plants' (Davidson 2011, pp. 46-47). Of course, the real Hugh Miller commissioned his own 'preparations' (Morrison-Low and Nuttall 2003; Anderson 2005). And in any case no such presentation to the real-life Hugh Miller is known, and it is not clear that he owned anything more complex than a botanist's (simple) microscope (Morrison-Low and Nuttall 2003, pp. 221-223; McKenzie Johnston 2011, p. v).

Perhaps Harriet's imagination combined elements of the inscribed silver platter, and an erroneous account of Charles Peach's acquisition of a fine microscope quoted (and there corrected!) in Smiles' biography, which she surely read for its mentions of her father (Smiles 1878, p. 248; Nuttall 2004).

An unusual example of personalia which we have not located is the old safe from *The Witness* newspaper office, which was reportedly being given to the Museum of the United Free Church in 1902 - though a writer in the *Inverness Courier* felt that 'even a more graceful act' would be to give it to the proposed Hugh Miller Institute in Cromarty (Cochrane 1902). The complication here is that the United Presbyterian Church and Free Church had, in 1900, united to form the United Free Church, but a section of the Free Church rejected the union. In a later court case, the (continuing) Free Church was awarded, amongst other things, the natural science collections from the Museum (Swinney 1982).

An interesting item deserving further investigation is the three-dimensional paper model of the classic Cromarty Old Red fish '*Pterichthys*' (now *Pterichthyodes*) in its unsquashed state, presently in NHM, reportedly made by Miller to work out the three-dimensional skeletal structure. It was somehow acquired by D'Arcy Wentworth Thompson (1860-1948), biologist and mathematician, and donated to the museum in the 1890s (Forey 2003). It would be useful to know if other copies exist in other museums, to corroborate the attribution. They would be valuable in showing a stage in Miller's thinking about the structure of that fish (Bob Davidson and Nigel Trewin, pers. comms. 2008).

Those examples illustrate the potentials, but also the problems, posed for the curator by Miller's personalia. It is beyond the scope of this paper to give a full listing of personalia and to discuss the related issue of portraiture and imagery of Hugh Miller, including photographs, and sculpture, more generally. But the Amelia Paton Hill statue figured here, and the photographs discussed elsewhere in this issue, show how valuable such items are in exhibitions and writings about Miller, as well as being of considerable interest in their own right (Figure 18; Gostwick 2005; Stevenson 2017; Taylor and Morrison-Low 2017).

17.10 The fate of the Miller papers

So far as we can tell, therefore, most of Miller's papers were variously lost or discarded by his biographer, in clearouts at the *Witness* offices and in Australia, and destroyed by the *Luftwaffe*. Shortland (1996b, pp. 1-2) suggested that the surviving Miller papers in NLS were mostly bought from a dealer in Perth, Western Australia, but we have shown that only a small proportion came from Australia, and that from Adelaide rather than Perth. The apparent conflict between the existence of the family papers in Australia, and their presence in the cottage displays from 1885, can now be resolved. The Davidsons did not take all of Miller's papers and even returned some to Hugh the younger. Even so, there was not that much in the cottage, and nothing like the mass of papers one would need for a serious biography, as Bessie Mackay was plainly aware. Sadly, the decision to prepare a suitable biography, and to gather the materials for it, evidently caused problems twice over, for those seeking to write about Miller himself, but also those writing about his correspondents. Such a gathering together could flush out documents, or confirm their prior loss, but it could actually do damage by leading to the division of sets of correspondence, with differential losses, and obvious implications for the completeness and balance of the surviving record today, as in the case of Roderick Murchison's own correspondence (Collie and Diemer 2004).

A full census of known manuscript material and its locations over time, perhaps as an online database, would throw light on those issues, and be a valuable research resource in itself. However, caution is needed in interpreting newspaper reports, for obvious reasons. For instance, Miller's suicide note has not been traced, though its text has been published often enough. The obvious assumption is that it was destroyed out of consideration to the family. However, at the Portobello commemoration of 1902, William Baird (c.1844-1926), local banker and historian, 'produced a book which at one time formed a part of Miller's library, and in which on a fly-leaf was written his pathetic farewell message […] handed round the company for examination' (Anon. 1902h). Presumably Baird had simply copied it in from another source; but we are left in doubt. It is also worth noting that we have been unable to trace copies of circulars for the appeal to build Hugh Miller's Monument at Cromarty, c. 1858-1859, and for the 1902 centenary celebrations at Cromarty.

18. Discussion: Hugh Miller and his museums

This paper has shown how Miller's collection evolved from a private collection into one incorporated into formally public institutions, under varying philosophies of specimen documentation, exhibition design, and funding regimes.

Curation. The main curatorial problem is undoubt-

edly the proliferation of documentation systems. Further curation will be needed to tighten the still tentative conclusions offered here, including examination of patterns within and between the numbering systems. Examples of the problems of curating historical collections integrated with a larger museum collection can be seen in the collections of Etheldred Benett (1775-1845) of Wiltshire, in the Academy of Natural Sciences of Philadelphia (Torrens *et al.* 2000), and Julius Ewald (1816-1896), in the Museum für Naturkunde, Berlin (Nadim *et al.* 2015). However, those studies also demonstrate the unexpected fruits for modern research that such work can produce.

An unexpected insight from our work has been the different practices of museum curators and librarian-archivists. Curators are apt to label a specimen with its collector and, equally instinctively, assimilate that information when examining specimens. This is not the case with manuscripts, and one has to ask explicitly for provenance data. But, conversely, the National Library of Scotland has carefully archived exhibition scripts where museums have not done so. We have also been struck by the contrasting fates of Miller's fossils and manuscripts. The inconveniently heavy and bulky, but financially valuable, fossils were (mostly) disposed of almost at once, safeguarding their future, but the family's ambitions for the papers had unfortunate if unintended consequences.

The nature of fossils. Miller's fossils can be used in display in three ways, somewhat reflecting the divisions within the Edinburgh Museum until the 1940s:

- As biological specimens, showing life of the past in itself
- As geological specimens, such as convenient date-labels and environment-of-deposition indicators
- And as historic objects

Obviously, the value of Miller's specimens lies partly in their scientific worth, especially for published specimens and those from lost or depleted sites. But they also played a role in Miller's contribution to wide-ranging Victorian debates. An eminent historian of science visiting NMS to deliver a public lecture was fascinated to learn that the museum held actual individual specimens widely illustrated in the pre-Darwinian evolutionary debates of the 1840s and 1850s, with implications for the nature of the cosmos, the origin of life and of humanity, and the associated moral and religious issues. This is part of a potential dilemma for the display of such specimens in an exhibition which covers the findings of modern science. It is anachronistic to assess Miller's work solely on the basis of modern geology and palaeontology, even if it is just how his understanding of Scottish stratigraphy differs from today's. But to assess Miller's work in the context of his own time is apt to clash with the modern scientific message which one also wishes to convey, confusing the visitor and adding to the exhibition's complexity. One approach is to ignore, or minimise, the historical complexities and simply display the fossils as fossils. This was, broadly, the approach taken by Ben Peach and by LIA's 'permanent' successor of 2002, which were about Miller's collection, and also in the Museum of Scotland of 1998, which was not about Miller at all, except insofar as Miller was credited on the labels. The other approach is to take the opportunity to explore the intellectual history of the collection in greater depth, as in the 2002 temporary exhibition. It depends on the exhibition's aims; either way, clear thinking is important.

Changing exhibition philosophies. We suspected that the exhibitions would reflect changing public attitudes to Miller and more widely to Scottish history and culture (Taylor 2007). There has evidently been a great change in the prior knowledge to be expected in the visitor. At the time of Miller's death and for some time after, he was widely read and respected by Scots in particular, but also all over the English-speaking world. An 1864 visitor to Cromarty even asserted about Miller's books that 'they do not merit the name of Scotchmen who have not read at least some of them' (Anon. 1864d)! Many visitors to Cromarty were there precisely because they had read Miller's books. Places associated with Miller became part of the tourist trail, with optional nodule-bashing at Cromarty and Eathie by 'geologic tourists', which began even in Miller's lifetime (Miller 1854, p. 503; Taylor and Morrison-Low 2017). Any geologist would know of Miller - indeed, someone might even become a geologist because of him. 'There was seemingly a generation whose imagination Miller's elegant prose captured for geology' (Knell and Taylor 2006, p. 87). Indeed, two or three generations seems nearer the mark, if the example of Ramsay MacDonald is any guide. But Miller's anti-evolutionary arguments would have seemed increasingly obsolete as time passed and a simplistic science-versus-religion storyline came to dominate perceptions of earlier debates (there is perhaps a hint of this in Traquair's essay; Peach *et al.* 2017). At the start of the twentieth century Miller was still well known and much read for his self-help writings and his sheer love of geology. But his books now went out of print, with the exception of *The Old Red Sandstone* and *My Schools and Schoolmasters*. By the final decades of the 20th century he seemed largely forgotten, with

the occasional exceptions already noted here and an anthology by Rosie (1981, esp. pp. 86-87) which was itself a reaction to this oblivion. This paralleled a wider neglect of Scottish culture and history.

However, a growth of interest in Miller came with the later 20th century revival of Scottish history, and a parallel appreciation of the history of museums and collections, and of the complexities of nineteenth century science. The 2002 centenary came at just the right time to stimulate research into the interesting stories that were emerging, greatly helped by the prior work of Shortland, Oldroyd and other writers in the 1996 volume (Shortland 1996a; Borley 2002, 2003). Even now, however, only a minority of people are familiar with Miller, though they will always form a proportion of visitors to Cromarty. But it is no longer possible to expect the ordinary visitor to have any prior knowledge of Miller. (One is reminded of the perhaps apocryphal story of some visitors to the Grassic Gibbon Centre in Kincardineshire expecting to see long-armed apes, yet Lewis Grassic Gibbon was, of course, the pen name of Leslie Mitchell (1901-1935), author of *A Scots Quair* and an outstanding figure of 20th century Scottish literature.) The connection with geology would not have helped, given the roller-coaster trajectory seen in small local museums with geological collections during the 20th century (Knell 1996). From its Victorian heyday, geology in museums suffered from a decline of public interest and political support, complicated by economic depression and then wartime austerity, with a nadir in the middle of the 20th century, before a slow revival from the 1950s. This matches what happened with the cottage at Cromarty. From early hopes, it reached a trough before and during the Second World War, and perhaps survived only because of the support of the National Trust for Scotland, to undergo postwar modernisation and more recently a major reorganization.

This changing perception of Miller is, as we suspected, reflected in the exhibitions. Ben Peach evidently planned part of the 1920s exhibition on the assumption that Miller's books, never mind the man himself, would be familiar to a significant proportion of the audience, who would want to see the actual fossils mentioned in the books. This was evidently the main aim of the original 1860s display. It could not work in quite the same way in the cottage at Cromarty, simply because the collection there only had a few of the actual published specimens, but the geological displays as modernised in the 1950s were partly structured by the content of several of Miller's books (the available evidence is too thin to decide this question for the earlier displays, Goodchild 1902b). But, in the temporary Edinburgh exhibition of 2002, so far as we remember, we never even considered any Peach-style mass display of type and figured specimens. The books were important, and we gave them due measure, but they did not dictate the exhibition structure except at quite a low level. Indeed, in 2002, we had no expectation that the visitor would necessarily know anything about Miller himself, or his books. At Cromarty, the geological display continues to be partly thematically linked to Miller's books, but the overall structure now reflects the nature of Miller House, so that (for instance) themes such as family and journalism are placed downstairs, modern geological activities in one attic, and Miller's geological work and specimens in the other attic. This last has a further primary division between Miller's original and local collecting in the Cromarty area, versus his later collecting elsewhere, with the books apportioned appropriately.

Finally, another striking difference between the exhibitions over the years is in the density of specimens, though this simply reflects changing exhibition design styles rather than anything Millerian (Table 3).

Exhibition and date	Number of objects or groups	Floor area/m²	Objects/m²
Ben Peach, c. 1920-1939 (RSM, permanent)	c. 1080	56	19.2
Testimony of the Rocks, 2002 (NMS, temporary)	126	100	1.3
Hugh Miller 2002-2009 (NMS, permanent)	36	c. 14	2.6

Table 3: The comparative density of some exhibitions on Hugh Miller over the years. The different object densities are in part due to changing design philosophies. However, the two permanent galleries also used solid runs of display cases from side to side, unlike the 2002 exhibition which used individual display cases. 'Objects' includes replicas and casts; a 'group' is of essentially identical items displayed en masse, such as belemnites. Floor area includes visitor gangway space, which is somewhat arbitrary for the 2002-2009 gallery in particular, but this does not much change the overall conclusion.

Resource allocation. Those who run museums, and manage exhibition programmes, decide whether Hugh Miller is given exhibition space. At Cromarty, of course, Miller is the Local Hero, one of the burgh's greatest sons, and the Birthplace Cottage and Museum is his own. But the question at Edinburgh is more complex. So far as we are aware, there was no commitment by the Museum to display the collection permanently, whether as a memorial to Miller or not (apart from one probably misleading report; Anon. 1858l). Gallery space is arguably the most precious resource of a museum besides its collections and the expertise of its staff, and any display has to earn its keep under the pressures of space and changing usage. The original display space devoted to Miller (as opposed to using his specimens piecemeal in other displays) seems to have been the single octagonal desk case. When Director Martin made a much more substantial allocation of permanent gallery space to the Miller collection, he was by implication downgrading the more purely scientific display of fossil fishes, on the pragmatic view that exploring science-historical stories, such as Hugh Miller's, was one useful tool in an overall programme of bringing science to the public. His justification notably described the collection as 'historic' as well as scientific. Yet Miller was not quite so historic that he was unfamiliar to many visitors, especially to geologists. The display was retained until the postwar reorganization, when, as for the rest of the twentieth century, a permanent Hugh Miller display was evidently not considered a sufficient priority for gallery space. But many of Miller's fossils did remain on show, used in displays organised for other reasons. The charming statue also remained on display, albeit as a curatorial anomaly (and indeed it was returned to the arts side both curatorially and for exhibition purposes during the 2009 revamp of the Royal Museum). Of course, temporary exhibitions allow the evasion of the constraints of permanent galleries, and this is how Hugh Miller was covered in the postwar decades, often in collaboration between institutions. He was plainly not forgotten.

This was not just a matter of whether Hugh Miller was passé or not; the acquisition of other large collections of fossils during the 20th century would have provided further pressure to relegate Hugh Miller's fossils back into safe storage. Here we perceive an additional tension between what one might call the collection's 'historic' status accrued as time went on, and the fact that the collection has to compete in a practical sense with other collections that the museum accumulates. Even individual specimens show this competition for attention, as shown in the displacement of some Miller specimens by newer finds in selection for the 1998 Museum of Scotland. The Miller collection, being a pioneering collection, does of course have a head start in the number of type, figured and cited specimens (the exact number being currently under review; Andrew Ross, pers. comm. 2017).

Wider museum movements and Hugh Miller's Cottage. A natural question is whether the opening of the cottage museum reflected wider movements of the 1880s such as those for local museums, preferably rates-supported, in small towns, and for educational activities in museums, both exemplified by Thomas Greenwood's polemic *Museums and Art Galleries* (1888). Finnegan (2005) has argued that an emphasis on direct experience of nature, and the moral and health benefits of self-improvement, permeated Scottish natural history in the later 19th century, and that this came with an associated emphasis on founding and supporting local museums in conjunction with the activities of the local society. Such organised societies, often with links to the local museum, have been described in the Highlands for the late 19th and early 20th centuries by Withers and Finnegan (2003) and Finnegan (2005, 2009). This was all, of course, very Millerian in spirit, and the Inverness Scientific Society and Field Club was only too happy to visit Cromarty and its museum in 1893 and again in 1902 (Anon. 1898b, 1906). Hugh Miller the younger, like other colleagues in the Geological Survey, was an active member of the Inverness society in the later 1880s and 1890s, judging from his publications in its *Transactions* (e.g. H. Miller the younger 1893). An initiative of his, the Hugh Miller Medal at Cromarty Public School, is a nice example of the approach to nature outlined by Finnegan. Hugh the younger funded a bronze medal for geology, to be awarded to a pupil 'evinc[ing] some intelligent interest' in local geology and 'present[ing] two or three good specimens of his own finding to the Museum of the Scientific Society at Inverness' (Anon. 1887e).

The two English small museums noted earlier again make interesting comparisons. Haslemere Educational Museum (founded 1888) carried out overtly educational programmes (Swanton 1947). Street Museum (1887) was, so far as is known, a static and conventional museum, but it was conceived as part of the Street Institute under the aegis of the Clark family who were the major employers in the village, so in that sense it had an explicit role in improvement and beneficial recreation (Anon. 1887a). Also, as part of their educational role, Haslemere and Street combined displays of local geology and natural history with material from further afield, even overseas. None of those formal aims can be proven for the cottage in its early decades. But this simply reflects the lack of formal reports, written

mission statements, and expert staff (entertaining as at least one custodian seems to have been), and the near-certainty that the cottage's economics could only sustain a static display with an elderly retiree or two as custodian. Moreover, Cromarty seems to have been far too small a burgh to maintain a critical mass of natural scientists, let alone an organised society of the kind able to give sustained support to the museum. A common-sense conclusion is that these wider movements, for small museums and for museum education, perhaps encouraged the foundation of the cottage museum in a very general sense, but nothing more was practical. However, the question is perhaps moot, because the emphasis of the displays, as far as science went, was on local fossils and geology, and on Miller's example more generally - which was all perfectly educational, improving, and consistent with Finnegan's thesis anyway.

Another approach is to consider the cottage museum as a Great Man's Home. There were many such places, including some Great Women's too, to be visited even in the 1880s, although some only became formalised as museums later on in long careers of being open to the public (see the compendium of such writers' houses by Marsh 1993, which surprisingly omits Miller's). For instance, the home of the poet William Cowper at Olney only became a museum in 1900, though it had been routinely open or at least accessible to the public long before, as Miller himself found in 1845 (Miller 1847, pp. 277-279; Mavor 1993). Two apparently obvious Scottish comparisons to Miller's birthplace (David Livingstone's in Blantyre, Andrew Carnegie's in Dunfermline) were actually opened in the 1920s, which still perhaps illustrates a wider climate of opinion germane to the NTS's decision to take over the cottage (Anon. 1928b, 1929b). But, interestingly, two other birthplace houses opened in 1881-1884. One was, of course, that of the poet Robert Burns (1759-1796) in Alloway, Ayrshire, taken over in 1881 by a charitable trust with the addition of further relics (Anon. 1881; Dunn 1993). Admittedly it had been operating as a pub long before that, so access was not a problem, and indeed it might seem ironically appropriate as part of a Rabbie Burns Experience, for a poet who sang such verse as *The cock may craw, the day may daw / And aye we'll taste the barley bree* (Scots: 'the cock may crow, the day may dawn, and still we'll taste (drink) the barley brew (ale)'). But visiting a howff, however touched by genius, was out of the question for respectable folk, and metaphorically drying-out the birthplace was (on balance) beneficial. Moreover, and perhaps even more relevantly, the birthplace of Miller's near-contemporary Thomas Carlyle (1795-1881), writer, historian and philosopher, in Ecclefechan, Dumfriesshire, was bought by a relative in March 1883 to be preserved as a memorial (Anon. 1883a, 1884a; Campbell 1993). Those timings are highly suggestive relative to the Miller brothers' apparent decision to go ahead with the cottage museum in Cromarty. Certainly Hugh the younger could easily visit them, for his literarily minded wife's country estate was in Dumfriesshire (Morison 1905, p. 100). If nothing else, Hugh might have gleaned some ideas for his displays.

The fates of Miller's museums. Another question is the degree to which Miller's birthplace as preserved actually represented the buildings and furnishings as he would have known them. Quite apart from the uncertainties over the outbuildings, we have presented evidence that the cottage was even more modified than hitherto thought, and that Hugh the younger did not attempt to recreate the cottage as it was in his father's childhood, at least in the sense of a whole house furnished as it was around 1810 and opened to the public. Rather, he was content to establish what was effectively a small museum in the upstairs rooms. No doubt this stemmed from the practicalities involved, and the need to make room for a custodian's residence, but it also perhaps reflected a lack of interest in what then would have seemed obsolete and unremarkable domestic furniture and fittings. It was only much later that two out of three of the ground floor rooms were opened to the public, and furnished as living space.

More generally, the Livingstone, Carnegie, Burns and Carlyle examples share much the same developmental pattern as Miller's, in that the original birthplace has, effectively, become an exhibit within a modern complex formed by the construction of new buildings adjacent, or the takeover of old ones, into which the museum displays and services tend to be moved. Another common factor is eventual takeover by a formal public charitable trust, whether the National Trust for Scotland or one specific to the building.

The most drastic modification is, of course, demolition. Miller's home (like Burns', Carnegie's and Livingstone's) shows how a link with a Great Person could save low-grade houses from being knocked down long ago, by preserving them through the critical period when they were old enough to be out of date and useless, but not old enough to be interesting in themselves. Hugh Miller's Cottage is now amply worthy of preservation in its own right, simply because it is one of Cromarty's oldest vernacular houses, complete with thatched roof. More surprisingly, under all the later accretions, Shrub Mount is a unique surviving example of the old Portobello seaside villa, but its accidental survival has nothing to

do with Miller (Campbell and Holder 2005). The difference, of course, is that Miller began his life in the Cottage, but prematurely and violently cut it short in Shrub Mount (and, in any case, had only spent a short time there). No wonder the family left Shrub Mount and sold it as soon as they could. It is now greatly changed, with both house and gardens increasingly subdivided and modified. In the 1880s, for instance, the Working Men's Reading Rooms adapted the already much altered Shrub Mount to their needs, and, just as appropriately, the local newspaper publisher and printer moved to new premises on part of the former garden in 1895 (Anon. 1884b, 1889e, 1895b). The printer's parcel of land included the museum, which was used for commercial and industrial purposes, and latterly incorporated into a larger building, until its demolition in the 1970s (Figure 8; Campbell and Holder 2005, pp. 67-68). A 'small company of Portobello residents who had known Hugh Miller' marked the 1902 centenary of his birth by gathering at Shrub Mount, where they 'walked about the ground where Miller's garden had been', now the site of a builder's yard, plasterer's shop, and newspaper office, 'visited what had been his museum - now a shed', inspected the house and the site of the suicide, and then went to luncheon where, one hopes, they soon cheered up; they certainly sent a cordial telegram to Provost Junor at the Cromarty celebrations (Anon. 1902g, p. 7; 1902h). A century later in 2002, when we attended the unveiling of the commemorative plaque to mark Miller's house, the site of the museum was an access area and car park.

Final reflections. The Miller museums story also shows the role of initiative and enthusiasm, for decision-makers cannot select ideas if the ideas are not presented to them (unless, of course, they have their own bright ideas; it was a surprise to find the unexpected implications of Thomas Carlaw Martin's background). The Hugh Miller Museum in Cromarty surely owes its origin and survival to Hugh the younger, and we now realise also, his brother William, as well as the family's support more broadly then, as well as more recently. The Cottage also owes a great deal to the initiative, inspiration and enthusiasm of Frieda and Martin Gostwick, successive Property Managers; at the suggestion of Frieda (Manager 1992-2000) the NTS initiated a project for the extension into Miller House, and Martin (2000-2009) was heavily involved in the series of fund-raising initiatives to achieve this. Likewise, other exhibitions stemmed from curators' personal initiatives. But people outside museums are important, too. The 2002 exhibition in Edinburgh (for one) benefited from the support of the family, and not just by help with research and donations of objects, past and present. Even simply attending exhibition openings and events is important in validating them in the eyes of decision-makers and of the wider community. Academics, journalists, and others outside the museum also have a role, such as the Rev. Professor Donald Macleod in his opening the 2002 exhibition (as well as arranging for the loan of items from the Free Church). Since then, also, The Friends of Hugh Miller have become increasingly important as a support group for the Cromarty museum and for linked initiatives such as events and publications.

Miller's collection was, and remains, important as a scientific and display resource, with a historical importance it accrued through his writings. He built his own museum; and he remains one of the very few geologists worldwide to have a (separate!) museum devoted to his life and work. Of course, as with searches for 'firsts' (Torrens 1995), hunts for the 'unique' are apt to be invidious, and to end up in quibbles of how one defines just what it is that is supposedly unique. It is, for one thing, strictly misleading to describe the Museum at Cromarty as devoted to a geologist. The early displays also paid attention to Miller's achievement as a writer, an activist for the Free Church, a social commentator, and so on, as do the more recent displays. And if one includes part-time geologists, as Miller always was, as subjects for personal museums, then one must also admit, for instance, John Ruskin, mineralogist as well as writer and art critic, with his personal museum (though not birthplace) in the Lake District (Hewison 1993), and Charles Darwin (1809-1882), a fine geologist in his own right, with Down House in Kent (Neve 1993). Perhaps the only museum purely devoted to someone's geological life and work (but not, in this case, his birthplace or home) is that for Joachim Barrande (1799-1883) and his work on the fossils of Bohemia at the Památník Joachima Barranda in Skryje, Czech Republic. The Cromarty museum nevertheless remains unusual, and perhaps unique, amongst geologists' museums in being an actual birthplace, and also in being tightly linked to the actual landscape around it, and the mental landscapes of Miller's readers, by his own writings. In this respect, it is reminiscent of Cowper's at Olney (cf. Miller's comments, Miller 1847), and Gilbert White's (1720-1793) at Selborne in Hampshire, where he was the parson-naturalist author of *The Natural History and Antiquities of Selborne* (Mabey 1993; White 2013).

This reminds us that it is often fruitful to think about museums from a geographical point of view (Finnegan 2007). In a sense, we have already done this when discussing the exhibition plans. But on a wider scale, one obvious difference between the Edinburgh and Cromarty exhibitions is the nature of

their links with their surroundings. At Edinburgh, an exhibition on Miller is inevitably somewhat divorced from its surroundings, though the city still has much of the character it had in Miller's time. Links with Miller are apt to be hidden, swamped by the busy city's complexity; it is not obvious, for instance, that just downhill from the National Museum of Scotland was Miller & Fairly's printing shop where *The Witness* and many of his books, including *The Old Red Sandstone*, were produced. In contrast, the Cottage and Miller House are much more obviously set in Miller's Cromarty, especially if one also visits the Courthouse Museum which deals with Cromarty more generally. The town retains much of its 18th and 19th century character, so the visitor in that sense is already roaming Miller's habitat even before entering the Birthplace Cottage and Museum. But Cromarty's history features in Miller's writings, and most of his autobiography is set there, so anyone who has read those books will already possess a mental geography of Cromarty in anticipation of reality. Even so, as Taylor and Morrison-Low (2017) suggest, the completion of the Hugh Miller Monument in 1859 was surely an important factor in providing something for people to see. The monument was something that the nascent tourist industry could offer visitors at a time when the cottage was, to put it mildly, not at its best, and indeed the tourism which the monument helped maintain must have been one factor in the Miller brothers' 1880s decision to open the cottage as a museum.

Figure 46. Miller's 'laboratory' as he knew it, a bit of coastal erosion more or less: Simon Knell examining the boulder Miller used to lay out his specimens as he found them at the classic Old Red Sandstone fish site in Cromarty, during the 2002 centenary celebration. The oil platform in the background reflects the economic aspect of geology - which Miller did not miss in his discussion of this tract, which included the Coalheugh Well just inland, a failed pre-William Smith coal boring into the Devonian (Miller 1841; Torrens 2003). Copyright and courtesy of the Trustees of National Museums Scotland.

Miller and his Museum continue to carry on their role in the townscape of Cromarty frozen by nineteenth century economic decline, and then by more recent conservation, pretty much in the state in which he left it, and make a major contribution to the local tourist industry (Gostwick 2005; Alston 2006). Miller, and the tales he told, also continue to feature strongly in the various printed and spoken guided tours of Cromarty that have been developed in recent years, such as that for the 2002 centenary reprinted in Borley (2003, pp. 349-352). This is, of course, also true for those with a more geological interest, though the geological side of matters at Cromarty has not been formalised to the same degree, certainly nothing to compare with, for instance, Lyme Regis. Any historian keen to reconstruct scientific research of the heroic age will find Miller's field sites much as they were, some coastal erosion and a few hundredweight of nodules apart (Figure 46). This makes Miller a very unusual nineteenth-century scientist, with his Cromarty homes, and 'laboratories' - or at least his nearby collecting sites - and geological collection not too far removed from how he left them, however different his homes and hunting grounds around Edinburgh are today.

We hope that our paper is a useful contribution to future curation, and an interesting study of an unusual collection and an equally unusual museum, which suggests some worthwhile lines for further research. For instance, our conclusions on the cottage smithy would benefit from specialist assessment, and more could be said about the National Trust for Scotland era, and the cottage's significance to the Trust as an early acquisition. We end our telling of the Miller museums story in 2010, for it is appropriate to leave the ensuing years to our successors, though we happily note the new storage for the collections at NMS (Ross 2013). Some problems of interpreting the Miller collection, and some solutions, seem remarkably modern in these first decades of the 21st century, when cooperative partnership between national and local museums, and a 'distributed national collection' (as it is called, comprising the collective collections of museums in Scotland), are highly topical. Our final thought is our surprise at realising that our own efforts fit into a wider story. The Miller collections in Edinburgh and Cromarty stemmed from the same common source, but still remained interconnected, and rather than forking into two separate streams, they have formed one braided river. We are simply recent participants - for now - in a continuous cycle of activity at Hugh Miller's various museums, modulated by wider perceptions of his significance, but peaking every 50 years in lock-step with the successive anniversaries of his birth.

19. Acknowledgements

We wish first to express our appreciation of the great encouragement, support, information and critical assessment which we received over many years from the late Marian McKenzie Johnston and her husband Henry McKenzie Johnston CB, both in their own right, and also through their wider contacts with the Miller family. Marian was the great-great-granddaughter of Hugh and Lydia Miller through their daughter Harriet. She was also the collateral descendant of the geologically minded Catherine Allardyce of Cromarty, sister of another great-great-grandmother of Marian's.

We also wish to make due acknowledgement to our colleagues at National Museums Scotland and its predecessors who have curated the Miller collection over the period covered by this paper, including but not only Charles Waterston, Roberta Paton, Bill Baird, Ian Rolfe, and Liz Hide. More recently we thank Yves Candela, Vicen Carrio, Peter Davidson, Simon Howard, Brian Jackson, Andy Ross, Suzie Stevenson, Sarah Stewart and Stig Walsh for their assistance with this project. Mark Shaw, Suzanne Miller, Andrew Kitchener, and Nick Fraser (Keepers of Natural Sciences) encouraged and supported our research into this area of the NMS collections. Andrew Kitchener and Geoff Swinney advised on the history of the natural science collections. The core team for the 2002 temporary exhibition comprised lead designers Jacqui Duffus and Kimberley Baxter and educator Christine Thompson, and the authors as curators. It is pleasant also to remember the work of many other colleagues past and present involved in such things, including the other curators, conservators, exhibition designers, technicians, education officers, and publication and marketing staffs, and other members of the museum team, who actually brought those initiatives to fruition, and the front of house staff and volunteer guides who ensured their smooth operation. Adnan Amjad carried out the evaluation which we cite.

Amongst those colleagues in other museums, which collaborated in the projects which we report, and for sometimes extensive discussion of these and other matters, are (but not only) Frieda Gostwick, Martin Gostwick and Alix Powers-Jones, Hugh Miller Museum & Birthplace Cottage, National Trust for Scotland, Cromarty; David Alston and Paul Monk, Cromarty Courthouse Museum; the late Iain Maciver, Iain Gordon Brown, Paul Hambelton, Sally Harrower and Sheila Mackenzie, National Libraries of Scotland, Edinburgh; Jane Petrie and Jeanette Pearson, High Life Highland (Inverness Museum and Art Gallery); and Susan Seright and Barbara Cohen, Groam House Museum, Rosemarkie.

As well as those whom we have already acknowledged in the text, we thank John Cairns, Ian Campbell, John Cooper, Ted Daeschler, Bob Davidson, John Diemer, Howard Falcon-Lang, Diarmid Finnegan, Archie Foley, Peter Friend, Julian Holder, Simon Knell, Joanne Lamb, Hugh Torrens, and Nigel Trewin and many others for information and discussion. David Alston was of great help with the Cromarty historical background. Margaret Allen provided indispensable information and advice on the Davidsons in Australia. David Bate, Mike Howe, Andrew Morrison, Graham McKenna and Fergus Taggart advised on the British Geological Survey archives.

We are grateful for the assistance of these archives and libraries and their staff, and permission to use their resources: Argyll Estates,Inverary; Art Gallery of South Australia, Adelaide; Barr-Smith Library, University of Adelaide; Flinders University, Adelaide; Royal Society of South Australia, Adelaide; State Library of South Australia, Adelaide; South Australian Museum, Adelaide; Cambridge University Library, Cambridge; Sedgwick Museum, University of Cambridge; Edinburgh Council Archives, Edinburgh; National Library of Scotland, Edinburgh; National Records of Scotland, Edinburgh; New College Library and Special Collections Library, University of Edinburgh; Elgin Museum (Moray Society), Elgin; Hunterian Museum, University of Glasgow; Museum of Comparative Zoology, Harvard; Highland Council Libraries, Inverness; High Life Highland (Inverness Museum and Art Gallery), Inverness; and British Geological Survey, Keyworth and Edinburgh; Geological Society of London, London; and Culture Perth and Kinross, Perth.

For copyright and image permissions and access, we also thank Henry McKenzie Johnston on behalf of the Miller family; British Geological Survey; Ian Campbell; Garve Scott-Lodge and the Cromarty Image Library; Historic Environment Scotland; Inverness Museum and Art Gallery; National Library of Scotland; and the National Trust for Scotland. John Sinclair helped find NTS images and Martin Gostwick kindly gave permission to reuse material from an earlier piece on the Goodchild *Guide* in *Hugh's News* (issue no. 3, 2007). Jan Dawson provided the exhibition plans. We thank Steve Donovan for his careful refereeing. We are grateful for the support of the libraries of National Museums Scotland and the University of Leicester. LIA is grateful for funding from the Isaac Newton Trust (Trinity College, Cambridge).

20. References

The annual reports of the Edinburgh Museum of Science and Art were published in various forms; see Swinney (2002).

ABSALOM, R.G. 1933. Two unpublished letters of Hugh Miller. *North Western Naturalist* **March 1933**, 20-27.

AGASSIZ, J.L.R. 1844-1845. *Monographie des poissons fossiles du Vieux Grès Rouge ou Système Dévonien (Old Red Sandstone) des Îles Britanniques et de la Russie*. 2 vols. Soleure, Neuchâtel.

ALLAN, D.A. [1946]. *Report for the year 1945 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 11pp.

ALLAN, D.A. [1947]. *Report for the year 1946 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 14pp.

ALLAN, D.A. [1948]. *Report for the year 1947 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 14pp.

ALLAN, D.A. [1949]. *Report for the year 1948 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 14pp.

ALLAN, D.A. [1950]. *Report for the year 1949 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 14pp.

ALLAN, D.A. [1951]. *Report for the year 1950 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 15pp.

ALLAN, D.A. [1952]. *Report for the year 1951 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 17pp.

ALLAN, D.A. [1953]. *Report for the year 1952 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 15pp.

ALLAN, D.A. [1954a]. *Report for the year 1953 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 19pp.

ALLAN, D.A. (ed.) 1954b. *The Royal Scottish Museum. Art and ethnography. Natural history. Technology. Geology*. *1854-1954*. Oliver and Boyd, Edinburgh, 58pp.

ALLAN, D.A. [1955]. *Report for the year 1954 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 17pp.

ALLAN, D.A. [1956]. *Report for the year 1955 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 16pp.

ALLAN, D.A. [1957]. *Report for the year 1956 on the Royal Scottish Museum*. Cyclostyled report, Scottish Education Department, Edinburgh, 20pp.

ALLAN, R. 1873. Holiday rambles. Cromarty and Hugh Miller. *Scottish Congregational Magazine* n.s. **23**, 322-326.

ALLEN, M. 1999. 'The author's daughter, the professor's wife' - Harriet Miller Davidson. *Journal of the Historical Society of South Australia* **27**, 103-124.

ALLEN, M. 2005. Miller, Lydia Falconer, n. Fraser (Mrs H. Myrtle) [and] Harriet Miller Davidson. *In*: Ewan, S., Innes, S., Reynolds, S., and Pipes, R. (eds.). *Biographical Dictionary of Scottish women*. Edinburgh University Press, Edinburgh, 265.

ALLMAN, G.J. 1860. Annual Report of the Regius Keeper of the Museum of Natural History, Edinburgh [for 1859]. *Seventh Report of Science and Art Department, Appendix* A_C, 207-210 and as an extract therefrom; also *Parliamentary Papers* 1860 **XXIV** [2626.], 547-550.

ALLMAN, G.J. 1866. Report of the Edinburgh Museum of Natural History, for the year 1865. *Thirteenth Report of Science and Art Department, Appendix F*, 263-265 and as an extract therefrom; also *Parliamentary Papers* 1866 **XXV** [3649.], 627-629.

ALLMAN, G.J. 1867. Report of the Edinburgh Museum of Natural History [for 1866]. *In*: Archer, T.C. *Report on the condition of the Edinburgh Museum of Science and Art for 1866*, 260-263; also *Fourteenth Report of Science and Art Department, Appendix F*, 253-263 and as an extract therefrom; also *Parliamentary Papers* 1867 **XXIII** [3853.], 285-295.

ALSTON, D. 2006. *My little town of Cromarty. The history of a northern Scottish town*. Birlinn, Edinburgh, xxvi + 372pp.

ALSTON, D. 2007. Preface. *In*: Taylor (2007), 13-15.

AMJAD, A. 2002. *Evaluation report: 'Testimony of the Rocks: Hugh Miller 1802-1856*'. Unpublished report, copy on file, Department of Natural Sciences, NMS.

AMOS, S. 1871. Some books of the month. *Fortnightly Review* **9**, 412-418.

ANDERSON, L.I. 2005. Hugh Miller: introducing palaeobotany to a wider audience. *In*: Bowden, A.J., Burek, C.V. and Wilding, R. (eds.). *History of Palaeobotany: Selected Essays. Geological Society, London, Special Publications* **241**, 63-90.

ANDERSON, L.I. and TAYLOR, M.A. 2008. Charles W. Peach, palaeobotany and Scotland. *The Geological Curator* **8**, 393-425.

ANDREWS, S.M. 1982. *The discovery of fossil fishes in Scotland up to 1845, with checklists of Agassiz's figured specimens*. Royal Scottish Museum, Edinburgh, 87pp.

ANON. 1844. Coast Guard. *Aberdeen Press and Journal* 27 Nov., 3.

ANON. 1854. Deaths. *Inverness Courier* 30 Mar., 8.

ANON. 1855a. Town-council proceedings.

Caledonian Mercury 1 Mar., 3.
ANON. 1855b. 'As the Town Council are not the patrons […].' *Scotsman* 10 Mar., 2.
ANON. 1855c. Town-council proceedings. *Caledonian Mercury* 15 Mar., 4.
ANON. 1857a. Town Council of Edinburgh. *Scotsman* 14 Jan., 3.
ANON. 1857b. Town Council. *Caledonian Mercury* 11 Feb., 2.
ANON. 1857c. 'If it were ever doubted that [...].' *Caledonian Mercury* 12 Feb., [2-3].
ANON. 1857d. 'You will be glad to hear […].' *Inverness Advertiser* 17 Feb., 5.
ANON. 1857e. Proposed testimonial to the late Hugh Miller. *Dumfries and Galloway Standard* 15 Apr., 2.
ANON. 1857f. The Hugh Miller Endowment. *Glasgow Herald* 17 Apr., 6.
ANON. ('Fair Play') 1857g. The late Hugh Miller's museum. *Caledonian Mercury* 27 May, 3.
ANON. 1858a. Exeter Hall lectures. *Standard* 12 Jan., 1.
ANON. 1858b. Edinburgh Town Council. *Caledonian Mercury* 24 Feb., [2].
ANON. 1858c. Town Council of Edinburgh. *Scotsman* 24 Feb., 3.
ANON. 1858d. The late Hugh Miller's museum. *The Times* 25 Feb., 5.
ANON. 1858e. Unemployed workmen. *Caledonian Mercury* 17 Mar., 1.
ANON. 1858f. Gossip. *Sheffield & Rotherham Independent* 10 Apr., suppl., 1.
ANON. 1858g. Hugh Miller's museum. *Caledonian Mercury* 24 Apr., [2].
ANON. 1858h. Hugh Miller's Museum. *Scotsman* 24 Apr., 3.
ANON. 1858i. The late Hugh Miller. *Standard* 2 Jun., 5.
ANON. 1858j. 'Miss Burdett Coutts [...].' *Trewman's Exeter Flying Post* 10 Jun., 7.
ANON. 1858k. Industrial Museum of Scotland. *Scotsman* 17 Jul., 3.
ANON. 1858l. The late Hugh Miller's geological museum. *Inverness Courier* 23 Sep., 6.
ANON. 1858m. Wednesday, 28th January, 1857 […]. *Proceedings of the Royal Physical Society of Edinburgh* **1**, 223-225.
ANON. 1858n. *Directory of the Industrial Museum of Scotland, and of the Natural History Museum, Edinburgh*. Chapman and Hall, London, 15pp.
ANON. 1858o. Museum of the late Hugh Miller. *Geologist* **1**, 257.
ANON. 1859a. Peter Bayne. *Scottish Review* **for 1859**, 339-354.
ANON. 1859b. Caution to bathers. *The Witness* 30 Jul., [2].
ANON. 1859c. Industrial Museum of Scotland. *Caledonian Mercury* 8 Aug., [3].
ANON. ('J.R.') 1859d. Twenty-four hours at Cromarty. Reminiscences of Hugh Miller. *Banffshire Journal and General Advertiser* 1 Nov., 6.
ANON. 1862. Cromarty Mechanics' Institute. *Inverness Courier* 24 Jul., 5.
ANON. 1863. Death of Hugh Miller's mother. *Inverness Courier* 11 Jun., 5.
ANON. 1864a. 'The family of Hugh Miller [...].' *Geological Magazine* **1**, 96.
ANON. 1864b. 'Another and very impressive instance [...].' *Scotsman* 29 Feb., 2.
ANON. 1864c. Hugh Miller's birthplace. *Dundee, Perth and Cupar Advertiser* 17 Jun., 4.
ANON. 1864d. Notes of a tour in the north. II. *Aberdeen People's Journal* 30 Jul., 2.
ANON. 1867. Furnished residence on Drummond Terrace. *Inverness Courier* 7 Feb., 4.
ANON. 1869. Royal Scottish Academy's exhibition. Concluding notice. *Scotsman* 24 Apr., 7.
ANON. 1870a. Adelaide direct. Elder Line of clipper ships. *The Times* 2 Mar., 2.
ANON. 1870b. Shipping news. *Dundee Courier* 18 Mar., 2.
ANON. 1870c. Shipping intelligence. *South Australian Register* 27 Jun., 4.
ANON. 1870d. Miscellaneous. *South Australian Register* 16 Jul., 6.
ANON. 1870e. Induction of the Rev. John Davidson. *South Australian Register* 3 Aug., 3.
ANON. 1870f. The Society of Arts' Exhibition. *South Australian Register* 24 Dec., 5.
ANON. 1870g. Hugh Miller's Life and Letters. *Glasgow Herald* 30 Dec., 4.
ANON. 1871a. Our library table. *The life and letters of Hugh Miller* [...]. *Athenaeum* **2262**, 271.
ANON. 1871b. New books. *Blackwood's Edinburgh Magazine* **109**, 440-464.
ANON. 1871c. Hugh Miller. *British Quarterly Review* **54**, 76-109.
ANON. 1871d. Mr Bayne's life of Hugh Miller. *Examiner* **3293**, 259-260.
ANON. ('A University Man') 1871e. Hugh Miller, as seen in his 'Life and Letters'. *Good Words* **12**, 18-25.
ANON. 1871f. The life and letters of Hugh Miller. [...]. *London Quarterly Review* **36**, 439-461.
ANON. 1871g. Bayne's Life of Hugh Miller. *Saturday Review* **31**, 572-573.
ANON. 1871h. History and biography. *Westminster Review* **39**, 554-572.
ANON. 1871i. Hugh Miller, Dr Candlish, and Free Church journalism. *Scotsman* 23 Feb., 6.
ANON. 1872. *Edinburgh Museum of Science and Art. Catalogue of Natural History Department*. Edinburgh Museum of Science and Art,

Edinburgh, 52pp.
ANON. 1873. Inverness - proposed new School of Science and Art and museum. *Scotsman* 7 Apr., 4.
ANON. 1874a. Drinking fountain for Ripon. *Inverness Courier* 29 Jan., 3.
ANON. 1874b. Inverness exhibition of arts and antiquities. *Scotsman* 16 Sep., 4.
ANON. 1875. A sister of Hugh Miller. *Scotsman* 27 Dec., 4.
ANON. 1880a. Death by scalding in Edinburgh. *Edinburgh Evening News* 19 Nov., 3.
ANON. 1880b. Deaths. *Edinburgh Evening News* 22 Nov., 3.
ANON. 1881. Burns' Cottage. *Dundee Advertiser* 7 Dec., 2.
ANON. 1882. Hugh Miller's birthplace at Cromarty. *Inverness Courier* 6 Jul., 2.
ANON. 1883a. Ecclefechan - Carlyle's birthplace. *Scotsman* 26 Feb., 6.
ANON. 1883b. A holiday at Inverness - III. *Dundee Advertiser* 24 Sep., 2.
ANON. 1883c. The late Mrs. Harriet Miller Davidson. *South Australian Register* 22 Dec., 6.
ANON. 1884a. Carlyle's birthplace. *Annandale Observer and Advertiser* 23 May, 2.
ANON. 1884b. Working-men's Reading Rooms. *Portobello Advertiser* 13 Sep., 2.
ANON. 1885a. The late Mr Robert Fairly, of the 'Witness'. *Scotsman* 12 May, 4.
ANON. 1885b. Excursion from Nairn to Cromarty. *Inverness Courier* 27 Aug., 2.
ANON. 1887a. Street. Opening of the geological museum. *Western Gazette* 29 Apr., 6.
ANON. 1887b. The S.S. 'Earnholm', - extensive improvements. *Inverness Courier* 3 Jun., 4.
ANON. 1887c. Aberdeen, Leith, and Moray Firth Steam Shipping Coy., Ltd. *Ross-shire Journal* 24 Jun., 1.
ANON. 1887d. Pleasure sail on the Moray Firth. *Invergordon Times* 20 Jul., 2.
ANON. 1887e. Cromarty Public School. *Inverness Courier* 5 Aug., 4.
ANON. 1888a. Free Church General Assembly. The exhibition. *Inverness Courier* 12 Jun., 5.
ANON. 1888b. Invergordon and Cromarty summer holiday. *Invergordon Times* 15 Aug, 2.
ANON. 1888c. Unveiling of memorial busts at Wallace Monument. *Scotsman* 12 Sep., 7.
ANON. 1888d. Hugh Miller's copy of 'My schools and schoolmasters'. *Edinburgh Evening News* 19 Sep., 4.
ANON. 1889a. Montrose. Natural History and Antiquarian Society. *Dundee Advertiser* 16 May, 7.
ANON. 1889b. To the Black Isle, Easter Ross, and northwards. II. - Cromarty and Hugh Miller. *Aberdeen Free Press* 24 May, 4-5.
ANON. 1889c. A holiday trip. Cromarty and Hugh Miller. *Invergordon Times* 29 May, 4.
ANON. 1889d. Death of an old friend of Robert Dick, the Thurso baker. *Aberdeen Free Press* 21 Aug., 4.
ANON. 1889e. Working Men's Reading Rooms. *Portobello Advertiser* 20 Sep., 5.
ANON. 1890a. The Free Church College Hugh Miller Memorial. *Scotsman* 24 Mar., 6.
ANON. 1890b. Free Church. The case of Dr Dods. *Dundee Courier* 28 May, 3.
ANON. 1890c. Disestablishment. *Dundee Courier* 31 May, 2.
ANON. ('A Lady Passenger') 1891a. A trip to the Moray Firth. *Aberdeen Press and Journal* 23 May, 5.
ANON. ('A.M.') 1891b. My first trip to Cromarty, and what I saw there. *Inverness Courier* 3 Jul., 6.
ANON. 1891c. Among the relics of the past. *Preston Herald* 12 Dec., 11.
ANON. 1892a. Let of shootings, &c. *Aberdeen Press and Journal* 23 May, 4.
ANON. 1892b. Deaths. *Inverness Courier* 14 Jun., 8.
ANON. 1892c. 'During the visit […].' *Cromarty News* 18 Aug., 1.
ANON. 1892d. 'Mr H. Miller […].' *Cromarty News* 18 Aug., 1.
ANON. 1892e. Ladies' column. Notes in passing. *Dundee Evening Telegraph* 21 Dec., 4.
ANON. 1893a. Free Church Jubilee Memorial Exhibition. Northern exhibits. *Ross-shire Journal* 2 Jun., 6.
ANON. 1893b. Pleasure sailing on the Beauly, Moray and Cromarty Firths. *Ross-shire Journal* 14 Jul., 1.
ANON. 1893c. The late Lieutenant-Colonel William Miller. *Scotsman* 28 Dec., 5.
ANON. 1893d. The late Lieutenant-Colonel William Miller. *Inverness Courier* 29 Dec., 6.
ANON. 1894. The late Mr Alexander Galletly. *Scotsman* 3 Mar., 8.
ANON. 1895a. The late Miss Allardyce, Cromarty. A friend of Hugh Miller and Rev. John Stewart. *Inverness Courier* 25 Jan., 6.
ANON. 1895b. 'As is well-known […].' *Portobello Advertiser* 15 Feb., 4.
ANON. 1896a. Death of Hugh Miller's son. *Invergordon Times* 15 Jan., [2].
ANON. 1896b. The late Peter Bayne. *Inverness Courier* 18 Feb., 3.
ANON. 1897a. Another gift to the town. *Scottish Highlander* 4 Nov., 4.
ANON. 1897b. Improvements. *Inverness Courier* 23 Nov., 5.
ANON. 1898a. Hugh Miller's birthplace and museum. The boy poet and editor. *Dundee Evening Telegraph* 31 Aug., 3.

ANON. 1898b. Excursion to Cromarty. 22nd July 1893. *Transactions of the Inverness Scientific Society and Field Club* **4**, 274-276.

ANON. 1899a. Hugh Miller's birthplace. Its romantic origin. Neglected and falling to ruins. *Aberdeen People's Journal* 17 Jun., 3.

ANON. 1899b. 'The house in Cromarty […].' *Academy* **1416** (24 Jun.), 672.

ANON. 1900. 'Hugh Miller's birthplace […].' *Edinburgh Evening News* 18 Jun., 6.

ANON. 1901a. Centenary of Hugh Miller's birth. Proposed celebration. *Dundee Courier* 9 Dec., 4.

ANON. 1901b. The centenary of Hugh Miller. *Scotsman* 17 Dec., 7.

ANON. 1902a. *The centenary of Hugh Miller being an account of the celebration held at Cromarty on 22nd August, 1902*. Glasgow University Press, Glasgow, 80pp.

ANON. 1902b. The Hugh Miller Centenary. *Nature* **66**, 156.

ANON. 1902c. Hugh Miller Centenary. *Museums Journal* **1**, 204.

ANON. 1902d. The Hugh Miller Centenary. *Scotsman* 15 Feb., 8.

ANON. 1902e. Hugh Miller's centenary. Celebrations at Cromarty. *Scotsman* 23 Aug., 7.

ANON. 1902f. Hugh Miller's centenary. Celebrations at Cromarty. Speech by Mr Bignold, M.P. *Aberdeen Weekly Journal* 27 Aug., 6.

ANON. 1902g. Portobello and Hugh Miller. *Scotsman* 23 Aug., 7.

ANON. 1902h. Hugh Miller centenary. Celebrations at Portobello. *Midlothian Journal* 29 Aug., 6.

ANON. 1902i. The proposed Hugh Miller Institute at Cromarty. *Scotsman* 9 Oct., 9.

ANON. 1903a. Cromarty Public School. Presentation of prizes. *Ross-shire Journal* 9 Jan., p. 7.

ANON. 1903b. Jacobite Exhibition at Inverness. Description of the exhibits. *Aberdeen Journal* 13 Jul., 4.

ANON. 1904a. Ms. of a Hugh Miller lecture. *Edinburgh Evening News* 11 May, 6.

ANON. 1904b. 'A prophet may receive honour […].' *Scotsman* 27 Aug., 6.

ANON. 1904c. The Hugh Miller Institute. Speeches by Mr Carnegie and Sir A. Bignold, M.P. *Scotsman* 27 Aug., 8.

ANON. 1906. Excursion to Cromarty. *Transactions of the Inverness Scientific Society and Field Club* **6**, 216-217.

ANON. 1908. *The Royal Scottish Museum Edinburgh: a guide to the collections*. His Majesty's Stationery Office, Glasgow, 63pp.

ANON. 1909. Eminent living geologists. Ramsay H. Traquair […]. *Geological Magazine* (5) **6**, 240-250.

ANON. 1910. New director of Royal Scottish Museum. *Scotsman* 24 Dec., 6.

ANON. 1911a. The new director of the Royal Scottish Museum. *Museums Journal* **10** (Jan.), 192-193.

ANON. 1911b. Royal Scottish Museum. The appointment of Sir T. Carlaw Martin. *Scotsman* 10 Mar., 8.

ANON. 1911c. Chalmers Church. A deceased pastor honoured. *The Advertiser* [Adelaide] 19 Jun., 10.

ANON. 1912a. *The Royal Scottish Museum, Edinburgh. A guide to the collections*. His Majesty's Stationery Office, Glasgow, 68pp.

ANON. 1912b. *The Royal Scottish Museum, Edinburgh. Guide to the collections of the Geological Survey illustrative of Scottish geology*. 6th edition. His Majesty's Stationery Office, Edinburgh, 32pp.

ANON. 1912c. Death of a distinguished Scottish palaeontologist. *Scotsman* 23 Nov., 8.

ANON. 1912d. Antarctic fishes. Report on the *Scotia* Collection. *Scotsman* 17 Dec., 11.

ANON. 1912e. Eminent living geologists. William Carruthers […]. *Geological Magazine* (5) **12**, 193-199.

ANON. 1912f. Museum reports. *Museums Journal* **12** (4), 119-121.

ANON. 1913. *The Royal Scottish Museum, Edinburgh: a guide to the collections*. His Majesty's Stationery Office, Glasgow, 68pp.

ANON. 1914. *The Edinburgh Academy Register. A record of all those who have entered the school since its foundation in 1824*. Edinburgh Academical Club, Edinburgh, 638pp.

ANON. 1916. *The Royal Scottish Museum, Edinburgh. A guide to the collections*. His Majesty's Stationery Office, Glasgow, 72pp.

ANON. 1919. Hugh Miller's daughter. Last of the geologist's family. *Scotsman* 18 Oct., 9.

ANON. 1920. The late Sir Thomas Carlaw Martin. *Scotsman* 27 Oct., 8.

ANON. 1921a. 'The death occurred at Elizabeth-street […].' *The Advertiser* [Adelaide] 17 Jan., 6.

ANON. 1921b. Mr J.H.M. Davidson. *The Observer* [Adelaide] 22 Jan., 33.

ANON. 1924. *The Royal Scottish Museum, Edinburgh. A guide to the collections*. His Majesty's Stationery Office, Glasgow, 63pp.

ANON. 1926. Hugh Miller's birthplace. *Aberdeen Press and Journal* 18 Jan., 6.

ANON. 1928a. The museums' appeal. Growing public interest. A Scottish example. *Scotsman* 2 May, 14.

ANON. 1928b. Carnegie birthplace. Dunfermline memorial. A house of treasure. *Scotsman* 29 Jun.,

11.
ANON. 1929a. *The Royal Scottish Museum Edinburgh. A general guide to the collections*. His Majesty's Stationery Office, Edinburgh, 56pp.
ANON. 1929b. Livingstone Memorial. Opened by Duchess of York. A place of pilgrimage. *Scotsman* 7 Oct., 10.
ANON. 1932. Prime Minister in Edinburgh. New University buildings. […]. *Scotsman* 29 Jan., 9.
ANON. 1934. Captain H.M. Miller. Service in war and peace. *The Times* 15 Jun., 21.
ANON. 1935a. *The Royal Scottish Museum, Edinburgh. A general guide to the collections*. His Majesty's Stationery Office, Edinburgh, 48pp.
ANON. 1935b. Hugh Miller MS. for Cromarty. *Aberdeen Journal* 2 Jan., 2.
ANON. 1936a. Hugh Miller's House. Suggestion to Mr Malcolm MacDonald. *Scotsman* 23 Jun., 9.
ANON. 1936b. Hugh Miller's desk. Gift by Commercial Bank of Scotland. *Scotsman* 29 Dec., 8.
ANON. 1937a. Hugh Miller. Mr Ramsay MacDonald's tribute. Quality and leadership. *Scotsman* 5 Jan., 10.
ANON. 1937b. Hugh Miller appeal. Birthplace for nation. £400 is required. *Scotsman* 11 Jun., 13.
ANON. 1937c. Hugh Miller's Cottage. To become national possession. Fund over-subscribed. *Scotsman* 6 Nov., 11.
ANON. 1937d. Gifts from Australia to Hugh Miller Institute. *Scotsman* 19 Nov., 9.
ANON. 1938a. Sundial designed by Sir Thomas Urquhart. Cromarty lady's gift to the Saltire Society. *Scotsman* 14 Sep., 14.
ANON. 1938b. Cromarty ceremonies. Memorial to Sir Thomas Urquhart unveiled. *Scotsman* 27 Sep., 7.
ANON. 1940a. Hugh Miller's Cottage. *Scotsman* 20 Feb., 5.
ANON. 1940b. Furnishing of Hugh Miller Cottage. *Aberdeen Weekly Journal* 29 Feb., 4.
ANON. 1943a. When Brighton's clinic was bombed. 50 seconds raid drama. *Evening Argus* [Brighton] 28 Apr., 2.
ANON. 1943b. Deaths. *Scotsman* 1 May, 8.
ANON. 1953. Hugh Miller's Cottage in Cromarty. *Scottish Geographical Magazine* **69**(2), 95-96.
ANON. 1974. *Hugh Miller. Exhibition in NLS Exhibition Hall, Aug.-Sep. 1974*. National Libraries of Scotland, Edinburgh, 28pp typescript [copies in NLS and NMS Library].
ANON. 2008a. Launch of the Scottish Fossil Code. *Palaeontology Newsletter* **68**, 72-73.
ANON. 2008b. Fossil code makes a debut. *Earth Heritage* **30**, 16.
ANON. 2009. When wind and waves wreaked havoc on fisher folk. *Inverness Courier* 7 Apr., 7.
BAILEY, E.B. 1952. Hugh Miller, 1802-56. Commemoration at Cromarty. *Nature* **170**, 790.
BAILLIE, T.W. 2003. Robert Halliday Gunning and the Victoria Jubilee Prizes. *Scottish Medical Journal* **48**, 54-57.
BAIRD, W. 1898. *Annals of Duddingston and Portobello*. Elliott, Edinburgh, xviii + 509pp.
BAYNE, P. 1871. *The life and letters of Hugh Miller*. 2 volumes. Strahan, London.
BAYNE, P. 1879a. 'With reference to […].' *Athenaeum* **2672**, 52.
BAYNE, P. 1879b. Robert Dick and Hugh Miller. *Athenaeum* **2676**, 184.
BAYNE, R. 1901. Bayne, Peter (1830-1896). *In*: Lee, S. (ed.) *Dictionary of National Biography, Supplement* **1**, 146-147.
BEATON, A.J. 1894. *Illustrated guide to the Black Isle Railway with historical and traditional notes on Cromarty and a chapter on the geology of the Black Isle*. Ross, Dingwall, 43pp.
BLAIKIE, W.G. and PERKINS, P. 2004. Davidson, Harriet Miller (1839-1883). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/7214 accessed 15 Dec. 2015].
BLAIKIE, W.G. and SAVAGE, D.W. 2004. Duff, Alexander (1806-1878). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/8167 accessed 4 May 2017].
BORLEY, L. (ed.) 2002. *Hugh Miller in context: geologist and naturalist: writer and folklorist*. [...] Cromarty Arts Trust and others, Cromarty, 112pp.
BORLEY, L. (ed.) 2003. *Celebrating the life and times of Hugh Miller. Scotland in the early 19th Century*. [...] Cromarty Arts Trust etc., Cromarty, 352pp.
BULL, R. 2013. *Lyme Regis Museum. Lyme's history in objects 15. 1888-92. Army entrenching tool handle once thought to be 'Mary Anning's hammer'. Accession Number LYM 1993/126*. [http://www.lymeregismuseum.co.uk/lrm/wp-content/uploads/2016/08/15_entrenching_-tool_-handle_without-copyright-drawings.pdf, downloaded 11 Oct. 2016].
BUNBURY, C.J.F. 1852. Description of a peculiar fossil fern from the Sydney Coal Field, Cape Breton. *Quarterly Journal of the Geological Society of London* **8**, 31-35.
CALDER, J. (ed.) 1989. *The wealth of a nation in the National Museums of Scotland*. National Museums of Scotland, Edinburgh, ix + 198pp.
CAMPBELL, G.D., 8th DUKE OF ARGYLL, 1906. *George Douglas Eighth Duke of Argyll K.G., K.T. (1823-1900) autobiography and memoirs*. 2 volumes. Murray, London.

CAMPBELL, I. 1993. Ecclefechan, Dumfries and Galloway; and Haddington, E. Lothian. *In*: Marsh, K. (ed.) *Writers and their houses. A guide* […]. Hamish Hamilton, London, 105-110.

CAMPBELL, I. and HOLDER, J. 2005. Hugh Miller's last house and museum: the enigma of Shrub Mount, Portobello. *Architectural Heritage* **16**, 51-71.

CANT, M. 1984. *Marchmont in Edinburgh*. John Donald, Edinburgh, xii + 176pp.

CANTOR, G. 2005. *Quakers, Jews and science. Religious responses to modernity and the sciences in Britain, 1650-1900*. Oxford University Press, Oxford, xii + 420pp.

CARNEGIE. A. 1904. *Hugh Miller Institute dedication*. Privately published, Dunfermline, 15pp.

CARRUTHERS, W. 1870. On the fossil cycadean stems from the Secondary rocks of Britain. *Transactions of the Linnean Society of London* **26**, 675-708.

CHAYES, F. 1958. Memorial of Samuel James Shand. *American Mineralogist* **43**, 317-324.

CLARK, J.W. and HUGHES, T.McK. 1890. *The life and letters of the Reverend Adam Sedgwick, LL.D., D.C.L., F.R.S.* […]., 2 vols. Cambridge University Press, Cambridge.

[CLARKE, J.M.] 1902a. The Hugh Miller Centenary. *Science* **16**, 556 [anonymous but authorship from Schuchert (1926, p. 230)].

CLARKE, J.M. 1902b. The centenary of Hugh Miller. *Science* new series **15**, 631.

CLEEVELY, R.J. 1983. *World palaeontological collections*. Mansell and British Museum (Natural History), London, 365pp.

CLEEVELY, R.J. and CHAPMAN, S.D. 1992. The accumulation and disposal of Gideon Mantell's fossil collections and their role in the history of British palaeontology. *Archives of Natural History* **19**, 307-364.

[CLOSE, F.] (as 'Dean of Carlisle'), n.d. *Hugh Miller's "Testimony of the Rocks:" or, God in his word and in his works*. 36pp. pamphlet.

COCHRANE, R. 1902. A relic of Hugh Miller. *Inverness Courier* 10 Jun., 3.

COLLIE, M. and DIEMER, J. 1995. Murchison in Moray. A geologist on home ground. With the correspondence of Roderick Impey Murchison and the Rev. Dr. George Gordon of Birnie. *Transactions of the American Philosophical Society* **85**, i-xxix, 1-263.

COLLIE, M. and DIEMER, J. (eds.) 2004. *Murchison's wanderings in Russia: his geological exploration of Russia in Europe and the Ural Mountains, 1840 and 1841. British Geological Survey Occasional Publication No. 2*. British Geological Survey, Keyworth, xvi + 474pp.

COONEY, S.M. 2006. Carruthers, Robert (1799-1878). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/4770 accessed 6 Jun. 2017].

COWAN, R.M.W. 1946. *The newspaper in Scotland. A study of its first expansion 1815-1860*. Outram, Glasgow, 432pp.

CROMARTY COURTHOUSE 1993. *East Church, Cromarty. Survey of inscriptions on gravestones*. Cromarty Courthouse, Cromarty, unpaginated.

CURLE, A.O. 1917. Royal Scottish Museum. *In*: Anon. *Report of the Committee of Council on Education in Scotland. 1916-1917*. His Majesty's Stationery Office, London, 21-22.

CURLE, A.O. 1918. The Royal Scottish Museum. *In*: Anon. *Report of the Committee of Council on Education in Scotland. 1917-1918*. His Majesty's Stationery Office, London, 20-22.

CURLE, A.O. 1919. Royal Scottish Museum. *In*: Anon. *Report of the Committee of Council on Education in Scotland. 1918-1919*. His Majesty's Stationery Office, London, 20-23.

CURLE, A.O. 1920. *Report for the year 1919-20 by the Director on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 16pp.

CURLE, A.O. 1925. *Report for the year 1924 on the Royal Scottish Museum*. Cyclostyled typescript, 8pp [copies in NMS Library].

CURLE, A.O. 1926. *Report for the year 1925 on the Royal Scottish Museum*. Cyclostyled typescript, 10pp [copies in NMS Library].

CURLE, A.O. 1928. *Report for the year 1927 by the Director, on the Royal Scottish Museum, Edinburgh*. Cyclostyled typescript, 9pp [copies in NMS Library].

CUTHBERT, W. 1902. A reminiscence of Hugh Miller. *Scotsman* 4 Oct., 11.

DAVIDSON, H.M. 2011 [originally published 1884], ed. and with introduction by McKENZIE JOHNSTON, H.B. *Sir Gilbert's children*. For The Right Reasons, Inverness, 80pp.

DAVIS, P. 1995. George Johnston (1797-1855) of Berwick upon Tweed and the pioneers of marine biology in north-east England. *Archives of Natural History* **22**, 349-369.

DAVIES, W. 1964. William Pengelly, F.R.S., 1812-1894. *Studies in Speleology* **1**, 3-8.

DESMOND, A. and MOORE, J. 2009. *Darwin's sacred cause. Race, slavery and the quest for human origins*. Allen Lane, London, xxii + 485pp.

DESMOND, R. 1994. *Dictionary of British and Irish botanists and horticulturists including plant collectors, flower painters and garden designers*.

Taylor and Francis, London, 900pp.
DOBBIE, J.J. 1907. *Report for the year 1906 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 18pp.
DOBBIE, J.J. 1908. *Report for the year 1907 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 24pp.
DOBBIE, J.J. 1909. *Report for the year 1908 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 28pp.
DONOVAN, S.K. and SCHOOR, D.I.E. 2016. A game of two halves? Split specimens in different collections. *The Geological Curator* **10**, 195-199.
DUNN, D. 1993. Robert Burns. Alloway, Ayrshire. *In*: Marsh, K. (ed.) *Writers and their houses. A guide* […]. Hamish Hamilton, London, 71-82.
DUNS, [J.], 1887. William Stevenson. *History of the Berwickshire Naturalists' Club* **10**, 289-299 [author identified from F.R.S.E. affiliation].
DUTTON, G. 1988. Preece, Frederick William (1857-1928). *Australian Dictionary of Biography*, online edition [http://adb.anu.edu.au/biography/preece-frederick-william-8101/text14141 accessed 8 Jul. 2017].
EGERTON, P. de M.G. and MILLER, H. 1860. Palichthyological notes, No. 12: remarks on the nomenclature of the Devonian fishes. *Quarterly Journal of the Geological Society of London* **16**, 119-136.
FAIRLY, R. 1871. The late Hugh Miller, the Witness, and the Free Church leaders. *Scotsman* 8 Mar., 6.
FALCON-LANG, H.J. 2008. Marie Stopes and the Jurassic floras of Brora, NE Scotland. *Scottish Journal of Geology* **44**, 65-73.
FINNEGAN, D.A. 2005. Natural history societies in late Victorian Scotland and the pursuit of local civic science. *British Journal for the History of Science* **38**, 53-72.
FINNEGAN, D.A. 2007. The spatial turn: geographical approaches in the history of science. *Journal of the History of Biology* **41**, 369-388.
FINNEGAN, D.A. 2008. 'An aid to mental health': natural history, alienists and therapeutics in Victorian Scotland. *Studies in the History and Philosophy of Biology and the Biomedical Sciences* **39**, 326-337.
FINNEGAN, D.A. 2009. *Natural history societies and civic culture in Victorian Scotland*. Pickering and Chatto, London, xi + 254pp.
FINNEGAN, D.A. 2011. Exeter-Hall science and evangelical rhetoric in mid-Victorian Britain. *Journal of Victorian Culture* **16**, 46-64.
FISHER, D.W. 1987. John Mason Clarke: James Hall's protégé-successor. *Earth Sciences History* **6**, 114-118.
FISHER, G.P. 1866. *Life of Benjamin Silliman, M.D., LL.D.* […]. 2 vols. Charles Scribner, New York.
FLEMING, J., 1851. Introductory lecture on natural science. *In*: Anon. *Inauguration of the New College of the Free Church, Edinburgh*: *November, M.DCCC.L.* […]. Johnstone and Hunter, Edinburgh, 213-232.
FOREY, P. 2003. Palaeozoic origami. *Set in stone. The NHM Palaeontology Dept. Newsletter* **1**(3), 11-12.
GEIKIE, A. 1858 Ms. *Reference catalogue of the Hugh Miller Collection. 14 June 1858*. Unpublished Ms., Department of Natural Sciences, NMS.
GEIKIE, A. 1875. *Life of Sir Roderick I. Murchison Bart.* […]., 2 vols. Murray, London.
GEIKIE, A. 1902. Address by Sir Archibald Geikie, D.C.L., F.R.S. *In*: Anon. (1902b), 40-69.
GEIKIE, A. 1915. A Canadian memorial to Hugh Miller. *Nature* **95**, 479.
GEIKIE, A. 1924. *A long life's work: an autobiography*. Macmillan, London, xii + 426pp.
GOODCHILD, J.G. 1901a. Astronomical models in museums. *Museums Journal* **1**, 156-164.
GOODCHILD, J.G. 1901b. On the arrangement of mineralogical collections. *Museums Journal* **1**, 193-198.
GOODCHILD, J.G. 1902a. On the arrangement of geological collections. *Museums Journal* **1**, 219-225.
GOODCHILD, J.G. 1902b. *Guide to the geological collections in the Hugh Miller Cottage, Cromarty*. Dingwall. Reprinted in Goodchild *et al.* (2017).
GOODCHILD, J.G., TAYLOR, M.A. and ANDERSON, L.I. 2017. J.G. Goodchild's *Guide to the Geological Collections in the Hugh Miller Cottage, Cromarty* of 1902. *The Geological Curator* **10** (7), 447-454.
GOSTWICK, M. 2005. *Hugh Miller Museum and Birthplace Cottage Cromarty*. National Trust for Scotland, Edinburgh, 48pp.
GOSTWICK, M. 2016. A dark place with some probably insoluble mysteries. *Hugh's News. Newsletter of the Friend of Hugh Miller* **27**, 5-8 [http://s3.spanglefish.com/s/27844/documents/newsletters/newsletterwinter16.pdf].
GRANT DUFF, M.E. 1897. *Notes from a diary 1851-1872*., 2 vols. Murray, London.
GREENWOOD, T. 1888. *Museums and art galleries*. Simpkin, Marshall, London, xvi + 419pp.
GREGORY, J.W. 1909. Obituary notice of John George Goodchild, born 26th May 1844, died 21st Feb. 1906. *Transactions of the Edinburgh Geological Society* **9**, 331-350.
GUNN, W. 1897. Obituary notice of Hugh Miller,

F.R.S.E., F.G.S., etc., of H.M. Geological Survey of Scotland. *History of the Berwickshire Naturalists' Club* **15**, 322-324.

HEALEY, E. 2012. Coutts, Angela Georgina Burdett-, suo jure Baroness Burdett-Coutts (1814-1906). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/32175 accessed 15 Dec. 2015].

HERRIES DAVIES, G.L. 2007. *Whatever is under the Earth. The Geological Society of London 1807 to 2007*. Geological Society Publishing House, Bath, xiii + 356pp.

HEWISON, R. 1993. John Ruskin. Brantwood, Coniston, Cumbria. *In*: Marsh, K. (ed.) *Writers and their houses. A guide* […]. Hamish Hamilton, London, 328-338.

HISLOP, S. 1861. On the age of the fossiliferous thin-bedded sandstone and coal of the Province of Nágpur, India. *Quarterly Journal of the Geological Society of London* **17**, 346-354.

HOEVELER, J.D. 2007. McCosh, James (1811-1894). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/17402 accessed 15 Dec. 2015].

HORNE, J. 1897. Obituary notice of Hugh Miller. *Transactions of the Edinburgh Geological Society* **7**, 132-138.

HOWELL, H.H. and GEIKIE, A. 1861. *The geology of the neighbourhood of Edinburgh (Map 32.) Memoirs of the Geological Survey of Great Britain and of the Museum of Practical Geology*. Her Majesty's Stationery Office, London, vi + 58pp.

HUSSAKOF, L. 1913. Ramsay Heatley Traquair. *Science* n.s. **37**, 509-511.

KLEMUN, M. 2011. The geologist's hammer - 'fossil' tool, equipment, instrument and/or badge? *Centaurus* **53**, 86-101.

KNELL, S.J. 1996. The roller-coaster of museum geology. *In*: Pearce, S.M. (ed.) *Exploring science in museums*. Athlone, London, 29-56.

KNELL, S.J. 1997. Museums, fossils and the cultural revolution of science: mapping the changing politics of knowledge in early nineteenth-century Britain. *In*: Knell, S.J., MacLeod, S. and Watson, S. (eds.) *Museum revolutions: how museums change and are changed*. Routledge, London, 28-47.

KNELL, S.J. 2000. *The culture of English geology, 1815-1851. A science revealed through its collecting*. Ashgate, Aldershot, xxi + 377pp.

KNELL, S.J. 2007. Museums, reality and the material world. *In*: Knell, S.J., (ed.), *Museums in the material world*. Routledge, London, 1-28.

KNELL, S.J. and TAYLOR, M.A. 2006. Hugh Miller: fossils, landscape and literary geology. *Proceedings of the Geologists' Association* **117**, 85-98.

LAMB, J. 2011. *Dalrymple Crescent. A snapshot of Victorian Edinburgh*. T. & J. Lamb, Edinburgh, xviii + 286pp.

LEASK, W.K. [1896]. *Hugh Miller*. Oliphant, Anderson and Ferrier, Edinburgh, 157pp.

LEMIEUX, P. 1996. Historical overview. The *Fossil-Lagerstätte* Miguasha: its past and present history. *In*: Schultze, H.-P. and Cloutier, R. (eds.) *Devonian fishes and plants of Miguasha, Quebec, Canada*. Verlag Dr. Friedrich Pfeil, München, Germany, 9-22.

LISTON, J.J. and SANDERS, H.L. 2005. The 'other' Glasgow boys: the rise and fall of a school of palaeobotany. *In*: Bowden, A.J., Burek, C.V. and Wilding, R. (eds.) *History of Palaeobotany: Selected Essays. Geological Society, London, Special Publication* **241**. The Geological Society, pp. 197-228.

LOCKE, A.A. 1916. *The Hanbury family*. 2 vols. Humphreys, London.

LONGMUIR, [J.] 1860. On the restoration of *Pterichthys* in 'The Testimony of the Rocks'. *Annual Report of the British Association for the Advancement of Science*, **for 1859**, *Reports of Transactions*, p. 263.

LURIE, E. 1988. *Louis Agassiz. A life in science*. Johns Hopkins University Press, Baltimore, xiv + 457pp.

LYELL, K.M. (ed.) 1906. *The life of Sir Charles J.F. Bunbury Bart*. […]. 2 vols. Murray, London.

[LYON, G.] (as 'G.L.'), 1867. Memoir of the Society. *Transactions of the Edinburgh Geological Society* **1**, 1-6.

McCONNELL, A. 2009. Hanbury, Sir Thomas (1832-1907). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/54055 accessed 19 Dec. 2015].

MACFADYEN, C. 2008. Code of the Scots. *Geoscientist Online* 20 May, https://www.geolsoc.org.uk/Geoscientist/Archive/July-2008/Code-of-the-Scots.

McGOWAN, R.Y. and CLUGSTON, D.L. 2007. Pioneers in Scottish ornithology. *In*: Forrester, R.W., Andrews, I.J., Mcinerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. and Grundy, D.S. (eds.) *The Birds of Scotland*. 2 volumes. Scottish Ornithologists' Club, Aberlady, vol. 1, 97-108.

McKENZIE JOHNSTON, H.B. 2011. Introduction. *In*: Davidson (2011), iii-vii.

McKENZIE JOHNSTON, M.A. 2007. Foreword. *In*:

Taylor (2007), 6-8.
McKENZIE JOHNSTON, M.A. 2008. Miller, Lydia Mackenzie Falconer (bap. 1812, d. 1876). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/18732 accessed 15 Dec. 2015].
McKENZIE JOHNSTON, M.A. and TAYLOR, M.A. 2002. Lydia Miller and the posthumous reputation. *In*: Borley (2002), 103-111.
MACLEOD, D. 1996. Hugh Miller, the Disruption, and the Free Church of Scotland. *In*: Shortland (1996a), 187-205.
MACPHERSON, H.G. 1986. Department of Geology. *In*: Brock, S. and Harley, A. (eds.). *The Royal Scottish Museum final report 1983-84-85*. Royal Scottish Museum, Edinburgh, 24-29.
MABEY, R. 1993. Gilbert White. The Wakes, Selborne, Hampshire. *In*: Marsh (1993), 453-459.
MALCOLM, E.H. 2003. *The Cromarty we knew. A walk through the 1930s*. 2nd edition. Cromarty History Society and Friends of Cromarty Courthouse, Cromarty, 162pp.
MARSH, K. (ed.) 1993. *Writers and their houses. A guide to the writers' houses of England, Scotland, Wales and Ireland. Essays by modern writers*. Hamish Hamilton, London, xix + 515pp.
MARTIN, T.C. 1912. *Report for the year 1911-12 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 31pp.
MARTIN, T.C. 1913. *Report for the year 1912-13 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 24pp.
MARTIN, T.C. 1914. *Report for the year 1913-14 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 28pp.
MARTIN, T.C. 1915. *Report for the year 1914-15 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 26pp.
MATTHEW, H.C.G. 2009. Campbell, George Douglas, eighth Duke of Argyll [...] (1823-1900). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/4500 accessed 16 Dec. 2015].
MATTHEW, H.C.G. 2015. Russel, Alexander (1814-1876). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/24292 accessed 19 Dec. 2015].
MAVOR, E. 1993. William Cowper. Orchard Side, Olney, Buckinghamshire. *In*: Marsh, K. (ed.) *Writers and their houses. A guide* […]. Hamish Hamilton, London, 141-150.
MILLAR, A.H. and MARTIN, J. 2004. Kinnaird, George William Fox, ninth Lord Kinnaird of Inchture, Baron Rossie, and first Baron Kinnaird of Rossie (1807-1878). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/15635, accessed 4 May 2017].
MILLER, H. 1841. *The Old Red Sandstone; or new walks in an old field*. John Johnstone, Edinburgh, xxiii + 275pp.
MILLER, H. 1847. *First impressions of England and its people*. John Johnstone, London, xx + 407pp.
MILLER, H. 1854. *My schools and schoolmasters; or, The story of my education*. Johnstone and Hunter, Edinburgh, v + 537pp.
MILLER, H. 1857. *The testimony of the rocks, or geology in its bearings on the two theologies, natural and revealed*. Constable, and Shepherd & Elliott, Edinburgh, xii + 500pp.
MILLER, H. 1858. *The cruise of the Betsey, or, a summer ramble among the fossiliferous deposits of the Hebrides*. Constable, Edinburgh, ii + 486pp [first edition; reissued 2003 in facsimile by NMS Publishing, Edinburgh].
MILLER, H. 1859. *Sketch-book of popular geology; being a series of lectures delivered before the Philosophical Institution of Edinburgh*. Constable, Edinburgh, xxxvi + 358pp.
MILLER, H. 1870. *Leading articles on various subjects*. Nimmo, Edinburgh, viii + 453pp.
MILLER, H., the younger, 1871. The late Mr J.G. Wood and Hugh Miller. *Scotsman* 13 Mar., 7.
MILLER, H. 1892. *The Old Red Sandstone, or, New walks in an old field*. [Essentially the 7th and first posthumous edition, published 1857.] Nimmo, Hay and Mitchell, Edinburgh, xxxi + 385pp.
MILLER, H., the younger, 1893. The Sutors of Cromarty, a chapter in pre-glacial geology. *Transactions of the Inverness Scientific Society and Field Club* **3**, 131-135.
MILLER, H., the younger, 1894. Miller, Hugh (1802-1856). *In*: Lee, S. (ed.), *Dictionary of national biography*, vol. 37, 408-410.
MILLER, H. 1896. *Footprints of the Creator, or the Asterolepis of Stromness*. Revised edition. Nimmo, Hay and Mitchell, Edinburgh, lxxii + 352pp.
MILLER, H. (ed. SHORTLAND, M.) 1995. *Hugh Miller's Memoir. From stonemason to geologist*. Edinburgh University Press, Edinburgh, v + 266pp.
MILLER, L.M.F.F. (ed. MACKAY, L.M.) 1902. Mrs Hugh Miller's Journal. *Chambers's Journal* (6) **5**, 305-308, 369-372, 461-464, 513-516.
MOIR, E. 1901. Hugh Miller's death. *British Weekly*, Scotch Edition, 4 Apr., 644.
MORISON, A. 1905. *The Blackhalls of that Ilk and Barra. Hereditary Coroners and Foresters of the*

Garioch. Spalding Club, Aberdeen, xvi + 180pp.
MORISON, J. 1876. In remembrance of Lydia Falconer Fraser. Mrs Hugh Miller. *Ladies' Edinburgh Magazine* **2**, 185-192.
MORRISON-LOW, A.D. and NUTTALL, R.H. 2003. Hugh Miller in an age of microscopy. *In*: Borley (2003), 214-226.
MULLAY, A. 2016. Zeppelins over Edinburgh. *History Scotland* **16**, 16-21.
MUNDEN, A.F. 2004. Close, Francis (1797-1882). *Oxford dictionary of national biography*, online version [http://www.oxforddnb.com/view/article/5703 accessed 15 Dec. 2015].
MURCHISON, R. I. 1859. On the succession of the older rocks in the northernmost counties of Scotland; with some observations on the Orkney and Shetland Islands. *Quarterly Journal of the Geological Society of London* **15**, 353-418, 419*-421*.
MURDOCH SMITH, R. 1888. Report of the Director of the Edinburgh Museum of Science and Art for 1887. In *Thirty-fifth Report of the Department of Science and Art, Appendix F*, 234-240; also *Parliamentary Papers* 1888 **XLII** [C.5279.], 280-286.
MURDOCH SMITH, R. 1889. Report of the Director of the Edinburgh Museum of Science and Art for 1888. In *Thirty-sixth Report of the Department of Science and Art, Appendix F*, 270-277; also *Parliamentary Papers* 1889 **XXXIII** [C.5654.], 314-321.
MURDOCH SMITH, R. 1890. Report of the Director of the Edinburgh Museum of Science and Art for 1889. In *Thirty-seventh Report of the Department of Science and Art, Appendix F*, 301-308; also *Parliamentary Papers* 1890 **XXXII** [C.6053.], 349-356.
NADIM, T., MOHR, B.A.R, and LÖWE, S.A. 2015. Reconstructions of a historic paleontological collection: diversity re-created. *Earth Sciences History* **34**, 348-366.
NARENDRA, B. 1979. Benjamin Silliman and the Peabody Museum. *Discovery* **14**(2), 13-39.
NEVE, M. 1993. Charles Darwin. Down House, Downe, Kent. *In*: Marsh, K. (ed.) *Writers and their houses. A guide* […]. Hamish Hamilton, London, 151-158.
NEWBOULD, I.D.C. 2008. Stanley, Edward John, second Baron Stanley of Alderley and first Baron Eddisbury (1802-1869). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/26267 accessed 15 Dec. 2015].
NUTTALL, R. 2004. 'An outdoor man': Charles Peach and the luminosity of the sea. *Quekett Journal of Microscopy* **39**, 783-791.
O'CONNOR, R.J. 2007. *The Earth on show: fossils and the poetics of popular science, 1802-1856*. University of Chicago Press, Chicago, xiii + 541 pp.
OGILVIE, F.G. 1902. *Edinburgh Museum of Science and Art. Report for the year 1901*. His Majesty's Stationery Office, London, 15pp.
OLDROYD, D.R. 1980. Sir Archibald Geikie (1835-1924), geologist, romantic aesthete, and historian of geology: the problem of Whig historiography of science. *Annals of Science* **37**, 441-462.
OLDROYD, D.R. 1996. The geologist from Cromarty. *In*: Shortland (1996a), 76-121.
OLDROYD, D.R. 1999. Early ideas about glaciation in the English Lake District: the problem of making sense of glaciation in a glaciated region. *Annals of Science* **56**, 175-203.
OLDROYD, D.R. 2002. *Earth, water, ice and fire: two hundred years of geological research in the English Lake District. Geological Society, London, Memoir 25*. Geological Society Publishing House, London, vii + 328pp.
OLDROYD, D. R. 2004a. Geikie, Sir Archibald (1835-1924). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/33364 accessed 16 Dec. 2015].
OLDROYD, D.R. 2004b. Peach, Benjamin Neeve (1842-1926). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/37839 accessed 15 Dec. 2015].
OLDROYD, D. R. 2004c. Peach, Charles William (1800-1886). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/21665 accessed 15 Oct. 2010].
PAGE, B.W. 1974. A system of colour coding. *Newsletter of the Geological Curators' Group* **1**, 23-24.
PARRINGTON, F.R. and WESTOLL, T.S. 1974. David Meredith Seares Watson 1886-1973. Elected F.R.S. 1922. *Biographical Memoirs of Fellows of the Royal Society* **20**, 482-504.
PATON, R.L. 1976. *A catalogue of the fossil vertebrates in the Royal Scottish Museum, Edinburgh. Part five. Acanthodii. Royal Scottish Museum Information Series Geology 6*. Royal Scottish Museum, Edinburgh, viii + 40pp.
PATON, R.L. 2004. Traquair, Ramsay Heatley (1840-1912). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/48896 accessed 7 Jun. 2017].
PATTERSON, C. and FORTEY, R.A. 1999. Thomas Stanley Westoll. 3 July 1912-19 September 1995. *Biographical Memoirs of Fellows of the Royal Society* **45**, 531-546.

PEACH, B.N. 1883. On the occurrence of *Pterygotus* and a limuloid in the Caithness Flagstones, and on the nature and mode of formation of 'Adam's Plates'. *Proceedings of the Royal Physical Society of Edinburgh* **7**, 343-350.

PEACH, B.N., TRAQUAIR, R.H., ANDERSON, L.I. and TAYLOR, M.A. 2017. *Guide to the Hugh Miller Collection in the Royal Scottish Museum, Edinburgh, c*. 1920. *The Geological Curator* **10** (7), 375-428.

PEACH. C.W. [1866-1867] Ms. [Catalogue of the Hugh Miller Collection]. Bound with Geikie (1858 Ms). Department of Natural Sciences, NMS.

PENGELLY, H. 1897. *A memoir of William Pengelly, of Torquay, F.R.S., geologist, with a selection from his correspondence*. John Murray, London, xii + 342pp.

PHEMISTER, J. and SABINE, P.A. 2004. McLintock, William Francis Porter (1887-1960). *Oxford dictionary of national biography*, online edition [http://www.oxforddnb.com/view/article/34791 accessed 15 Dec. 2015].

PONDER, G. 1970. *Mr. Goggin comes to town*. Privately published, Adelaide, 20pp.

PORTER, D.M. 2010. Darwin's plant fossils. *The Linnean* **26**(3), 10-11.

REEKS, M. 1920. *Register of Associates and Old Students of the Royal School of Mines and history of the Royal School of Mines*. Royal School of Mines (Old Students') Association, London, 233 + 212pp.

RICHARDS, J.T. 1885. On Scottish fossil cycadaceous leaves contained in the Hugh Miller collection. *Proceedings of the Royal Physical Society of Edinburgh* **8**, 116-123.

[RITCHIE, J.] (as 'J.R.'), 1925. A contrast in skulls. *Scotsman* 9 May, 8 [James Ritchie (1882-1958) was Keeper of Natural History at RSM].

ROBERTS, M.B. 2009. Adam Sedgwick (1785-1873): geologist and evangelical. *In*: Kölbl-Ebert, M. (ed.) *Geology and religion: a history of harmony and hostility. Geological Society, London, Special Publications* **310**, 155-170.

ROSIE, G. 1981. *Hugh Miller. Outrage and order. A biography and selected writings*. Mainstream, Edinburgh, 236pp.

ROSS, A. 2013. The new Palaeobiology Store at National Museums Scotland. *Edinburgh Geologist* **54**, 19-22.

ROSS, R. 1857. To the Editor of the *Inverness Courier*. *Inverness Courier* 21 May, 6.

ROWATT, T. [1940]. *Report for the year 1939 by the Director on the Royal Scottish Museum, Edinburgh*. Cyclostyled report, Scottish Education Department, Edinburgh, 30pp.

ROWLAND, D. 1997. *The Brighton Blitz*. S. B. Publications, Hove, 87pp.

[RUSSEL, A.]. 1871. Literature. *The life and letters of Hugh Miller* [...]. *Scotsman* 3 Mar., 5 [the anonymous author must be Alexander Russel (1814-1876), as he alludes to editing the *Scotsman* during the Cardross church cases of 1859-1864, when Bayne edited *The Witness* (Matthew 2015)].

RUSSELL, E.J. 1944. Thomas Hudson Middleton 1863-1943. *Obituary Notices of Fellows of the Royal Society* **4**, 554-569.

SCHUCHERT, C. 1926. John Mason Clarke. *National Academy of Sciences biographical memoirs* **12**, 182-244.

SCHUCHERT, C. and RUEDEMANN, R. 1925. John Mason Clarke (1857-1925). *Science* **62**, 117-121.

SEWARD, A.C. 1911. The Jurassic flora of Sutherland. *Transactions of the Royal Society of Edinburgh* **47**, 643-709.

SEWARD, A.C. 1912. A petrified *Williamsonia* from Scotland. *Philosophical Transactions of the Royal Society of London, Series B* **203**, 101-126.

SHEETS-PYENSON, S. 1992. Horse race: John William Dawson, Charles Lyell, and the competition over the Edinburgh natural history chair in 1854-1855. *Annals of Science* **49**, 461-477.

SHERBORN, C.D. 1940. *Where is the - Collection? An account of the various natural history collections* […]. Cambridge University Press, Cambridge, 149pp.

SHORTLAND, M. (ed.) 1996a. *Hugh Miller and the controversies of Victorian science*. Clarendon Press, Oxford, viii + 401pp.

SHORTLAND, M. 1996b. Introduction. *In*: Shortland (1996a), 1-13.

SMILES, S. 1878. *Robert Dick baker of Thurso geologist and botanist.* Murray, London, xx + 436pp.

SMILES, S. 1879. Dick's letters to Hugh Miller. *Athenaeum* **2674**, 122.

SMITH, J.A. 1858. Museum of the late Hugh Miller. *Proceedings of the Royal Physical Society of Edinburgh* **1**, 439.

SMITH, J.A. 1863. Hugh Miller's Museum. *Proceedings of the Royal Physical Society of Edinburgh* **2**, 151.

SREBRNIK, P.T., 1986. *Alexander Strahan, Victorian publisher*. University of Michigan Press, Ann Arbor, viii + 269pp.

STACE, H.E., PETTIT, C.W.A., and WATERSTON, C.D. 1987. *Natural science collections in Scotland (botany, geology, zoology).* National Museums of Scotland, Edinburgh, xxvi + 373pp.

STEVENSON, S. 2017. Hugh Miller and the Gravestone, 1843-4. *The Geological Curator* **10** (7), 455-461.

SUTHERLAND, E., and McKENZIE JOHNSTON,

M.A. 2002. *Lydia, wife of Hugh Miller of Cromarty*. Tuckwell, East Linton, xvii + 188pp.

SWANTON, E.W. 1947. *A country museum. The rise and progress of Sir Jonathan Hutchinson's Educational Museum at Haslemere*. Educational Museum, Haslemere, xvi + 155pp.

SWINNEY, G.N. 1982. Some Richardson type specimens in a collection of Australian fishes, with notes on their collector Robert Neill. *Archives of natural history* **11**, 17-25.

SWINNEY, G.N. 1999. A natural history collection in transition. Wyville Thomson and the relationship between the University of Edinburgh and the Edinburgh Museum of Science and Art. *Journal of the history of collections* **11**, 51-70.

SWINNEY, G.N. 2002. Reporting on the museum: the annual reports of the Edinburgh Museum of Science and Art. *Archives of natural history* **29**, 99-108.

SWINNEY, G.N. 2003. Furnishing a museum: nineteenth-century exhibition casing in the Royal Museum, Edinburgh. *Furniture history* **39**, 121-140.

SWINNEY, G.N. 2006. Reconstructed visions: the philosophies that shaped part of the Scottish national collections. *Museum management and curatorship* **21:2**, 128-142.

SWINNEY, G.N. 2013. *Towards an historical geography of a 'National' Museum: the Industrial Museum of Scotland, the Edinburgh Museum of Science and Art and the Royal Scottish Museum, 1854-1939*. PhD thesis, University of Edinburgh.

SWINNEY, G.N. 2015. Collecting legacies: national identity and the world-wide collections of National Museums Scotland. *Review of Scottish Culture* **26**, 132-147.

SYMONDS, W.S. 1860. On the physical relations of the reptiliferous sandstones of Elgin. *Edinburgh New Philosophical Journal*, n.s. **12**, 95-101.

[TAYLOR, H.M.] (as 'One who knew him'), 1900. My recollections of Hugh Miller. *British Weekly*, Scotch Edition, 4 and 11 Oct., 480-481, 501-502 [authorship from Sutherland and McKenzie Johnston (2002, p. 163)].

TAYLOR, M.A. 2003. Introduction. *In*: Miller, H. *The Cruise of the* Betsey, with, *Rambles of a geologist*. National Museums of Scotland Publishing, Edinburgh, A11-A64.

TAYLOR, M.A. 2007. *Hugh Miller. Stonemason, geologist, writer*. NMS Publishing, Edinburgh, 176pp.

TAYLOR, M.A. 2008. A celebration of Hugh Miller, geologist. A 'Local Hero' event […]. *Palaeontology Newsletter* **68**, 67-71.

TAYLOR, M.A. 2016. Keith Leask and his biography of Hugh Miller. *Hugh's News. Newsletter of the Friends of Hugh Miller* **27**, 13-15 [http://s3.spanglefish.com/s/27844/documents/newsletters/newsletterwinter16.pdf].

TAYLOR, M.A. 2017. A memoir of Hugh Miller (1802-1856) attributed to his son Hugh Miller F.G.S. (1850-1896). *Archives of natural history* **44**, 103-109.

TAYLOR, M.A. and ANDERSON, L.I. 2012a. Hugh Miller (1802-1856): ephemera and information sought. *Coprolite* **68**, 10.

TAYLOR, M.A. and ANDERSON, L.I. 2012b. Hugh Miller (1802-1856): a lost catalogue of his fossil collection. *Coprolite* **68**, 10-11.

TAYLOR, M.A. and ANDERSON, L.I. 2012c. Hugh Miller (1802-1856): lost papers. *Coprolite* **68**, 11-12.

TAYLOR, M.A. and ANDERSON, L.I. 2012d. Hugh Miller (1802-1856): ephemera and information sought. *Newsletter of the Society for the History of Natural History* **104**, 13.

TAYLOR, M.A. and ANDERSON, L.I. 2012e. Hugh Miller (1802-1856): a lost catalogue of his fossil collection. *Newsletter of the Society for the History of Natural History* **104**, 13-14.

TAYLOR, M.A. and ANDERSON, L.I. 2012f. Hugh Miller (1802-1856): lost papers. *Newsletter of the Society for the History of Natural History* **104**, 14.

TAYLOR, M.A. and ANDERSON, L.I. 2015. Additional information on Charles W. Peach (1800-1886). *The Geological Curator* **10** (4), 159-180.

TAYLOR, M.A. and ANDERSON, L.I. 2017a. The appeal circular for the purchase of Hugh Miller's collection, 1858. *The Geological Curator* **10** (7), 369-373.

TAYLOR, M.A. and ANDERSON, L.I. forthcoming. A note on Alfred Tennyson and Hugh Miller. *Tennyson Research Bulletin* **11** (1).

TAYLOR, M.A. and CLARK, R.D. 2016. Ichthyosaurs from the Lower Lias (Lower Jurassic) of Banwell, Somerset. *Geoscience in South-West England* **14**, 59-71.

TAYLOR, M.A. and GOSTWICK, M. 2003. Hugh Miller's collection - a memorial to a great geological Scot. *Edinburgh Geologist* **40**, 24-29; [http://edinburghgeolsoc.org/eg_pdfs/issue40_full.pdf].

TAYLOR, M.A. and KITCHENER, A.C. 2007. *Scotland's beginnings. Scotland through time*. NMSE Publishing, Edinburgh, 96pp.

TAYLOR, M.A. and LEVITT, S. 2016. Mary Anning (1799-1847) and the photograph 'The Geologists' taken at Chudleigh in 1843 and ascribed to William Henry Fox Talbot (1800-1877). *Geoscience in South-West England* **13**, 419-427.

TAYLOR, M.A. and MORRISON-LOW, A.D. 2017. The first known stereophotographs of Hugh Miller's Cottage and the building of the Hugh

Miller Monument, Cromarty, 1859. *The Geological Curator* **10** (7), 429-445.

TORRENS, H.S. 1995. Mary Anning (1799-1847) of Lyme; 'the greatest fossilist the world ever knew'. *British Journal for the History of Science* **28**, 257-284.

TORRENS, H. S. 2003. William Smith (1769-1839) and the search for English raw materials: some parallels with Hugh Miller and with Scotland. *In*: Borley (2003), 137-155.

TORRENS, H.S. 2006. Notes on 'The amateur' in the development of British geology. *Proceedings of the Geologists' Association* **117**, 1-8.

TORRENS, H.S. 2009. Dissenting science: the Quakers among the Founding Fathers. *In*: Lewis, C.L.E. and Knell, S.J. (eds.). *The making of the Geological Society of London. Geological Society, London, Special Publication* **317**, 129-144.

TORRENS, H.S., BENAMY, E., DAESCHLER, E.B., SPAMER, E.E. and BOGAN, A.E. 2000. Etheldred Benett of Wiltshire, England, the first lady geologist - her fossil collection in the Academy of Natural Sciences of Philadelphia, and the rediscovery of 'lost' specimens of Jurassic Trigoniidae (Mollusca: Bivalvia) with their soft anatomy preserved. *Proceedings of the Academy of Natural Sciences of Philadelphia* **150**, 59-123.

TRAQUAIR, R.H. 1886. Report of the Keeper of the Natural History Department for the year 1885. *In*: Murdoch Smith, R. *Report of the Director of the Edinburgh Museum of Science and Art for 1885*, 343-345; also *Thirty-third Report of the Department of Science and Art, Appendix F*, 343-345; also *Parliamentary Papers* 1886 **XXIX** [C.4707.], 391-393.

TRAQUAIR, R.H. 1887. Report of the Keeper of the Natural History Department for the year 1886. *In*: Murdoch Smith, R. *Report of the Director of the Edinburgh Museum of Science and Art for 1886*, 282-284; *Thirty-fourth Report of the Department of Science and Art, Appendix F*, 282-284; also *Parliamentary Papers* 1887 **XXXIV** [C.5076.], 334-336.

TRAQUAIR, R.H. 1893a. Report of the Keeper of the Natural History Department for the year 1892. *In*: Murdoch Smith, R. *Report of the Director of the Edinburgh Museum of Science and Art for 1892*, 281-284; also *Fortieth Report of the Department of Science and Art, Appendix F* , 276-284; also *Parliamentary Papers* 1893-94 **XXIX** [C.6905.], 341-344.

TRAQUAIR, R.H. 1893b. [Presidential address on natural history museums.] *Proceedings of the Royal Physical Society of Edinburgh* **11**, 173-191.

TRAQUAIR, R.H. 1902. Report of the Keeper of the Natural History Department. *In*: Ogilvie (1902), 4-5.

TRAQUAIR, R.H. 1903a. Report of the Keeper of the Natural History Department for the year 1902. *In*: Ogilvie, F.G. Edinburgh Museum of Science and Art. *Report for the year 1902 by* [...] *the Director*. His Majesty's Stationery Office, London, 6-7.

TRAQUAIR, R.H. 1903b. Notes on the history of the Royal Physical Society. *Proceedings of the Royal Physical Society of Edinburgh* **15**, 105-109.

TRAQUAIR, R.H. 1904. Report of the Keeper of the Natural History Department for the year 1903. *In*: Dobbie, J.J. *Edinburgh Museum of Science and Art. Report for the year 1903 by* [...] *the Director*. His Majesty's Stationery Office, London, 6-7.

VALLANCE, D.J. 1910. *Report for the year 1909 by the Acting Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 28pp.

VALLANCE, D.J. 1911. *Report for the year 1910 by the Acting Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 26pp.

WALKER, R.B. 1972. Davidson, John (1834-1881). *Australian Dictionary of Biography*, online edition [http://adb.anu.edu.au/biography/davidson-john-3372/text509 accessed 15 Dec. 2015].

WARDINGLEY, C. 1890. Geological rambles in Cromarty and neighbourhood. *Hardwicke's science-gossip* **26**, 211-212.

WATERSTON, C.D. 1950. Note on the sandstone injections of Eathie Haven, Cromarty. *Geological Magazine* **87**, 133-139.

WATERSTON, C.D. 1951. The stratigraphy and palaeontology of the Jurassic rocks of Eathie (Cromarty). *Transactions of the Royal Society of Edinburgh* **62**, 33-51.

WATERSTON, C.D. 1954a. The Hugh Miller Cottage, Cromarty. *Museums Journal* **53** (10), 255-257.

WATERSTON, C.D. 1954b. The Department of Geology. *In*: Allan (1954b), 49-53.

WATERSTON, C.D. 1954c. Catalogue of type and figured specimens of fossil fishes and amphibians in the Royal Scottish Museum, Edinburgh. *Transactions of the Edinburgh Geological Society* **16**, i-x and 1-91.

WATERSTON, C.D. [1961]. *Hugh Miller. The Cromarty Stonemason*. National Trust for Scotland, Edinburgh, 32pp.

WATERSTON, C.D. 1977. Department of Geology. *In*: Tebble, N. *The Royal Scottish Museum triennial report 1974-76*. Royal Scottish Museum, Edinburgh, 40-43.

WATERSTON, C.D. 1980. Department of Geology.

In: Tebble, N. *The Royal Scottish Museum triennial report 1977-78-79*. Royal Scottish Museum, Edinburgh, 40-43.

WATERSTON, C.D. 1986. Hugh Miller. *In*: Calder, J. (ed.) *The enterprising Scot. Scottish adventure and achievement*. National Museums of Scotland, Edinburgh, 160-169.

WATERSTON, C.D. 1997. *Collections in context. The Museum of the Royal Society of Edinburgh and the inception of a National Museum for Scotland*. NMS Publishing, Edinburgh, x + 212pp.

WATERSTON, C.D. 2002a. The Cromarty years, Hugh Miller as geologist and naturalist. *In*: Borley (2002), 26-31.

WATERSTON, C.D. 2002b. An awakening interest in geology. *In*: Borley (2002), 696-697.

WAUGH, R. 1900. Hugh Miller. *British Weekly*, Scotch Edition, 29 Nov., 172.

WEBB, K. 1961. *The St Trinian's story*. Penguin, Harmondsworth, 63pp.

[WESTOLL, T.S.] ('T.S.W.') 1938. Hugh Miller, 1802-56. Commemoration at Cromarty. *Nature* **142**, 696 [evidently T. S. Westoll later F.R.S. (1912-1995), worker on Old Red Sandstone vertebrates then at Aberdeen (Patterson and Fortey 1999)].

WHITE, G., ed. SECORD, A. 2013. *The natural history of Selborne*. Oxford University Press, Oxford, 352pp.

WILDING, R. 2005. D.H. Scott and A.C. Seward: modern pioneers in the structure and architecture of fossil plants. *In*: Bowden, A.J., Burek, C.V. and Wilding, R. (eds.). *History of Palaeobotany: Selected Essays. Geological Society, London, Special Publications* **241**, 153-160.

WILLIAMS, R.B. and TORRENS, H.S. 2016. No. 3 Highbury Grove, Islington: the private geological museum of James Scott Bowerbank (1797-1877). *Archives of Natural History* **43**, 278-284.

WILSON, R.B. 1977. *A history of the Geological Survey in Scotland*. Institute of Geological Sciences, Edinburgh, 23pp.

WITHERS, C.W.J. and FINNEGAN, D.A. 2003. Natural history societies, fieldwork and local knowledge in nineteenth-century Scotland: towards a historical geography of civic science. *Cultural Geographies* **10**, 334-353.

WOOD, W. 1871. Mr Hugh Miller and Mr J.G. Wood. *Scotsman* 2 Mar., 2.

WOODWARD, H., 1904. 'In memory of Alfred Gillett […].' *Geological Magazine* (5)**1**, 96.

WYSE JACKSON, P.N. 2006. *The chronologers' quest: episodes in the search for the age of the Earth*. Cambridge University Press, Cambridge, xvii + 291pp.

WYSE JACKSON, P.N. and SPENCER JONES, M.E. 2007. The quiet workforce: the various roles of women in geological and natural history museums during the early to mid-1900s. *In*: Burek, C.V. and Higgs, B. (eds.). *The role of women in the history of geology. Geological Society, London, Special Publication* **281**, 97-113.

THE APPEAL CIRCULAR FOR THE PURCHASE OF HUGH MILLER'S COLLECTION, 1858

by M.A. Taylor and L.I. Anderson

Taylor, M.A. and Anderson, L.I. 2017. The appeal circular for the purchase of Hugh Miller's collection, 1858. *The Geological Curator* 10 (7), 369-373.

This reproduces, in facsimile, the only known copy of the *Proposal to Purchase the Museum of the Late Hugh Miller* for deposition in the Natural History Museum (later part of National Museums Scotland). It is datable on internal evidence to 1858. This particular copy belonged to Charles W. Peach and is annotated by him.

**Michael A. Taylor, Research Associate, Department of Natural Sciences, National Museums Scotland, Chambers St., Edinburgh EH1 1JF, Scotland, and Honorary Research Fellow, Department of Museum Studies, University of Leicester. Email mat22@le.ac.uk; disambiguator: http://orcid.org/0000-0002-1495-8215; and Lyall I. Anderson, Honorary Research Fellow, School of Museum Studies, University of Leicester, (formerly Department of Natural Sciences, National Museums Scotland). Email lia3@le.ac.uk.* *Received 15 February 2016. Accepted 15 February 2016.*
**All correspondence to M. A. Taylor.*
.

Introduction

We reproduce here a circular for the, eventually successful, appeal to raise funds for the purchase of the collection of Hugh Miller (1802-1856) and its deposition in what was then the Natural History Museum, Edinburgh (a precursor of today's National Museums Scotland), with what must be an interim list of subscribers to date. It can be dated to late April or early May 1858 (Taylor and Gostwick 2003). The background to its publication, and the information contained in it, are analysed further in Taylor and Gostwick (2003) and Taylor and Anderson (2017). The only known copy is in the British Geological Survey library at Keyworth, Nottinghamshire (GSM 1/669). The annotation to the cover is by Charles W. Peach (1800-1886) (Taylor and Anderson 2017). We would be grateful to hear of any other copies of the *Proposal*, or similar material relating to the appeal, in existence.

Acknowledgements

Reproduced by permission of the British Geological Survey (BGS). CP17/044. No part of this work may be reproduced without permission of BGS. Graham McKenna, Michael Howe, Tracey Gallagher, Gill Nixon and Emma Gallagher (BGS) are thanked for their kind assistance.

References

TAYLOR, M.A and ANDERSON, L.I. 2017. The museums of a local, national and supranational hero: Hugh Miller's collections over the decades. *The Geological Curator* **10** (7), 285-368.

TAYLOR, M.A. and GOSTWICK, M. 2003. Hugh Miller's collection - a memorial to a great geological Scot. *Edinburgh Geologist* **40**, 24-29; http://www.edinburghgeolsoc.org/edingeologist/z_40_04.html.

Sent Dr Smith 10/- in postage stamps 21 July 1858 CWP

PROPOSAL TO PURCHASE

THE

MUSEUM OF THE LATE HUGH MILLER.

At the invitation of the Lord Provost a preliminary meeting was held on Monday, 12th April, in the Council Chambers. There were present—Professors George Wilson, Allman, Miller, and Balfour; George Dalziel, Esq., Robert Horn, Esq., John Hope, Esq., Richard Hunter, Esq., Wm. Oliphant, Esq., Rev. Dr. Hanna, James Duncan, Esq., David Laing, Esq., Councillor D. S. Anderson, P. B. Mure Macredie, Esq., F. Brown Douglas, Esq., Jas. Burness, Esq., Dr. James Russell, Dr. John Alexander Smith, Thomas Constable, Esq., Dr. Coldstream, &c.

The Lord Provost stated that he had received letters from the Duke of Argyle, Lord Murray, Lord Handyside, Sir Wm. Gibson-Craig, Robert Paul, Esq., and others, expressing their cordial concurrence in the object of the meeting.

His Lordship stated that he had called this meeting in consequence of the strong desire felt and expressed in many quarters that the Geological Museum collected by our late distinguished countryman Mr. Miller, should be secured for Scotland, and deposited in the new Industrial Museum of our city. An application had been made to the late Government with a view of inducing them to become the purchasers. They had cordially entered into the project, and a sum of £500 had been set aside by them for this object. Two other offers, however, had been received—the one from a Scottish Nobleman, of £1000, and the other from an American College, of One Thousand Guineas. It is hoped that the present Government will carry out the intention of their predecessors. It would require, however, that their grant should be supplemented so as to make up the whole Sum at least to £50 above the highest offer, before Mr. Miller's family could be asked to carry out their desire to have the Museum permanently deposited in Edinburgh. It had appeared to his Lordship that a vigorous effort should be made to prevent the Museum being carried across the Atlantic; that no more suitable Memorial of the genius and scientific labours of Mr. Miller could be erected and preserved; that a Collection so distinctively illustrative of the Geology of Scotland, made by one of whom Scotland had such reason to be proud, instead of passing into private hands, should be placed in one of the public Institutions of the country; and that he had called the present Meeting to take this matter into consideration.

Several gentlemen having warmly expressed their concurrence in these views, it was unanimously resolved, that a Subscription List should immediately be opened. All those present at the Meeting at once put down their names. It being understood that the Museum must, in any event, be removed from its present site before Whitsunday, the following Sub-Committee was appointed to prosecute the Subscription with as little delay as possible:—Professors Simpson, Allman, George Wilson, Miller, and Balfour; the Rev. Dr. Hanna, Dr. Smith; Messrs. R. Horn, R. Paul, David Maclagan, D. S. Anderson, James Duncan; The Lord Provost, *Convener*; Mr. Leckie, of the Commercial Bank, *Treasurer*; Mr. Constable and Dr. George Lawson, *Secretaries*.

Subscriptions may be remitted by Post-office Order, or otherwise, to the Treasurer, or paid to any Branch of the Commercial Bank.

LIST OF SUBSCRIBERS

TO THE

HUGH MILLER MUSEUM FUND.

His Grace the Duke of Argyll,	£1	0	0
Her Grace the Duchess of Argyll,	1	0	0
The Most Hon. the Marquess of Lorn	1	0	0
The Lady Emma Campbell,	2	0	0
The Most Hon. The Marquess of Breadalbane,	10	0	0
Right Hon. and Right Rev. the Lord Bishop of London,	1	0	0
The Right Hon. The Earl of Rosebery,	1	0	0
Hon. Lord Murray,	5	0	0
Alexander Murray Dunlop, Esq , M.P.,	25	0	0
Charles Cowan, Esq., M.P.,	25	0	0
Robert Horn, Esq., Advocate,	25	0	0
J. M. Hog, Esq., Newliston,	5	5	0
The Right Honourable Lord Kinnaird,	5	0	0
Hon. Arthur Kinnaird, M.P.,	5	0	0
The Right Honourable the Lord Advocate,			
Sir John Richardson, Bart., Lancrigg, Grasmere,	1	0	0
The Very Rev. Francis Close, D.D., Dean of Carlisle,	1	0	0
The Right Hon. John Melville, Lord Provost,	5	0	0
Sir Roderick I. Murchison, K.H., Director of the Geological Survey,	10	10	0
Sir Charles Lyell,			
Hon. Mrs. Mackenzie, Moray Place,	5	0	0
Miss Mackenzie, do.	3	0	0
Miss P. Mackenzie, do.	2	0	0
Sir William E. Logan, Provincial Geologist of Canada,	3	0	0
A. Cowan, Esq., 30, Royal Terrace,	3	0	0
John James Ruskin, Esq., Camberwell,	1	0	0
John Ruskin, Esq., Camberwell,	1	0	0
Hon. Lord Handyside,	1	0	0
The Solicitor-General,	1	0	0
Hon. Mrs. Hamilton,	1	0	0
Sir William Gibson-Craig, Bart.,	1	0	0
F. Brown Douglas, Esq., Advocate,	1	0	0
George Patton, Esq., 30, Heriot Row,	1	0	0
Sheriff Jameson, Churchhill House,	1	0	0
Thomas Cleghorn, Esq., Advocate,	1	0	0
A. Coventry, Esq., Advocate,	1	0	0
James T. Gibson-Craig, Esq.,	1	0	0
Robert Chambers, Esq.,	1	1	0
Professor John Schank More,	1	0	0
Professor Simpson, 52, Queen Street,	£1	0	0
Professor George Wilson, Elm Cottage,	1	0	0
Professor Balfour, 27, Inverleith Row,	1	0	0
Professor Allman, 10, Hope Street,	1	0	0
Professor Miller, Charlotte Square,	1	0	0
Professor Laycock, Rutland Street,	1	0	0
Rev. Dr. Guthrie, 1, Salisbury Road,	1	0	0
Rev. Dr. Hanna, 4, Castle Terrace,	1	0	0
Rev. Professor Bannerman, 7, Clarendon Crest.,	1	0	0
Rev. Dr. John Bruce, Saxe-Coburg Place,	1	0	0
Rev. G. D. Cullen, 28, Royal Terrace,	1	0	0
Councillor D. S. Anderson,	1	0	0
Patrick Graham, Esq., Royal Crescent,	1	0	0
John Hope, Esq., 31, Moray Place,	1	0	0
James Burness, Esq., 11, Drummond Place,	1	0	0
Dr. W. Seller, F.R.C.P , 18, Northumberland St.,	1	0	0
Dr. John Coldstream, F.R.C.P., 51, York Pl.,	1	0	0
Dr. James Russell, F.R.S.E., 15, Lynedoch Pl.,	1	0	0
Dr. John Alexander Smith, 7, West Maitland St.,	1	0	0
Robert Paul, Esq., 16, Randolph Crescent,	1	0	0
D. J. Thomson, Esq., 19, East Claremont St.,	1	0	0
Messrs. Thomas Constable and Co., 13, Thistle St.,	5	0	0
Peter Scott, Esq., 3, Bruntsfield Place,	1	0	0
Richard Hunter, Esq., 10, Ainslie Place,	1	0	0
David Laing, Esq., Signet Library,	1	0	0
P. B. Mure Macredie, Esq.,	1	0	0
James Campbell Tait, Esq., 2, Park Place,	1	0	0
George Dalziel, Esq., 10, Regent Terrace,	1	0	0
David Maclagan, Esq., M.D., Pres. R.C.P.E.,	1	0	0
David Maclagan, Esq., C.A., 129, George St.,	1	0	0
William Leckie, Esq., Commercial Bank,	1	0	0
William Oliphant, Esq., 21, Buccleuch Place,	1	0	0
George Harvey, Esq., R.S.A., Regent Terrace,	1	0	0
Dr. George Lawson, Royal Institution,	1	0	0
J. A. Ainslie, Esq., Fordel,	1	0	0
James Duncan, Esq , 46, Queen Street,	1	0	0
Mrs. Duncan, do. do.,	1	0	0
Rev. John Cairns, D.D., Berwick,	1	0	0
The Lady Jane Charteris,	1	0	0
Benjamin Bell, Esq., M.D., F.R.C.S.,	1	0	0
W. Cumming, Esq., M.D., Queen Street,	1	0	0
Alexander Fraser, Esq., Canonmills Cottage,	1	0	0
Mrs. Colonel Madden, Regent Terrace,	1	0	0

	£	s	d
Barron Grahame, Esq. of Morphie,	£1	0	0
A. E. Monteith, Esq., Inverleith House,			
Sir William Johnston of Kirkhill,	1	0	0
A. K. Johnston, Esq., F.R.S.E., St. Andrew Sq.,	1	0	0
T. B. Johnston, Esq , St. Andrew Square,	1	0	0
G. R. Kinloch, Esq., General Register House,	1	0	0
Donald Beith, Esq., Castle Street,	1	0	0
John Moir, Esq., M.D., Castle Street,	1	0	0
Alexander Bryson, Esq , Princes Street,	1	0	0
P. A. Dassauville, Esq., Royal Bank,	1	0	0
George Logan, Esq., General Register House,	1	0	0
Sir George Sinclair, of Ulbster, Bart.,	1	0	0
Henry Craigie, Esq., Falcon Hall,	1	0	0
David Mackinlay, Esq., of Newlandburn,	1	0	0
Thomas Knox, Esq., Hanover Street,	1	0	0
C. Lawson, Esq., Borthwick Hall,	1	0	0
Messrs. P. Lawson & Son, 1, George IV. Bridge,	1	0	0
George E. Russell, Esq., City Treasurer,	1	0	0
John Buchanan, Esq. of Carbeth,	1	0	0
Hon. Lord Mackenzie,	1	0	0
James Cunningham, Esq., 50, Queen Street,	1	0	0
Mrs. Ogilvie, 32, Heriot Row,	1	0	0
Alexander Currie, Esq., 43, Heriot Row,	1	0	0
James Johnston, Esq., M.D.,	1	0	0
George S. Keith, Esq., M.D., Northumberland St.,	1	0	0
Rev. John Jaffray, Frederick Street,	1	0	0
James Bridges, Esq., Belfield,	1	0	0
James Matthews Duncan, Esq., M.D.,	0	10	6
Rev. Charles Watson, D.D.,	1	0	0
Hon. Lord Neaves,	1	0	0
James Watson, Esq., Charlotte Square,	1	0	0
Thomas Oliphant, Esq., Charlotte Square,	1	0	0
James Walker, Esq. of Dalry,	1	0	0
E. F. Maitland, Esq., Melville Street,	1	0	0
Arthur Fraser, Esq.,	1	0	0
James Begbie, Esq., M.D.,	1	0	0
David Mure, Esq., 12, Ainslie Place,	1	0	0
James Wright, Esq., 13, Ainslie Place,	1	0	0
Misses Abercromby, Moray Place,	1	0	0
W. P. Alison, Esq., M.D.,	1	0	0
Stuart Neilson, Esq., N. Charlotte Street,	1	0	0
E. S. Gordon, Esq., 2, Randolph Crescent,	1	0	0
Sir T. M. Brisbane, Bart.,	1	0	0
Miss M'Dougall,	1	0	0
John Arch. Campbell, Esq., Albyn Place,	1	0	0
Robert Omond, Esq., M.D.,	1	0	0
John C. Brodie, Esq., Moray Place,	1	0	0
Alex. Gifford, Esq., St. Andrew Square,	1	0	0
John M. M'Candlish, Esq., Moray Place,	1	0	0
John M. Balfour, Esq., Pilrig House,	1	0	0
James Horne, Esq., St. Andrew Square,	1	0	0
John Miller, Esq., York Place,	1	0	0
Mrs. Muir, Regent Terrace,	1	0	0
John A. Rankin, Esq., Regent Terrace,	1	0	0
W. Waddell, Esq., W.S., Regent Terrace,	1	0	0
William Patrick, Esq , Albany Street,	1	0	0
William Burness, Esq., 11, Drummond Place,	1	0	0
David Smith, Esq., Ainslie Place,	1	0	0
James R. Dymock, Esq., Buccleuch Place,	1	0	0
George F. Barbour, Esq.,	£1	0	0
Messrs. J. & J. Gray, Melbourne Place,	1	0	0
Francis Richardson, Esq., Archibald Place,	1	0	0
Thomas Clapperton, Esq., Teviot Row,	1	0	0
John Henderson, Esq., Queen's Remembrancer,	1	0	0
Messrs. T. Nelson & Son, Hope Park,	1	1	0
P. Dalmahoy, Esq., Queen Street,	1	0	0
D. Jeffrey, Esq., Randolph Crescent,	1	0	0
Hugh Bruce, Esq., Moray Place,	1	0	0
G. H. Marshall, Esq., Heriot Row,	1	0	0
J. W. Mackenzie, Esq., 16, Royal Crescent,	1	0	0
Charles Jenner, Esq., Princes Street,	1	0	0
John Cadell, Esq., 20, Picardy Place,	1	0	0
R. Brown, Esq., 29, George Square,	1	0	0
John Russell, Esq., P.C.S., Canaan,	1	0	0
Alex. Auchie, Esq , 4, Argyll Square,	1	0	0
Alex. Campbell, Esq., Charlotte Square,	1	0	0
John Hunter, Esq., Craigcrook,	1	0	0
Wm. Lauder Lindsay, Esq., M.D., F.L.S., Perth,	1	0	0
William Belford, Esq., Perth,	1	1	0
Miss Cruickshanks,	1	0	0
Robert Macfie, Esq., Langhouse, Greenock,	6	0	0
James C. Howden, Esq., M.D., Royal Asylum, Montrose,	1	0	0
Thomas Macpherson Grant, Esq., Craigo,	1	0	0
Dr. Smyttan, 20, Melville Street,	1	0	0
Robert Fairly, Esq.,	1	0	0
R. G. Ogilvie, Esq., Cumberland Street,	1	0	0
T. G. Murray, Esq., Glenfinlas Street,	1	0	0
James Douglas, Jun., Esq., of Cavers,	1	0	0
James Richardson, Esq., 10, Keir Street,	1	0	0
Robert Richardson, Esq., 12, Bruntsfield Place,	1	0	0
James Mackenzie, Esq., Doune Terrace,	1	6	0
Robert Mercer, Esq., Ramsay Lodge, Portobello,	1	0	0
John Cowan, Esq., Valleyfield,	2	0	0
Samuel Raleigh, Esq , Northumberland Street,	1	0	0
John Geddes, Esq., 16, Shandwick Place,	1	0	0
William Campbell, Esq., 6, Rutland Square,	1	0	0
A Friend, per A. Gibson, Esq.,	1	0	0
James Brown, Esq , 4, Charlotte Square,	1	0	0
J. G. Wood, Esq., 52, Melville Street,	1	0	0
W. Ivory, Esq., St. Roque,	1	0	0
A. B. Shand, Esq., 57, Queen Street,	1	0	0
Hon. Lord Ardmillan,	1	0	0
James Mylne, Esq., 35, Charlotte Square,	1	0	0
Henry Callender, Esq., 11, Forres Street,	1	0	0
Archibald W. Goldie, Esq., York Place,	1	0	0
J. Burn Murdoch, Esq., York Place,	1	0	0
Alexander Smith, Esq., York Place,	1	0	0
George Tweedie Stodart, Esq., 16, Abercromby Pl.	1	0	0
W. Cowan, Esq , Montpelier,	1	0	0
Edmond Logan, Esq., 141, George Street,	1	0	0
A. M. Edwards, Esq., Surgeon, India Street,	0	5	0
William Brodie, Esq., Sculptor, Torphichen St.,	1	0	0
Mrs. Colonel Brodie,	1	0	0
Christian Miller, Esq., Montrose,	1	0	0
Colonel Portlock, R.E., Hyde Park,	1	0	0
—— Moore, Esq., Geological Society, London,	1	0	0
Professor Ramsay, Geological Survey,	1	0	0

Sheriff Napier, Coates Hall,	£1	0	0
John Beveridge, Esq., London Street,	1	0	0
Thomas Thomson, Esq., Walker Street,	1	0	0
Coutts Trotter, Esq., Dreghorn,	1	0	0
Henry Home Drummond, Esq., Blair Drummond,	1	0	0
Rev. F. Gillies, 17, Dean Terrace,	0	10	6
Rev. W. G. Blaikie, Pilrig Manse,	0	10	0
John T. Mowbray, Esq., Albany Street,	0	10	0
W. Flockhart, Esq., Trinity,	1	0	0
Rev. D. Thorburn, Charlotte Street, Leith,	0	10	0
David Maclaren, Esq., Greenhill Gardens,	1	0	0
Robert Blackie, Esq., Glasgow,	1	0	0
From Haddington, per Messrs. Robb and Finlayson,	4	0	0
Sir Philip Egerton,	1	0	0
Robert Ross, Esq., Cromarty,	1	0	0
Francis Russell, Esq., Advocate,	1	0	0
James Maclaren, Esq.,	1	0	0
Messrs. Thomas Cooper & Co., South Bridge,	1	0	0
Professor Bell, East Morningside House	1	0	0
Messrs. Thomas Duncan & Co., Princes Street,	1	0	0
Charles Chalmers, Esq., Castle Bank,	0	10	0
John Chalmers, Esq., do.	0	10	0
Walter Marshall, Esq., Regent Terrace,	1	0	0
J. H. Barry, Esq., Queen Street,	1	0	0
George Combe, Esq., Melville Street,	1	0	0
J. Cleghorn, Esq., York,	1	0	0
William Wood, Esq., Oxford Terrace,	1	0	0
Allan Fullerton, Esq., Glasgow,	1	1	0
Hon Lord Cowan, Ainslie Place,	1	0	0
R. M. Smith, Esq., Bellevue Crescent,	1	0	0
Robert Cox, Esq., Rutland Street,	1	0	0
J. T. Bowerbank, Esq., London,	1	0	0
James Webster, Esq., Bellevue Terrace,	£1	0	0
Patrick Dudgeon, Esq.,	1	0	0
The Very Rev. Principal Cunningham,	1	0	0
John Bell, Esq., Glasgow,	1	0	0
A Lady, per Dr. Benj. Bell,	1	0	0
R. D. B.,	0	10	6
A. C.,	0	5	0
Messrs. Menzies, Bernard, & Craig,	2	2	0
Thomas Erskine, Esq., Linlathen,	1	0	0
Miss Hunter Blair,	1	0	0
Rev. Mr. Duns, Torphichen,	1	0	0
James Home Rigg, Esq., of Downfield and Morton,	1	0	0
David Baxter, Esq., of Rinnaven,	1	0	0
William Drummond, Esq., Cupar,	1	0	0
Thomas Barclay, Esq., Sheriff-Clerk of Fife,	1	0	0
Colonel Dalyell, of Lingo,	1	0	0
R. Barclay, Esq., Montrose,	1	0	0
F. L. M. Heriot, Esq., Rutland Street,	1	0	0
Thomas Ivory, Esq., Ainslie Place,	0	10	0
A. S. Logan, Esq., York Place,	1	0	0
Patrick Fraser, Esq., Northumberland Street,	1	0	0
W. E. Baxter, Esq., M.P.,	1	0	0
Colonel Sykes, M.P.,	1	0	0
Miss Marion Wood,	0	5	0
A. Smollett, Esq., M.P.,	1	0	0
M. E. Grant Duff, Esq., M.P.,	1	0	0
The Hon. Thomas Erskine,	1	1	0
Henry Cadell, Esq., Grange,	1	0	0
Thomas Chalmers, Esq., Linlithgow,	1	0	0
R. S. Wyld, Esq., South Queensferry,	1	0	0
Archibald Geikie, Esq., Geological Survey,	1	0	0
Thomas Drybrough, Esq., Manor Place,	0	10	6

GUIDE TO THE HUGH MILLER COLLECTION IN THE ROYAL SCOTTISH MUSEUM, EDINBURGH, *c*. 1920

by Benjamin N. Peach, Ramsay H. Traquair, Michael A. Taylor and Lyall I. Anderson

Peach, B.N., Traquair, R.H., Taylor, M.A. and Anderson, L.I. 2017. Guide to the Hugh Miller Collection in the Royal Scottish Museum, Edinburgh, *c*. 1920. *The Geological Curator* 10 (7): 375-428.

Around 1920, the retired Geological Survey worker Benjamin Neeve Peach (1842-1926) wrote a guide to the permanent exhibition, which he had just completed, of fossils from the collection of Hugh Miller (1802-1856) in the Royal Scottish Museum, Edinburgh (now part of National Museums Scotland). This guide also incorporated an older assessment of Miller's work on fossil fishes by the former Keeper of Natural Sciences, Ramsay Heatley Traquair (1840-1912). The guide was not issued, probably because of economic pressures on the museum in a period of fiscal stringency after the Great War. It is here published with an introduction and notes. It contains considerable information on the structure, content, and interpretive strategy of the exhibition, a rare survival for displays of that era. It shows how Miller and his collection were perceived by a leading Scottish geologist of the day, and how the collection extended beyond just Old Red Sandstone fishes, with notable strengths also in Jurassic plants and Quaternary molluscs. It provides new evidence on Ben Peach's activity in his seventies, and his thoughts on the geology and palaeontology of Scotland once safely retired from the Survey and its domineering director Archibald Geikie, and looking back to the activities not only of Miller but of his own father Charles W. Peach (1800-1886). Finally, the guide is of real curatorial value for future work on the collection.

*†Peach, Benjamin N., and †Traquair, Ramsay H., Natural History Department, ††Royal Scottish Museum, Edinburgh 1, N.B.; *Michael A. Taylor, Research Associate, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh EH1 1JF, Scotland, and Honorary Research Fellow, School of Museum Studies, University of Leicester. Email mat22@le.ac.uk; disambiguator: http://orcid.org/0000-0002-1495-8215; and Lyall I. Anderson, Honorary Research Fellow, School of Museum Studies, University of Leicester (formerly Department of Natural Sciences, National Museums Scotland). Email lia3@le.ac.uk.* *Received 30 June 2016. Accepted 30 September 2016.*
† Deceased. †† Now National Museums Scotland.
**All correspondence to M. A. Taylor.*

Introduction

During our curatorial work on the collection of the great Scottish geologist and writer Hugh Miller (1802-1856), our attention was drawn to a two-part manuscript 'Guide to the Hugh Miller Collection in the Royal Scottish Museum, Edinburgh', and a typescript prepared from it, in the archives of National Museums Scotland. This was largely written by Benjamin Neeve Peach (1842-1926), then retired from the Geological Survey, with a section on Miller's palaeoichthyological work by Ramsay Heatley Traquair (1840-1912), the Museum's former Keeper of Natural Sciences. Part I deals with the 'General Collection', a stratigraphical display of Miller's fossils, while Part II deals with 'Special Collections', essentially a set of special topics such as type specimens, specimens illustrated in his books, and miscellaneous themes.

We transcribed Peach's manuscript to obtain information for curation. We now publish the *Guide* for the first time to make it available for research, beside our paper on the wider history of the Miller collections (Taylor and Anderson 2017). We assess its value in its 1920s context, both as a statement of then current geology and as a retrospective look back at Miller. Abbreviations: EUL-NC, New College Library, University of Edinburgh; NMS, National Museums Scotland; NRS, National Records of Scotland, via www.scotlandspeople.gov.uk; ORS, Old Red Sandstone; RPSE, Royal Physical Society of Edinburgh.

BEN PEACH'S GUIDE

Despite its title, Peach's *Guide to the Hugh Miller Collection* is what one would today call an exhibition guide dealing with the new permanent display of Hugh Miller specimens, rather than one to the collection as a whole. Even the specimen-dense display style of that era would accommodate only a fraction of the thousands of specimens in the Miller Collection. Some were of course used in other displays, and most of the rest must have remained in store. There are several references to both in the *Guide*, including storage under the desk-cases of the exhibition. This distinction between displays and reference cabinet collections was in more general practice in the Museum, in the Natural History (including the Miller fossils) and Geology departments (Martin 1914, p. 11), and the practice dated from an earlier period at least (Traquair 1893a, pp. 176-177).

Almost a century after it was written, the Guide remains of considerable interest for several reasons. At its simplest, the Guide gives a broad - and, we think, fascinating - overview of the collection which notably counteracts the assumption commonly held today, and perhaps also then, that Hugh Miller was interested in little but Old Red Sandstone fishes. This broader inclusion of fossils from different localities and stratigraphical ages across Scotland surely helped make Miller's collection an appropriate acquisition for Scotland's national collection. It was for somewhat different reasons that the collection of Ben Peach's father Charles (1800-1886) had almost as broad a scope (Anderson and Taylor 2008, Anderson and Lowe 2010). But this was where Miller and to some extent Peach differed from most other contemporary field collectors. Usually collectors worked their own local patches, and Miller and Peach did this of course, but they also travelled further and wider. Such broad collections pose problems in gaining an overview of them (Anderson and Taylor 2008; Taylor and Anderson 2017). The *Guide* is therefore useful as it gives a quick idea of at least some of the diversity of Miller's collection.

The *Guide* is of further curatorial value in sorting out the provenance of the various label styles, and in helping locate type, figured and cited specimens - or at least those which Peach and his predecessors had identified as such. Unfortunately, and today frustratingly, the *Guide* does not cite specimen numbers when discussing individual specimens. Perhaps Peach ignored this issue because of the incomplete curation of the collection under several different numbering systems (Taylor and Anderson 2017). It is of course possible that he had intended to curate and number any unregistered specimens used for display, leaving final revision of the *Guide* till afterwards, and that the matter fell into abeyance when the project was cancelled. However, this seems unlikely simply because the time to do this was before the exhibition labels were printed and the displays set out.

The *Guide* is of real value for museological history, showing how Miller's fossil collection was displayed in the Royal Scottish Museum during the first few decades of the 20th Century. It is a valuable exception to the seeming rule that museum displays, even so-called 'permanent' ones, were rarely, if ever, properly recorded before dismantling, even in institutional archives. This problem makes it hard to study past exhibitions, even in something as basic as reconstructing the geography of the displays, unless a detailed 'guide' or catalogue was prepared (other examples of detailed guides for geological exhibits are those prepared for the Chambers Institution, Peebles, and Cheltenham Art Gallery and Museum, interestingly at almost the same time as Peach's: Turner 1927, Wild 1920). But for the Miller display, as well as Peach's *Guide*, we have many of the tablets, labels and figures from the exhibition still surviving in the collections beside the fossils. This helps give a sense of how the exhibition might have looked. Elsewhere we use it to analyse the structure, content, and what one might today call the 'interpretive strategy' of the exhibition (Taylor and Anderson 2017).

The *Guide* became in places little more than a take-home checklist of specimens. This is simply because the *Guide* conformed closely to the exhibition's content, as far as we can tell. It therefore gives an excellent impression of the exhibition's strategy, which was essentially to display a selection of Miller's collection in the context of its interest and use for modern geology (of *c*. 1920), while also accommodating enthusiasts' wishes to see the actual fossils discussed and illustrated in his books (Taylor and Anderson 2017). Peach noticeably emphasised a group of Miller's papers delivered to the Royal Physical Society of Edinburgh and published as appendices to the later editions of *The Old Red Sandstone* (Miller 1892c, 1892d, 1892e, 1892f). Those important sources are often forgotten by modern readers, as *The Old Red Sandstone* is not indexed, and its contents pages omit any mention of those pieces. On the other hand, perhaps simply because he never completed final revision, Peach blatantly missed some highly relevant references in Miller's other books, especially *Sketch-book of Popular Geology and Edinburgh and its neighbourhood* (Miller 1889b, 1891). Miller's

wider life, by and large, is however largely omitted from the *Guide*, which reinforces the impression that the *Guide* stuck closely to the exhibition's content, rather than offering a wider treatment, as modern thinking on museum publications tends to recommend. The likely reasons for this are discussed by Taylor and Anderson (2017); one is that keeping matters strictly to science avoided the problem of discussing Miller's well-known opposition to the pre-Darwinian evolutionary theories of his day (e.g. Miller 1892b), in the same breath as portraying him as a hero of Scottish geology in what was now a post-Darwinian environment.

The *Guide* also vividly shows the regard in which Hugh Miller was held by Ben Peach, one of the greatest of Scottish field geologists, and by Ramsay Traquair, perhaps the leading palaeoichthyologist of his day. This is highly relevant to the question of how far this display served as a continuing monument to Miller (Taylor and Anderson 2017).

Finally, the *Guide* provides new evidence for Ben Peach's activity in his seventies, and his thoughts on the geology and palaeontology of Scotland, freed from the constraints of employment with the Geological Survey. Peach's obituarist remembered him as unduly deferential to authority, and by implication his Director-General, Archibald Geikie, even when the latter was wrong (Greenly 1928, in what was perhaps a coded attack on Geikie). But by the time Peach started on the Miller Collection, both he and Geikie had retired from the Survey, which was now run by a different government department from the Museum. Peach had also safely published his *Monograph on the Higher Crustacea of the Carboniferous Rocks of Scotland* in 1908. An enthusiasm for fossil shrimps and fishes might seem odd in someone who is inextricably linked, with his Survey comrade John Horne, to the deciphering of the Moine Thrust and the structural geology of the North-West Highlands and Southern Uplands. But palaeontology had been Peach's first love (Peach and Horne 1908; [Horne] 1926; Greenly 1928; Campbell 1930). In 1879 he had been appointed Acting Palaeontologist of the Scottish branch of the Survey, covering all fossils other than the plants, which were assigned to Robert Kidston the independent palaeobotanist, and the fishes, which were assigned to Ramsay Traquair of the Museum (then still the Edinburgh Museum of Science and Art); indeed, the Survey's own collections were kept and, latterly, displayed in the Museum (Taylor and Anderson 2017; Thomson and Wilkinson 2009). The *Guide* exemplifies these strong institutional and personal links between Survey and Museum. This palaeontological background also reflected Ben Peach's training at the Royal School of Mines and then the Survey under the likes of Thomas Henry Huxley (1825-1895), then Professor at the Royal School of Mines, and John Salter (1820-1869), the Survey palaeontologist (Secord 1985). It also drew from his outstanding family background and connections - again reflected in the *Guide* - as a son of Charles Peach. Ben himself had often accompanied his father on his fieldwork, which in part led to his nomination by Roderick Murchison for the School of Mines (Peach and Horne 1908; Taylor and Anderson 2015). Not surprisingly, some themes in the *Guide* reflect Peach family interests, such as the Drift of northern Scotland, Pleistocene shells, and Carboniferous plants. Moreover, the retired Charles Peach was employed by the Museum to curate and display the Hugh Miller Collection, which he was evidently glad to do in part as a tribute to his friend (Anderson and Taylor 2008; Taylor and Anderson 2017).

While with his father, Ben almost certainly met Robert Dick of Thurso, close to Wick, and very probably also Hugh Miller himself. Moreover, Miller's own son Hugh Miller the younger (1850-1896) was a colleague of Ben's in the Survey (Horne 1897) as was Miller’s friend Archibald Geikie. So, to the regard in which Miller was held by many Scottish geologists, we should add the personal links Ben had, which give further interest to his writings. All of those seem manifest in the *Guide* and in the parent exhibition.

Origin and dating

The *Guide* was evidently intended for publication as one of the special booklets printed by HM Stationery Office for sale to those visitors to the Royal Scottish Museum who wanted more detail than the general *Guide to the Collections* booklet (e.g. Anon. 1916). An example, as it happens coauthored by Peach, dealt with the three-dimensional structural model of the Assynt area (Peach and Horne 1913).

The new Hugh Miller display had been in gestation since at least the financial, and reporting, year of 1911-1912, in which the 'gathering together' of specimens at least began (Martin 1912, p. 12). But progress was evidently delayed by disruption caused by the Great War, for it was not completed till sometime in the 1919-20 reporting year, even after Ben Peach had been brought in in 1914-1915 (Martin 1915, p. 12; Curle 1920, p. 6; Taylor and Anderson 2017). The report for 1919-1920 noted that it was 'hoped soon to publish a special "Guide" to this Collection, which is of great scientific and historical interest' (Curle 1920, p. 6). The manuscript is in two parts which tend to stand separately in terms of intro-

ductory material and in terms of cross-referencing to other display cases. This suggests that Peach perhaps had two separate booklets in mind. If so, he would be disappointed, for the 1920-1921 report stated that 'a Guide to the Hugh Miller Collection of fossils by Dr. Peach exists in MS. and will be published in abbreviated form in due course' (Curle 1921, p. 4). This unpromising statement was more than fulfilled, for the *Guide* was never published. The surviving scripts suggest that the project was abandoned at a fairly advanced state, but before final editing.

It is possible that the Director had concerns with Peach's original script. Certainly, Peach's text is rough in places, as if written from memory, and it still needed further checking in detail against the original references. After reading it, one is not entirely surprised by stories of Peach's reluctance to set pen to paper (e.g. Bailey 1926; Oldroyd 1990, p. 270) - although perhaps his work on the crustacean monograph had weaned him somewhat off his notorious dependence on John Horne. The text also needed editing to root out redundancies, inconsistencies and infelicities, such as the fish which rejoiced in the possession of 'mouth organs'. References and other details were only incompletely checked, as noted above. But generally there seems nothing that a little work would not cure.

The real problem was almost certainly financial. The Director's just-quoted mention of the *Guide* was preceded by a discussion of Museum publications which expressed concern over the cost of production of specialist but slow-selling 'Sectional Guides' (Curle 1921, pp. 3-4, 1923, pp. 6-7). Scarce funds, needed to maintain and develop the Museum's services, were seen as being tied up in stocks of those booklets when both the Museum and its visitors had less to spend. Funding must in any case have become increasingly tight during the post-war financial crises which culminated in the 'Geddes's Axe' cuts in 1922-1923, and the Great Depression of the early 1930s. Moreover, Peach would himself die in 1926, removing one source of pressure for publication, and doubtless making it easier for the typescript to be quietly forgotten.

The surviving manuscript and typescript *Guide* is presumably that mentioned in the Director's reports, given the Directorial annotation on the manuscript. If so, then it must have been substantially completed by Peach at some time during the reporting year ending in March 1921. It would also depend on the finalization of the displays, which we know were physically completed during the 1919-1920 reporting year. This suggests a late 1920 to early 1921 date for the manuscript as it stands. Internal evidence constrains it almost as tightly. A reference to the 'late' Henry K. Brown (1847-1919), the museum artist, dates it to after Brown's death on 31 July 1919 (death certificate, NRS). Brown had held the Museum position of 'Art Preparer', and was promoted to Chief Art Preparer in 1903. He was seemingly still working at the Museum in 1911, though retired at his death (NMS Library D86:289, *Royal Scottish Museum. Staff Register*; Geoff Swinney, pers. comm. 2013; 1911 census, NRS, showing Brown resident at 16 Dalkeith Road, St Leonards, Edinburgh). However, this does not necessarily mean that Brown worked on the Miller display. His reconstructions might well have been recycled from older displays, especially the fish exhibits which were partly cannibalised and displaced to make way for the Miller exhibit (Taylor and Anderson 2017).

Ramsay Traquair, Hugh Miller, and fossil fishes

Traquair's contribution, titled 'Hugh Miller and his Palaeichthyological Work', is a self-contained and separate manuscript. It was found filed with Peach's typescript but is in a different hand. The reference to the 1902 bicentenary commemoration shows clearly that Traquair clearly wrote his account during - or at least for publication within - the calendar year following 22 August 1902. As it happens, Traquair delivered an address with the same title on 26 March 1903, to a joint meeting of the Geological Society of Glasgow (of which he was then President) and members of 'other scientific bodies' (Traquair 1905). Traquair soon delivered a paper on the same topic to the Edinburgh Geological Society on 16 April 1903 (Anon. 1903). The obvious inference is that this was the same talk but this cannot be verified as no abstract was published in the Society's *Transactions*. Peach convened the Edinburgh meeting, and would therefore have known of Traquair's paper.

The NMS manuscript compares well with the first part of the published summary of the Glasgow address (Traquair 1905), and is doubtless closely related. However, the manuscript suddenly finishes baldly halfway down a sheet of paper, omitting the material corresponding to the second part of the address. The equivalent second part of the summary is as follows (1905, p. 258):

> ' [...] On the other hand, Miller made a big mistake in mixing up two different creatures - *Homosteus* and *Glyptolepis* - in his so-called "*Asterolepis* of Stromness," neither of the two belonging to that genus as instituted by d'Eichwald. In this, however, it must in fairness

be stated that Miller was misled by Agassiz. So far as his fossil fish work [*Traquair presumably meant published description and taxonomy*] went, and unfortunately this was comparatively small in amount, Hugh Miller was a worthy pioneer in that new direction of the subject further developed by Pander and Huxley, and now adopted by all palaeichthyologists, namely, the bestowing of careful attention to structural details, instead of being satisfied merely with noting external form, and the configuration of teeth or scales. He was a fierce opponent of the doctrine of evolution, or "progressive development," as it was called in those days, of which the main idea was then in a very crude state, and Darwin's epoch-making work - "The Origin of Species" - did not appear till two years after Miller's death. But he was so devoted to scientific truth that many were of opinion, if he had lived on into post-Darwinian days, he too, like the overwhelming majority of modern naturalists, would have recognised the reasonableness of the doctrine of descent.'

This missing material therefore included Miller's attitude to evolution and scientific truth, but also his error over 'Asterolepis', and his methods in palaeoichthyology, so the deletion might have been to exclude contentious religious material and avoid duplication. The bald ending (which Traquair would surely have edited) and, at one point, the writer's inability to cope with taxonomic nomenclature, both suggest that Traquair did not prepare the existing manuscript. In any case Traquair died on 22 November 1912, well before Peach started work on the Miller display, never mind the *Guide* (Anon. 1912a; Paton 2004). Moreover, nothing in the script indicates that it was intended for a gallery guide.

Whatever the reasons for its creation and survival, the manuscript seemingly fleshes out the abstract of Traquair's bicentenary assessment: a remarkable tribute from a leading fossil fish researcher to compare with T. H. Huxley's remarks (Taylor 2007, pp. 64, 67 fn. 13; and see similar if briefer comments by Traquair 1880, pp. 149-151, 153, 155).

Editorial notes

Peach's part of the *Guide* survives as a handwritten manuscript, and a typescript evidently prepared at the behest of the Director, whose annotated instruction remains on the front of the manuscript (NMS Library, Director's Papers, Box 8.3). The typescript is only very partly checked and corrected, probably by the typist, for immediate typing errors, and there is little or no substantive editing. We used the manuscript rather than the typescript for this project. Traquair's text is a separate manuscript. Peach's manuscript runs in a single continuous pagination for both 'Parts' of the *Guide*, except that the pages dealing with desk-case 121 are missing; this was evidently not spotted at the typing stage, as the typescript simply continues over this break.

Peach's *Guide* was, as noted above, not formally ready for publication, but we have edited it very lightly, with the minimum of correction, to maintain its historical integrity, and to avoid obscuring Peach's original meaning, even at the cost of minor inconsistencies. We have corrected a few obvious errors in Peach's citations of publications by Miller and others. We have not tried to check Peach's names and literature citations against the actual specimens (should they be identifiable today), having left this for the curatorial project which this was intended to inform. Nor do we generally update the science (for which see e.g. Trewin 2002, Gordon and Sutherland 2003 and other volumes in the Joint Nature Conservation Committee series, and the Geological Society Correlation Charts such as Fortey *et al.* 2000). This is because Peach's versions, especially of taxonomic binomina, are useful evidence to compare with the labels on specimens when considering their curatorial history. We have however corrected a few obvious misspellings (*Diplicanthus* to *Diplacanthus*, *Maculostrobus* to *Masculostrobus*, *Chalmys* to *Chlamys*, and *Anarrachichas* to *Anarrhichas*), and standardised on *Homostius* (used by Peach interchangeably with *Homosteus*). We have put 'gastropod' for the now less usual 'gasteropod'. Otherwise we have left Peach's taxonomy as it was to avoid misleading changes, apart from deleting the comma between Linnean binomen and authority, and italicising binomines and genera (except for the special case of Miller's composite 'Asterolepis'). The presence of variant synonyms of the same taxa, and inconsistent treatment of authorities for the same Linnean binomina, especially for Quaternary molluscs, raise the possibility that Peach sometimes simply transcribed the existing specimen labels or faunal lists as a starting point for the *Guide*.

We have partly tidied up the format and sectional hierarchy, and corrected some minor spelling, typing and punctuation errors to improve readability, but we have not done a full copy-edit. We also edited out Peach's hopelessly long-winded literature references, leaving a few to convey the original flavour. We have generally used the much more commonly available editions of Miller's books from the uniform Nimmo, Hay and Mitchell (etc.) series of the 1880s and 1890s. There is, so far as we know, usually no significant difference between the various posthumous

printings. One exception is *Testimony of the Rocks* which was reset in type with changed pagination. Peach used both paginations, but mainly the later one.

Peach often referred to Miller *père* as 'Hugh Miller' or 'H. Miller'; we have changed all such references to plain 'Miller' except when referring to his son (1850-1896) of the same name. Any further interpolated material is clearly indicated in square brackets [thus]. We have modernised typography, transcribing ligatures as double letters, and M'Coy as McCoy following the modern standard for the Gaelic progenitive. We deleted an erroneous acknowledgement for the Portgower photographs to the Geological Society of Edinburgh.

Note that Peach seems to speak of 'counterparts' of a fossil where we would say 'part and counterpart'. He also seemingly uses Cromarty in two senses. One is the burgh and adjacent area, including Miller's classic fish site. The other is the county of Cromarty (or the combined county of Ross and Cromarty), hence the confusing references to 'Eathie, Cromarty'.

Figure 1 (not part of Peach's intended* Guide*). NMS.G.1859.33.4060,* Oxytoma inequivalvis*, from Hugh Miller's classic Upper Jurassic locality of Eathie Haven near Cromarty in grey, fine-grained limestone with other fossils including partial ammonites. Courtesy and copyright Trustees of National Museums Scotland.

GUIDE TO THE HUGH MILLER COLLECTION IN THE ROYAL SCOTTISH MUSEUM, EDINBURGH

BY B. N. PEACH

PART I : GENERAL COLLECTION

The Hugh Miller Collection occupies the south part of Gallery C, 2nd Floor of the Royal Scottish Museum at the extreme south-east end of the second floor above that upon which the visitor enters.[1]

GENERAL COLLECTION. – A general collection chiefly of fossils ranging from Pre-Cambrian to the end of Mesozoic time, arranged stratigraphically and zoologically, is shown in high wall-cases numbered from 44 to 59.[2] The rest of the general collection representative of Tertiary and Recent time is continued in desk-cases along the rail of [the] gallery ranging backwards from 116 to 114 inclusive.

SPECIAL COLLECTIONS. - Special collections are exhibited in desk-cases from 117 to 122 inclusive along the rail at the south end of [the] gallery. Three of these, viz., 119, 120, 121, are given over exclusively to the illustration of Hugh Miller's best known more exclusively geological works, viz., *Testimony of the Rocks, Foot-prints of the Creator*, and *The Old Red Sandstone* respectively.

TYPE SPECIMENS OF FOSSIL FISHES. Desk-case 122 is set apart for the exhibition of type specimens of fossil fishes, from the Old Red Sandstone and Carboniferous rocks of Scotland, used by specialists for their descriptions of these old world forms, and its contents are of inestimable value.[3]

TYPE AND FIGURED SPECIMENS OF JURASSIC PLANTS. – Part of desk-case 118 is devoted to showing the use made by specialists of the fossil plants collected by Miller from the Jurassic rocks of the Moray Firth basin; more especially by Professor Seward.[4]. The case contains many type specimens as well as figured specimens of types already established.

CRUISE of the BETSEY. – Part of desk-case 117 is made use of for the display of specimens gathered during the cruise and mentioned in the work.

SMALLER SPECIAL COLLECTIONS. – The rest of desk-cases 117 and 118 are made use of to show small special collections in illustration of structures of organisms, minerals and rocks from specimens gathered by Hugh Miller.

STATUE OF HUGH MILLER. – A beautiful statue of Hugh Miller in marble, by the late Mrs D. O. Hill, one of the Paton family, a well-known artist and wife of another artist known to fame, occupies a central place in the wall-cases at the end of the gallery.[5] It represents him in rapt contemplation of a fossil fish *Pterichthys milleri*, which he has discovered on breaking open a nodule from the Old Red Sandstone cliffs of the Sutors of Cromarty. The geological hammer, with which he delivered the stroke, is in his right hand, while at his feet lies the other half of the nodule to that which absorbs his attention and reveals to us the form of the long imprisoned fish. He is characteristically draped in his checked plaid, while, behind him, acting as a support, is chiselled a mass of conglomerate, of which much of his beloved 'Old Red Sandstone' of the Sutors is built up.[6]

The statue is one of Mrs D. O. Hill's most felicitous works, and in it she has, as it were, fossilized the deeper feelings of this great man whom we reverence.[7]

RESTORATIONS OF FOSSIL FISHES. – Restorations of some Old Red Sandstone fishes, after Traquair and Smith

[1] The Miller display occupied the southern part of this gallery which occupied the top balcony of the Whale Hall, and was also known as Gallery 2.8 in recent years. It now (2017) houses the *Survival* gallery. In 1920 it was at the south-east corner of the Chambers Street complex, at least as the visitor saw it. The Royal Museum complex had just been extended southward over the line of the 16th Century Flodden Wall to back onto Lothian Road, but this new area had not then been opened to the public. The visitor entrance mentioned is the old one at the top of the central steps in the Chambers Street facade. The current entrance, created in 2011, is a floor lower.

[2] See Taylor and Anderson (2017) for a sketch plan and explanation of this seemingly bizarre numbering system, caused by the placing of the exhibition within two running numbered series of existing display cases.

[3] Inestimable value, but not necessarily in a financial sense. Peach is surely indicating the special status of 'type' specimens as the standards against which revisionary or new taxonomy is compared.

[4] Professor Albert Charles Seward (1863-1941) was one of the most important palaeobotanists of the early 20th Century, becoming Professor of Botany at Cambridge from 1906 to 1936 (Harris 1941; Thomas and Bower 1941; Wilding 2005).

[5] Amelia Paton Hill (1820-1904), sculptor. David Octavius Hill (1802-1870) and Robert Adamson (1821-1848) created iconic portraits of Hugh Miller through the calotype process of early photography (Stevenson 2002, 2017; Taylor 2007).

[6] Peach is a little confused here. The Sutors (Souters: *anglice*, Cobblers) are the headlands forming the mouth of the Firth of Cromarty. Miller's classic Old Red Sandstone fish site is in a little bay sheltered by the South Sutor. Peach's description is wrong for this classic locality where there are no cliffs of Old Red Sandstone. Peach probably had in mind the Navity-Eathie sector to the south, which *does* have ORS cliffs, or the North Sutor where there is thick Old Red Sandstone conglomerate, and where the Old Red Sandstone might well have formed a cliff in Miller's time, though the area has since been modified by engineering works (Nigel Trewin, pers. comm. 2010). The 'outcrop' of conglomerate is probably artistic licence to support the statue, but might also have been intended to represent one of the erratic boulders cluttering the Cromarty foreshore.

[7] As well as referring to Miller's 'handedness', this interesting discussion of this statue, from a palaeontologist's perspective, valuably confirms independent conclusions by others (Knell and Taylor 2006; Taylor 2007).

Woodward, and coloured by the late Henry Brown, are placed in the space beneath the statue.[8]

ENLARGED PHOTOGRAPHS. – The spaces at the top of the wall-cases are utilized to show enlarged photographs of places of interest near Cromarty.[9]

LARGE SPECIMENS. – Some specimens, too large for the glass-covered cases, are shown on a bare bit of wall at the extreme south-east corner of the gallery.[10]

GEOLOGICAL MAPS. – Geological maps for reference to places in Scotland mentioned by Miller in his works are placed in available spaces. Of these the chief are Sir A. Geikie's Geological Map of Scotland on the scale of ten miles to one inch, published by J. Bartholomew, and the Geological Survey Map, Sheet 94 Scotland, scale 1 mile to 1 inch [*i. e. for the Cromarty area*], [a] large part of which is based on the work done by Hugh Miller, Junior, while he formed part of the staff of the Geological Survey.[11]

HUGH MILLER'S LABELLING, NUMBERING AND COLOURING. – Care has been taken to preserve labels or other scraps of writing attached to specimens by Miller in the position as placed by him. Many of the specimens are labelled in his own minute but clear writing, though the ink has now become so faint that some of the labels are no longer legible.[12] Most of the specimens bear his original number upon a small attached square or disc of paper,[13] and a point of great interest to us is that the colour of this disc lets us know at once what Miller considered the Geological Formation from which the fossil had been derived as shown in Table 1.[14]

TYPE AND FIGURED SPECIMENS. – Larger coloured paper discs have been attached to some of the specimens, since the collection was acquired by the Museum, to denote type and figured specimens. Type specimens are shown by the word TYPE in capital letters on a red ground while figured specimens are shown by the contraction FIGD., on a yellow ground.[15]

GENERAL COLLECTION

Wall-case 44

The two uppermost shelves of case 44 contain a small but most interesting suite of rocks and fossils from the Pre-Cambrian rocks of Assynt, Eireboll and Durness all in Sutherlandshire.[16]

The date of Miller's collecting of these specimens is indicated by extracts from his letters to his family published in Bayne's *Life and Letters of Hugh Miller* (Bayne 1871, vol.

Formations			**Colour of disc**
Recent and Post-Tertiary	Recent		Pink
	Glacial		
Tertiary	Pliocene		Not represented by colour *[i.e. white]*
	Miocene		
	Oligocene		
Mesozoic	Cretaceous		
	Jurassic as subdivided by Miller	Oolite	Yellow
		Lias	Blue
	Triassic		Not represented in collection
Palaeozoic	Permian		
	Carboniferous		Green
	Devonian and Old Red Sandstone		Brick-Red
	Silurian including Ordovician		Cobalt Blue
	Cambrian		Not represented by colour [*i.e. white*]
Pre-Cambrian	Torridonian		
	Lewisian or Fundamental Gneiss		

Table 1: Colour coding of paper discs bearing specimen numbers.

[8] Sir Arthur Smith Woodward (1864-1944), fossil fish specialist and Keeper of Geology at the British Museum (Natural History), later best known for being duped by the Piltdown Man forgery. Henry Brown was the Museum artist, see introduction. Reconstructions of this kind could be two-dimensional, such as paintings, or three-dimensional, such as models. It is clear from the entries below for wall-case 53 and desk-case 120 that at least one 'restoration', the *Holoptychius*, was three-dimensional, presumably of a complete fish in life or possibly a half model.

[9] What appear to be those photos survive in the Department of Natural Sciences, NMS (Taylor and Anderson 2017).

[10] Where the balcony narrows; evidently there was no room for more (Taylor and Anderson 2017, Figures 21, 23).

[11] Hugh Miller (1850-1896) (Horne 1897).

[12] Thus even at this stage in the collection's history, there was seemingly light-induced fading to the ink writing on Miller's original labels. Of course, this damage could have begun in Miller's time, in his skylit Portobello museum and in his houses before then.

[13] See discussion by Taylor and Anderson (2017).

[14] Peach is using an anachronistic terminology. Miller certainly could not have used the term Ordovician, defined long after his death, and was too undecided on the matter to have settled for 'Glacial'. See Taylor and Anderson (2017).

[15] Usefully giving one date for this practice. It must however have been confusing given that the Museum had a 'Type Gallery' in a completely different sense of 'type' – see footnote 81.

[16] Now Eriboll; and including some Cambrian dated rocks.

II, pp. 423-431) to be about 1851, 1852. These letters also reveal his views with regard to the geological age of the rocks of those regions. They are more completely set forth in one of his Presidential addresses given to the Royal Physical Society of Edinburgh two years afterwards,[17] and posthumously published in 1861 as an appendix to the seventh edition of his *Old Red Sandstone*, pp. 325-344[18] [= Miller (1892d)]. Both documents show that Miller correlated the Torridon Sandstone, resting on the 'Fundamental' gneiss of the west, with the basement conglomerates of the Middle Old Red Sandstone of the east, which, in the Sutors of Cromarty, he was accustomed to see resting unconformably upon coarse gneisses. The Assynt quartzite, of Cambrian age, he considered as the hardened representatives of the sandstones which overlay the Sutors' conglomerate, while the Cambrian limestones of Assynt and Durness he supposed were the hardened and altered fish-bearing beds of the Old Red Sandstone of the Moray Firth Basin.[19] The supposed upper quartzites of the west, which are now known to be the lower quartzites thrust forward on to the overlying Cambrian limestones, he correlated with the *Holoptychius*-bearing Upper Old Red Sandstone of the East Coast.

It must be taken into consideration that all this was before 1854 when his friend Charles William Peach was fortunate enough to find fossils in the Durness limestone; but even these were at first thought by Sir Roderick Murchison to be the remains of such Devonian forms as *Clymenia*.

On a second visit to Durness, C. W. Peach was enabled to gather such a suite of fossils as to settle effectually their relative age. After a study of these forms, the late J. W. Salter[20] gave as his opinion that they were of Lower Silurian[21] age and of a marked American facies. The subsequent work of the Geological Survey has gone to show that they belong to a zone of rocks that are considered by British geologists to be the uppermost members of the Cambrian system, while the American geologists look upon them as the base of their Ordovician or Lower Silurian; but this is a matter of little moment as both are agreed that they represent one and the same life province.[22]

The work of the Geological Survey has also brought out that the rocks lying between the quartzites – Miller's 'Quartz' – and the Durness Limestone contain the remains of the *Olenellus* fauna of marked American facies indicating a Lower Cambrian horizon.

PRE-CAMBRIAN. – The first specimen shown in wall-case 44 is one of the characteristic red felspathic Torridon Sandstone or arkose of Assynt, Sutherlandshire. For reference to the Torridon Sandstone from which this specimen came, see Miller (1892d, pp. 328-331).

CAMBRIAN. – Before beginning the description of the specimens of Cambrian age it may be as well to show the larger subdivisions of the Cambrian rocks of the N.W. Highlands adopted by the Geological Survey so as to

			Thickness in feet
Upper and Middle Cambrian	Durness Limestone, divided into seven distinct zones, numbered from below upwards		2000
Lower Cambrian	Olenellus Beds	Salterella Grit	30
		Fucoid Beds	60
	Quartzite	'Pipe Rock' divided into five zones by their pipe-casts of marine worms named *Scolithus*	250
		Basal Quartzite	250

Table 2: Table of Cambrian Strata of North-west Highlands

[17] Miller (1892d). The actual lecture was on 12 February 1853, and published in Miller's newspaper *The Witness* on 23 February (Shortland 1996, p. 355).

[18] An example of Peach's cumbersome referencing. From here onwards we have mostly streamlined it editorially.

[19] Oldroyd (1990, 1996) discusses the complex history of research in this classic area, and Miller's involvement. Marine fossils in the Durness limestone would be in line with Miller's (and others') view that the Old Red Sandstone fish were marine in origin.

[20] John W. Salter, the Geological Survey palaeontologist.

[21] In the officially accepted stratigraphy of the time, of course.

[22] Again, more family history for Ben Peach. As he noted, Miller was, in 1853, evidently unconvinced by the fossils of 'supposed organisms', nor did he recognize the 'pipe rock' of the Cambrian quartzite as biogenic. But in this he was hardly unique; indeed, he had been shown the locality under guidance by another collector. 1853 of course predated Charles Peach's classic finds of datable fossils from Durness in 1854, which he followed up with further work at Murchison's request (Murchison 1859; Oldroyd 1990; Taylor and Anderson 2015). Charles Peach summarised an interesting discussion, in part with Miller, of some of those finds at an RPSE meeting of 25 April 1855 (Peach 1858; the apparent date of 1853, on p. 14, is plainly a misprint). Miller was plainly still inclined to regard the limestones as of Old Red Sandstone age, as he did the Torridonian Sandstone. Nicol (1857, p. 36) also noted those views of Miller's, soon after Miller's death, but pointed out that Miller had not fully published them except for an article in *The Witness*, written before Peach's finds - no doubt the 23 February 1853 piece (see footnote 17). John Miller (1859, p. 580) expressed the opinion that Hugh Miller would have changed his views on the age of the Durness limestones in the light of the new evidence coming out. A further point of interest from the 1855 paper is that Peach's familiarity with Cornish fossils made it easier for him to recognise the 'pipes' of the Pipe Rock as burrow traces. Peach would not (then) venture an opinion on the age of the fossils, which were of course later authoritatively identified by Salter (Oldroyd 1990).

make references more easy (Table 2).

On the top shelf of case 44, next to the specimen of Torridon Sandstone, is placed a tablet with a specimen of white pebbly quartzite from the basement beds of the Quartzite ('Quartz' of Miller) (Miller 1892d, p. 331).

Scolithus linearis. – Next to the above come two specimens of mottled red quartzite with worm casts (pipes) in white from the uppermost zone of the 'Pipe Rock' or Upper Quartzite, Assynt, Sutherlandshire.

Miller (1892d, p. 331) gives a graphic description of the upper part of the Pipe Rock of Assynt, as follows: – 'its upper strata are of a red colour, mottled with white; and in one of these the white portions take the form of minute cylinders, vertically arranged across the stratum, like jars in a case. Where exposed to the weather, the red parts of the stone waste from around these, leaving them standing up over the surface, as the little pipes in the cistern of a shower-bath stand up over the plane of the bottom; and these curiously relieved cylinders McCulloch[23] regarded as probably organic. I could, however, find no grounds whatever for the conclusion, as in their mechanical structure they differ in no respect from the red matrix which incloses them'.

These cylinders are now generally accepted as of organic origin and have been named *Scolithus linearis* by Haldeman.

Following upon the specimens of 'Pipe Rock' is one of grey shale with flattened worm casts, *Planolites*, the so called 'fucoids'[24] from the Fucoid Beds of the *Olenellus* zone of Assynt, Sutherlandshire.

These are succeeded by three specimens of ochreous decomposing quartzite with *Salterella macculochi* Salter, from the Salterella Grit of Eireboll, N. Sutherlandshire. The circumstances accompanying the collecting of these specimens are given by Miller (1892d, pp. 338-339). Miller obtained his specimens from loose blocks; but there is an almost continuously exposed outcrop of the Salterella Grit accompanied by the Fucoid Beds for more than a mile a little to the east of Eireboll House and a very fine exposure of it on the shores of Camas an Duin where the outcrop goes out to sea to the north. This latter exposure lays bare the whole succession from the Pipe Rocks through the *Olenellus* zone up into the Durness Limestone. The Salterella Grit specimens are followed by three tablets with dolomitic limestone from the two lower zones of the Durness Limestone from Assynt, Sutherland. These in turn are succeeded by five tablets exhibiting Assynt Marbles (some polished) representing the Cambrian dolomitic limestones where metamorphosed by intrusive plutonic rock, near Ledbeg, Assynt, Sutherlandshire. For Miller's descriptions of the limestones and marbles of Assynt see Miller (1892d, pp. 334-337).

The Assynt marbles are succeeded by a single specimen of mottled dolomitic limestone with a poorly preserved fossil shell *Maclurea peachi* Salter from the Croisaphuill or sixth zone of the Cambrian limestone of Durness, Sutherlandshire, presented by the discoverer Charles William Peach to Miller about the year 1854, soon after the discovery.[25]

ORDOVICIAN or LOWER SILURIAN. – The specimens exhibited in case 44 are mostly from the Southern Uplands of Scotland particularly from the Girvan district of Ayrshire. These are perhaps of the greatest interest to us as Miller has fortunately left us a clue by which we are able to follow the discovery and collecting of many of the specimens collected in an address given by him to the Royal Physical Society [of Edinburgh] entitled 'On the Ancient Grauwacke Rocks of Scotland' (Miller 1892c).[26]

In the first part of the address (pp. 297-310), he gives a résumé of the early discovery of fossils in those rocks from the year 1792 when Sir James Hall, a follower of the great Hutton,[27] first found fossils, described by him as 'cockles', in the limestone at Wrae, in Peeblesshire, down to his own time.

In the second part Miller takes us with him and a local collector Alexander Maccallum[28] over the highly fossiliferous Stinchar Limestone quarries of Craighead, the now well known fossil locality of Drummuck[29] and Mulloch Hill situated to the north of the valley of the Girvan Water, and to the same fossiliferous limestone localities, the Balclatchie mudstones and the splendid sections exposed in the Penwhapple Glen and Ardwell [*word illegible*] south of that valley. To one who knows the region it is easy to follow his course by means of the fossils shown in case 44. He notices the American facies of some of the forms from the Stinchar Limestone, especially the fine *Maclurea*s, even before the discovery of the forms from the Durness Limestone, which Salter afterwards pronounced to be strongly American and also of Alleyne Nicolson[30] who afterwards studied the Stinchar limestone

23 John MacCulloch (1773-1835), pioneering surveyor of the geology of the Highlands and Islands. Miller was perhaps thinking of MacCulloch (1814, pp. 461-462).

24 Here, seaweeds and similar algae; Miller's usual identification for those Old Red Sandstone plant fossils which vaguely resembled *Fucus* and similar modern shore seaweeds (Anderson 2005).

25 This was an important species from the Durness Limestone (Murchison 1859).

26 Grauwacke or greywacke was a generic term for fine-grained and often more or less metamorphosed mudstones typical of the Lower Palaeozoic, for instance in the Southern Uplands. See Thackray (1976) on prior usage of 'Grauwacke'. This lecture was originally delivered to the Royal Physical Society of Edinburgh on 13 November 1852 (Anon. 1852b).

27 This is of course James Hutton (1726-1797), author of *The Theory of the Earth.*

28 Better known to some as Lang Sandy (*anglice*, Tall Alexander). Alexander McCallum (1804-1854), weaver, occasional fisherman, and keen geologist who supplemented his income by acting as a commercial geological collector and guide (McCance 2002).

29 Now assigned to the Ashgillian (Late Ordovician).

corals and found that they also had a nearer relation to American forms from the Trenton Limestone[31] than from any other European set of rocks from the same horizon.

On shelf 3 of case 44 are set out four tablets of some organisms of doubtful affinities, viz: –

1. *Recepticulites* sp. from Shropshire
2. *Nidulites favus* from Girvan, Ayrshire
3. *Prasopora grayae*, from Girvan, Ayrshire
4. *Prasopora grayae*, from Girvan, Ayrshire

Corals. –
Lindshoemia (*Petraia*[)] sp. from Girvan, Ayrshire
Streptelasma sp. from Girvan, Ayrshire (two tablets)

Trilobites. –
Asaphus tyrannus Murch., Llandeilo, Shropshire
Ogygia buchii Brong., Llandeilo, Shropshire
Ogygia sp., Canada West (2 spec)[32]
Calymene sp.
Asaphus (*Isoteles*) *rectifrons* Portl., Stinchar Limestone, Girvan
Asaphus (*Isoteles*) *rectifrons* Portl., Stinchar Limestone, Girvan
Encrinurus punctatus Brunn., Stinchar Limestone, Girvan
Calymene blumenbachii (4 specimens), Drummuck, Girvan
Cheirurus bimucronatus Murch., Drummuck, Girvan
Ampyx hornei Nich. and Eth., Balclatchie, Girvan
Trinucleus bucklandi Barrande, Drummuck, Girvan
Encrinurus punctatus Brunn., Balclatchie, Girvan

Crustacea. –
Turrilepas peachi Nich. and Eth., Balclatchie, Girvan
Pinnocaris lapworthi Eth., Jr., Balclatchie, Girvan
Turrilepas peachi,[33] an ancient barnacle, has been named from specimens collected since Miller's time. *Pinnocaris lapworthi*, a bivalve phyllocarid crustacean, has been described from specimens collected by Mrs Gray from Balclatchie, also since Miller's time.[34]
Brachiopods. – A whole shelf is taken up with the display of Brachiopods chiefly from the upper Llandeilo and Caradoc rocks of Girvan, Ayrshire and Wrae, Peeblesshire, comprising the genera *Lingula*, *Orthis*, *Strophomena*, *Orthotetes*, *Rafinesquina*, *Leptaena (Christiania)*, *Plectambonites*, *Platystrophia* and *Atrypa*. Of these perhaps the most interesting are the specimens of *Orthis confinis* which is the characteristic fossil of a band of sandstone underlying the Stinchar Limestone in which the white shells contrast strongly against the dark sandstone in which they occur as described by Miller (1892c, p. 314 [?*recte* p. 312]).

Lamellibranchs. – This group of shells is represented by two genera, viz., *Ctenodonta* sp. and *Bryssonia* sp. from the Wrae Limestone of upper Caradoc age, from Wrae Hill, Peeblesshire. These specimens derive their chief interest from having, in all probability, been presented to Miller by either Professor Nicol[35] or Robert Chambers[36] on their rediscovery of this fossil bearing rock forty years after the first discovery in it[37] of 'cockles' by Sir James Hall[38] in 1792 as set forth in Miller's address (Miller 1892c, p. 305).

Gastropods. – These are represented by the following –
Bellerophon acutus, Caradoc, Balclatchie, Ayrshire
Bellerophon bilobatus, Caradoc, Balclatchie, Ayrshire
Pleurotomaria qualteriata, Stinchar Limestone, Girvan
Maclurea magna Lesueur, Stinchar Limestone, Girvan
Maclurea magna Lesueur (operculum), Stinchar Limestone, Girvan
Maclurea maccoyi Salter, Stinchar Limestone, Girvan

The Stinchar Limestone is of upper Llandeilo age.[39] It was chiefly on these *Maclurea*s that Miller based the opinion that the Stinchar Limestone held fossils of an American facies as set forth in the above address (Miller 1892c, pp. 316-317).

The bottom of case 44 is taken up with an overflow of specimens too large to be easily accommodated on the narrow shelves above. The most interesting specimens are some fine examples of *Orthoceras* from the Caradoc rocks

30 Henry Alleyne Nicholson (1844-1899) worked on invertebrate fossils and was Regius Professor of Natural History at the University of Aberdeen from 1882 (Benton 1979).

31 Ordovician.

32 It is not clear whether Peach meant two specimens or two species. They are probably some of the fossils sent to Miller by 'Dr James Wilson of Upper Canada – a gentleman who, amid the wild backwoods, with none to assist and few to sympathize, has cultivated a close acquaintance with science for its own sake' and whose fossils 'had been collected in the modern township of Pakenham, not far from the banks of the Ottawa' (Miller 1889a, p. 73).

33 Named by Nicholson and Etheridge (1880, vol. 3, pp. 301-302) - but in fact for Ben Peach, not Charles who had provided many living and fossil barnacle specimens for Charles Darwin's monographs (Anderson and Lowe 2010). It is now considered a plumulitid machaeridian and has been renamed *Plumulites peachi* (Nicholson & Etheridge, 1880).

34 Described by Etheridge (1878); now considered a rostroconch. Mrs Elizabeth Gray (1831-1924) was a notable collector of Girvan fossils (Cleevely, Tripp and Howells 1989; McCance 2002, Donovan 2007).

35 Professor James Nicol (1810-1879), whose early researches were around his birthplace of Traquair near Innerleithen in Tweeddale; from 1853 Professor of Natural History at the University of Aberdeen. A major participant in the Highlands Controversy which led to Peach and Horne's great work on the structure of the North-west Highlands (Oldroyd 1990).

36 Robert Chambers (1802-1871), Peebles-born journalist and publisher, and anonymous author of the pro-evolutionary *Vestiges of the Natural History of Creation* in 1844 (Secord 2000; Taylor 2002). It might seem odd that Miller received fossils from Chambers despite his voracious attack on *Vestiges* in *Foot-prints of the Creator* (Miller 1896, first published 1849) – but *Vestiges*'s authorship was formally anonymous (Secord 2000).

of Penwhapple Glen and Ardwell both in the Girvan region of Ayrshire, which are alluded to by Miller (1892c, p. 314).

Wall-case 45

UPPER SILURIAN. – This case is devoted to the display of Upper Silurian fossils chiefly from the Wenlock and Aymestry Limestones of England and Wales. A few fossils are from the Llandovery and Tarannon rocks of Girvan, Ayrshire, and there is a small collection from Canada West and one or two specimens from South Africa. Miller (1892c, p. 309) records his visits to 'the rich deposits of middle England, the Wenlock limestones and shales of Dudley, and the upper Ludlow and Armistry [Aymestry] deposits of Sedgley and its neighbourhood', during which visit he doubtless acquired the fine collection part of which is shown here. The collecting of the Girvan fossils is also recorded in the second part of the same address; but no clue has been found as to how he acquired the Canada West and South African specimens; doubtless they were presents from some of his many admirers abroad.[40]

Hydroids. – On the top shelf is placed a slab with a fine example of *Monograptus vomerinus* Nich. from Ayrshire, in all probability from the Wenlock rocks of Straiton.

Corals. – The rest of the shelf is given over to corals of the genera *Syringopora*, *Favosites*, *Stromboides*, *Cystiphyllum*, *Cyathophyllum*, and *Palaeocyclus*, from the Girvan district of Ayrshire and Canada West. Of these the most noticeable are the specimens of *Cystiphyllum* and *Cyathophyllum* both from North America and a beautiful example of *Palaeocyclus porpita* Linnaeus.

Crinoids. – The corals are followed by specimens of crinoids from Dudley of the genera *Crotalocrinus*, *Hablocrinus*, *Periechocrinus*, and *Thysanocrinus* and a plaster cast showing the stem, cup, and arms of a nearly complete example of *Periechocrinus* an ancient stone-lily, the original of which is in the Dudley Museum. This cast is probably one brought back by Miller as a memento of his visit to the Museum.[41]

Trilobites. – Following upon the crinoids come the trilobites: -

Calymene blumenbachi Brong. Wenlock, Dudley, Shropshire
Calymene sp., Wenlock, Dudley, Shropshire
Phacops (*Dalmanites*) *caudatus* Phill., Wenlock, Dudley, Shropshire
Encrinurus laevis, U. Silurian, Canada West
Encrinurus sp., U. Silurian, South Africa
Cheirurus sp., U. Silurian, South Africa
Illaenus maccal[*l*]*umi* Salter, Llandovery, Mulloch Hill, Girvan

The last trilobite of this list is called after Alexander McCallum, who acted as Miller's guide over the Silurian rocks of the Girvan region, as related in the above mentioned address (Miller 1892c, p. 311). The fossil further illustrates points brought out by Miller in his description of the phenomena observed by him on his first day's excursion over the isolated patch of Silurian rocks north of the Dailly Coal-field (pp. 312-313). In the first case the fossil has preserved the glowing ochreous yellow colour of the specimens laid bare by them at the same locality from which it came, marvelled at and described by Miller. It further illustrates another point dwelt on by him, viz., that its caudal shield is as great as that of its cephalic shield which it closely resembles in shape.[42] This point is drawn attention to in connection with a small special collection of rolled up trilobites from the Miller collection exhibited in desk-case 118 devoted to the display of special structures.

[37] Nicol (1841) had been unable to find any material in the by then derelict quarry to confirm Hall's report, to his frustration, for they were almost the only known fossils from the ‘Silurian’ of the south of Scotland. One reason was of course the care and access – or rather the lack thereof – for Hutton's collection provided by Robert Jameson at the University of Edinburgh's Natural History Museum (Jones 1984). The modern curator might well sympathise with Nicol (pp. 164-165), 'Specimens […] we believe, still exist in some of the collections in Edinburgh; and it is to be regretted that no account of them has ever been published […] we cannot abstain from expressing our regret that such an important monument of the physical history of our country should have thus vanished without having been rendered available for the advancement of knowledge, and with no prospect of its place being supplied from other sources. It is a melancholy reflection, when leaving this deserted quarry, where the wild whistle of the mountain sheep shews how seldom their solitude is invaded, that these relics of former creations, which, if preserved to science, might have added an interesting page to the world's history, should have thus perished by the hand of man [for lime burning] at so recent a period, after having remained safely stored up in the cabinet of nature for so many ages, and throughout so many awful revolutions'. But happily in the autumn of 1847 Nicol found 'a few imperfect fossils' (Nicol 1848, p. 203), and Chambers followed (Miller 1892c, p. 305).

[38] James Hall (1761-1832), James Hutton's colleague, and a pioneer in experimental geology, including the melting and cooling of basaltic lava to determine its composition, and the folding of strata.

[39] Now considered Caradocian (Williams 1962).

[40] The Canada West fossils perhaps came from Dr Wilson (see footnote 32), though Miller refers to his fossils being only from the 'Lower Silurians' (1889a, p. 73), possibly reflecting a changed consensus on dating. The South African fossils might be the brachiopods from Swellendam in the Miller collection today. Their collector has so far defied conclusive identification, but one possibility is Robert Douglas (died c. 1863), a 'self-educated and enthusiastic geologist' as described in a paper on some of his finds delivered to the RPSE by William Carruthers (1830-1922) (Carruthers 1863, p. 108). Carruthers had himself trained as a Free Church minister, but changed career to botany thanks to the natural science training at the Free Church College in Edinburgh, and eventually became Keeper of Botany at the British Museum (Natural History) (Anon. 1912b). One might wonder whether we have here two more people inspired by Miller's example.

[41] The cast is not mentioned in his account of the visit to this fine museum (Miller 1889a, pp. 70-73). But some museums did sell casts.

Brachiopods. – These shells follow the trilobites and are placed on succeeding shelves. Most of the specimens are from the Wenlock Limestone of Dudley and belong to the genera *Atrypa, Dalmanella, Orthis, Orthotetes, Spirifera*, and *Retzia*, and of these *Atrypa reticularis* makes the greatest show as well it may for it is one of the characteristic brachiopods of the Upper Silurian rocks over the greater part of the Northern Hemisphere. *Retzia cuneata* is the least conspicuous of these fossils and it occurs on a large slab with *Dalmanites conopthalmus*, a trilobite which is not recorded in the foregoing list. Only one specimen, *Orthis* sp., is from Canada West.

The under part of the case is given over to specimens too large to show above, and [which] are mostly large slabs of Wenlock Limestone from Dudley crowded with fossils among which are many species of Polyzoa or sea-mats,[43] sea-lilies, lamp-shells,[44] and trilobites, most of which, with the exception of the sea-mats, have been shown separately on the shelves above.

Wall-case 46

ORDOVICIAN and SILURIAN. – The collection displayed in the upper part of this case may be looked upon as an overflow from the two preceding ones.

Nailed to the wall at end of case are large specimens of Ordovician graptolites, two of which show fine examples of *Diplograptus foliaceus* Murch. from the slate quarries of Cairn Ryan in Wigtownshire and which were probably presented to Miller by J. Carrick Moore, who in 1848 read his paper describing the Silurian rocks of Ayr and Wigtownshire before the Geological Society of London,[45] Two other specimens of *Diplograptus foliaceus* are also shown, one from Ardwell and another from Penwhapple Glen, both in the Girvan region of Ayrshire. These specimens are evidently some of those referred to by Miller (1892c, pp. 306-307, 315) where he compares this form to the recent *Pennatula*.[46]

Monticuliporids, corals and crinoids. – On the top shelf of wall-case 46 are exhibited some monticuliporids, corals, and a specimen of *Periechocrinus moniliformis*, from Mill-Port, Credit Lake, Canada West.

Brachiopods. – A few brachiopods are also shown among which *Leptaena rhomboidalis* Wilckens, from the Mulloch Hill, and *Pentamerus oblongus*, from Cuddiestone Glen, both in the Girvan district of Ayrshire, are of interest as showing the Llandovery horizon of the rocks from which they came.

Lamellibranchs. – Bivalves are represented by two a [sic] species of *Orthonota* from South Africa.

Polyzoa and Pteropoda. – The sea-mats *Ptilodictya* and *Fenestella* and the pteropods *Conularia sowerbyi* Defrance,[47] and an undetermined species are all from Canada West.

Gastropods. – *Bellerophon* (*Bucania*) *dilatata* Sow. from the Mulloch Hill, Girvan, Ayrshire, and a few others of the genera *Omphalotrochus* and *Murchisonia* from Dudley and Canada West are placed here.

A specimen of the coral *Streptelasma* (*Petraia*) *bina* Lonsd. is shown out of its proper place here as it came from the typical Llandovery rocks of May Hill.[48]

On the fourth shelf have been placed several slabs from Dudley on which may be seen various groups of fossils and a special slab from the Mulloch Hill, Girvan, with casts of *Meristella angustifrons, Orthis* (*Dalmanella*) *elegantula*, corals, and crinoid stems which illustrate well Miller's description of the occurrence of the fossils seen by him in the rocks on this horizon and locality (Miller 1892c, p. 313).

DEVONIAN or OLD RED SANDSTONE. – This formation occurs in Britain under two aspects. In Devonshire and Cornwall it is mostly represented by marine deposits holding a fauna in common with that of the rocks of Rhenish Prussia.[49] In the rest of our country it is represented by epicontinental deposits, often of a red colour and containing several peculiar and distinct fish faunas. The only other fossils associated with these fish remains, among which lungfish are conspicuous, are air breathing millipedes or gally-worms,[50] eurypterids, bivalve crustaceans, and early forms of land plants. One solitary exception however is that of *Anodonta jukesi*, a bivalve whose present near relatives are of freshwater habitat. This phase of the formation is generally known as the Old Red Sandstone.

During the Devonian period what is now the northern part of our country must have been subjected to a succession of great crustal earth movements and protracted periods of rapid accumulation for in Scotland there is a strong unconformability between the Lower Old Red Sandstone and the

[42] So that the head and tail ends could be brought close together for protection when the trilobite rolled up.

[43] Bryozoan fossils.

[44] Informal name for brachiopods.

[45] Carrick Moore (1849).

[46] *Pennatula*, the common Sea-Pen, a cnidarian related to sea anemones and hydroids. Miller was familiar with it from specimens brought up by Cromarty fishermen.

[47] This species is now placed with the conulariids.

[48] On the Gloucestershire-Herefordshire border.

[49] Now the Rhine Province of Germany.

[50] Gally-worm, an old word for centipede or millipede (*Chambers Dictionary*). Ben Peach had described *Archidesmus macnicoli* in a review (Peach 1883a), which included also David Page's species *Kampecaris forfarensis*.

Silurian and all older rocks. Only at one place are the Lower Old Red Rocks strictly conformable with the Downtonian or uppermost Silurian subdivisions. These latter rocks are violently unconformable to the adjacent upper Cambrian or Lower Silurian rocks of the Highland border showing that this part had been first acted upon by the movement in Upper Silurian time that culminated further south in Devonian time.

An equally powerful crust movement appears to have been proceeding during the deposition of the Lower Old Red Sandstone which culminated at its close; but this is not easy to demonstrate because the Middle Old Red Sandstone which is only known in the region north of the Grampians can only be seen to rest unconformably on rocks of an older date than those of the Lower division. The basement beds of the Middle division, however, often rest directly upon the newer granites and their basement conglomerates are full of their water-worn fragments thus showing that these deepseated plutonic rocks which are believed to be connected with the Lower Old Red Sandstone phase of vulcanicity had been exposed by denudation at the beginning of the deposition of the Middle Old Red Sandstone. The occurrence of the granite pebbles in the basement conglomerates of the Middle Old Red Sandstone had not escaped the notice of Hugh Miller and he further contrasted the occurrence of granite pebbles in places where no granite was exposed with the behaviour of the conglomerates of the Lower Old Red Sandstone in Arran where there are no granite pebbles in the Lower Old Red Conglomerates, in almost close juxtaposition to the Arran granite;[51] but the science of geology was not then sufficiently advanced for him to draw the obvious inference. His observations are given in *The Old Red Sandstone* (Miller 1892a, p. 144fn).

Evidence along another line is forthcoming. The fishes contained in the Lower and Middle Old Red Sandstone strata of Scotland are quite distinct from each other, not a single species being common to both. Sir Archibald Geikie considered that this might be accounted for by their having inhabited two separate lakes simultaneously but subsequent observation has shown that the land plants are quite as different from each other.

A third period of movement accompanied by wholesale denudation and deposition is shown by the unconformable behaviour of the Upper Old Red Sandstone in Scotland to every formation older than itself that it comes into conjunction with. In the Orkneys it is seen to rest unconformably upon beds low down in the Middle Old Red Sandstone. On the southern side of the Moray Firth it creeps across the lowest beds of the Middle division and comes to rest directly upon the Highland metamorphic rocks. South of the Grampians it either rests unconformably on the Lower Old Red Sandstone or it may lie on any member of the Silurian or Ordovician series.

The Upper Old Red Sandstone pass[es] conformably up into Lower Carboniferous rocks everywhere that the junction of the two is observable in Scotland thus showing that at the culmination of the Old Red Sandstone period a movement of gentle though widespread depression had succeeded to the more violent movements that accompanied the production of the Old Red Sandstone.

It is with the middle and upper members of the Formation that Miller had most to do and, more especially, with the Middle Old Red Sandstone of the Moray Firth Basin which he made particularly his own, by revealing the wonderful fish fauna he unearthed from it.

Miller's writings show that for long he considered the Middle Old Red Sandstone of the Moray Firth Basin to be the lowest member of the formation and the Old Red rocks of the Central Valley of Scotland to be the middle group; but, latterly, he changed this view on finding that the central valley rocks contained fishes like those found in the lowest strata of the Old Red Sandstone of the English and Welsh Border which pass down conformably into the Downtonian, the uppermost division, of the Silurian series. This change is expressed in Miller (1892a, p. 277).[52]

That Miller not only unearthed the fossil fishes but made considerable progress in unravelling the anatomy and affinities of these peculiar old world denizens of the waters, is shown in the following appreciative article written to commemorate Hugh Miller's centenary by the late Dr Ramsay H. Traquair, himself the greatest authority on Palaeozoic fossil fishes of his time. [*The section on wall-case 46 continues after Traquair's piece. See Introduction for a discussion of the origin, content and dating of this article.*]

Hugh Miller and his palaeichthyological work
Ramsay Traquair

On the 22nd August last [(1902) *inserted*], the centenary of the birth of Hugh Miller was celebrated at Cromarty, and, on that occasion, many eloquent speakers bore witness to his worth as a man, to his genius as a writer, to his zeal for the faith of his fathers, to his devotion to his church, as well as to the service he performed for science not only by his palaeontological discoveries, but by his making use of his wonderful powers of diction in popular-

[51] The Arran Granite, being of Palaeogene age, is far younger than the Devonian conglomerates and therefore could not have contributed eroded clasts to them – not that Miller would have known this, at least in modern terms. But he did pick up on the discrepancy between Arran, and the Moray Firth coast of Sutherland, in *The Old Red Sandstone* (Miller 1892a, p. 144), probably directly or ultimately from Murchison (1827, pp. 306-307) and Sedgwick and Murchison (1829, pp. 25, 34-35).

[52] This seems too strong. Peach is citing a *posthumous* editorial addition to *The Old Red Sandstone*. Miller's own comments in *Testimony of the Rocks* show that, at the time of his death, he had not made up his mind conclusively but also that he was certainly open to change (Miller 1857, pp. 448-451, 1890, pp. 406-409). In any case, not all the evidence had yet come in: especially Charles Peach's key finding of the supposedly Middle Old Red eurypterid *Pterygotus* under the supposedly Lower Old Red Caithness Flagstones near Lybster in Caithness (Peach 1883b).

ising the study of Geology at a time when theological feeling in many quarters ran almost as high against this new field of human knowledge, as it did years afterwards against the biological doctrines promulgated by the illustrious Darwin. The memory of Hugh Miller is revered by all educated Scotsmen irrespective of sect, and his name is held in esteem by all votaries of Geology not only in Britain but throughout the civilised world.

For me, on the present occasion, to retell the story of Hugh Miller's life, and to enter into a general eulogium of his character and achievements, would be superfluous as that has been already done many times by an abler pen than mine. On the other hand my task will be to put together a few notes on his original works in the domain of fossil ichthyology, a much less popular subject it is true, but one which at the same time does claim the attention of all who are interested in Scottish palaeontology, in the wealth of fishes and fish-remains which is found in its strata of Palaeozoic age, and one of the earliest collectors and students of these was Hugh Miller. It is with the fishes of the Scottish rocks of Devonian (Old Red Sandstone) age that his name is specially associated, for it was his discovery of a rich fish-bearing deposit of this epoch, which drew his attention to this department of the subject and led him to write that fascinating work *The Old Red Sandstone* as well as to follow up the matter in subsequent publication.

Hugh Miller's interest in palaeontology was, as we learn from his autobiography, first aroused during his apprenticeship when happening to break open a nodule from the [word *illegible but probably* Mesozoic] strata of Eathie, to his delight and surprise he found it to contain what he had never seen or dreamt of before, – a beautifully sculptured ammonite. It was not till some years afterwards, namely about 1830 that he discovered the Old Red Sandstone fish beds in the immediate neighbourhood of Cromarty itself, and which formed one of the main stores from which he derived his inspiration as a palaeichthyologist and in time his extensive and valuable collection of fossil fishes. But, before going further, it may be as well to inquire into the condition of Scottish Palaeozoic ichthyology at the time when Hugh Miller commenced to collect and to interest himself in the subject. Although Ure in his *Natural History of Rutherglen and East Kilbride* had already, in 1793, figured a number of fish-remains of Carboniferous age, no further interest in the matter seems to have been manifested until the time referred to, namely the third and fourth decades of last century[.] The collectors began to be busy, a number among whom may be mentioned – Dr Hibbert, Professor Jameson, and Lord Greenock, who worked among the Carboniferous rocks of Edinburgh district; Traill who collected in the Old Red of Orkney; Sedgwick and Murchison, who made known the fossil fishes of the same formation in Caithness; [and] Lady Gordon Cumming, Dr. Malcolmson, Mr Martin, Mr Stables, and Patrick Duff, the scene of whose labours was the Old Red of the Southern side of the Moray Firth; while the attention of the Rev. Drs Fleming and Anderson had been drawn to the fish-remains occurring in the sandstones of that period in Fifeshire and Perthshire.[53]

But in the year 1840 very little indeed had been published on Scottish fossil fishes though Sedgwick and Murchison in 1828 had given figures of *Dipterus* and other genera from Clashbennie and Drumdryan. In 1833, Agassiz had commenced the publication of his great and classical work the *Recherches sur les Poissons Fossiles* [(Agassiz 1833-1843)] and in the sheet and plates which appeared in 1835 are contained descriptions and figures of several Scottish genera both Devonian and Carboniferous, taken from specimens forwarded to him from Scotland, while again, in the part of the work, published in 1837 and 1838, we find illustrations of a few Scottish selachian fish remains. The subject being then completely in its infancy, it is clear that in the beginning and before he became acquainted with Agassiz, Hugh Miller would have derived but scanty assistance or information from the writings of the time.

He had to grope, as it were in the dark, and with the drawbacks of a want of previous training in comparative anatomy. But we shall see presently that in spite of his disadvantages, his insight into the structure of the strange old creatures was, in some cases, more acute than that of the illustrious Swiss naturalist himself [i.e., Agassiz].

One of the first results of the study of his own collection is seen in a most beautifully drawn figure, never published but contained in [a] letter from him to Fleming dated 1839, and now in the Kelvingrove Museum [in] Glasgow.[54] This is an attempted restoration of the 'creature' which so much engaged his attention when he first unearthed the treasures of the Cromarty fish-beds, [and] in it we find that he had blended the characters of two creatures namely *Coccosteus* and *Pterichthys*. The contour is oval like that of *Pterichthys*; like that genus it also has a comparatively short tail, and [a] prominent pair of pectoral appendages but the plates and the head and body as far as given clearly show that he had also used *Coccosteus* for the reconstruction. One cannot however fail to be struck with the exquisite neatness of the drawing as well as the fidelity with which one plate at least is delineated namely the great dorsal plate of the body cuirass of *Coccosteus decipiens*. He must however have speedily acquired the power of reading his specimens more correctly, for his *Old Red Sandstone* published two year[s] after the date of that letter, and one year after he had made the acquaintance of Agassiz,[55] contains restored figures which show that, in some cases, he had a clearer insight into the structure and configuration of these strange old fishes than the great Swiss naturalist himself. This will at once be seen if we place these figures side by side with the restorations published by Agassiz some years later in his *Poissons Fossiles du Vieux Grès Rouge* [Agassiz (1844-1845)], and compare

[53] For all those, see Andrews (1982).

[54] This must be the letter of 1 February 1839, partly published by Absalom (1933). Miller sent similar letters to other geologists (Andrews 1982; EUL-NC Mil 1.1).

[55] In person; Miller had written to him in 1838 (Andrews 1982).

both with the result of modern investigation based on material far more complete than the collections of that time afforded. Then in the *Foot-prints of the Creator or the Asterolepis of Stromness* published in 1849 original description and excellent figures are given of fish-remains chiefly from the Caithness flags for the acquisition of which he was mainly indebted to the friendly offices of Robert Dick the naturalist-baker of Thurso[.] We know indeed through Mr Smith,[56] that though Dick first observed fossil fishes in these flags in the year 1835 it was Hugh Miller's book on the Old Red Sandstone which aroused his interest in the matter and led to his becoming so enthusiastic and successful a collector. In 1848[57] Sir Philip Grey Egerton in a paper on *Pterichthys* gave copious extracts from letters which he had received from Hugh Miller whose conception of the configuration of the carapace of that strange creature in opposition to that of Agassiz he unhesitatingly corroborated. And again in 1859[58] the same author published as a supplement to his paper on the [*gap in manuscript; pencil annotation* 'See original for filling this gap. BNP'] extracts from similar correspondence dated back to 1848 and 1849 which he had with the gifted Scottish geologist on the subject of *Coccosteus* and which also included several figures of great interest.

The rest of Hugh Miller's observations on fossil fishes are no doubt scrappy and scattered and are to be found in *The Cruise of the Betsey*, the *Rambles of a Geologist*, the *Sketch-book of Popular Geology*,[59] and in an appendix to the latter work consisting of short papers brought together by his widow after his death.

[*Peach's text now resumes*]

Wall-case 46, continued

DEVONIAN. – A very small collection of marine fossils from the Devonian, or marine equivalent of the Old Red Sandstone, from Cornwall and N. America are placed in this case. They are as follows: –

Corals. – *Michelinea favosa*, popularly known as 'fossil honeycomb', from the upper Devonian of N. America
Favosites polymorpha, Polruan, Fowey, Cornwall
Petraia sp., Polruan, Fowey, Cornwall

Gastropods. –
Bellerophon bilobatus Sow., Polruan, Fowey, Cornwall

Fishes. – *Pteraspis* sp., Llantivet Bay, Cornwall

The Cornish specimens were presented to Miller by C.W. Peach about the year 1847, when he [Peach] made the first discovery of fish remains from the Devonian rocks of Cornwall, and were sent to Miller as a tribute to his work in the Old Red fishes of Scotland. Regarding this find the reader is referred to an extract from a letter sent by Sir Roderick Murchison to Hugh Miller, dated April 19th 1847, published in Bayne's *Life and Letters of Hugh Miller* (Bayne 1871, vol. II, pp. 412-415). At first the fish character of the remains was not generally accepted and the cancellated bony structure was mistaken for sponge network. Subsequent research however fully established the fish structure and E.R. Lankester showed that the remains belong to *Pteraspis*.[60]

OLD RED SANDSTONE. - Prior to Miller's time it was generally considered that the plant remains found in the Old Red Sandstone of the Moray Firth region were those of algae. Although at first Miller shared in this belief he was enabled to show that some of his specimens were those of land plants and one specimen found by him in the rocks of the Black Isle, near Cromarty, retained its microscopic structure. This proved to be not only a land plant but that it had set up a woody stem and become a tree which he styled 'the veritable [*recte* venerable] Adam of the forest'.[61] This specimen is placed in desk-case 120, given over to the illustration of his *Foot-prints of the Creator*. In a footnote dated 19 July 1845, to *The Old Red Sandstone* (Miller 1892a, pp. 117-118), William Nicol,[62] the greatest authority of his time on such structures, declares the wood to be coniferous.

LOWER OLD RED SANDSTONE. – Only very meagre representatives of the plants and animal remains from this division are found in the collection, most of which are shown in this case.[63]

Plants. – Three specimens of indeterminable plant remains from the flagstone quarries of Carmylie, Forfarshire, are placed here. Specimens of *Parka decipiens* Fleming from Carmylie are shown in desk-case 121 in illustration of Miller's *Old Red Sandstone*.

Fishes. - These are represented by two specimens of *Cephalaspis lyelli* Agassiz from Carmylie and one of *C. powriei* Lankester also from Carmylie, Forfarshire.[64]

[56] 'Mr Smith' is almost certainly an error for Samuel Smiles. Robert Dick (1811-1866), naturalist and geologist, and major collector of Old Red Sandstone fossils. See Smiles (1878, esp. pp. 98-100) and Anderson and Taylor (2008).

[57] Egerton (1848).

[58] Egerton (1860), delivered to the Geological Society of London in 1859.

[59] *Rambles* was the second 'book' in the same volume as *Cruise of the Betsey* (Miller 1858a). *Sketch-book*, Miller (1889b).

[60] Edwin Ray Lankester (1847-1929), zoologist and evolutionist. On the Cornish fishes, see notes for desk-case 118.

[61] See section for desk-case 120 for correct quotation.

[62] William Nicol (1770-1851), physicist, geologist, and pioneer in use of thin sections, especially in palaeobotany (Morrison-Low 1992; Anderson 2005).

[63] On Miller's plant fossils, see Anderson (2005). Fish fossils from the Lower Old Red Sandstone only began to be systematically collected in large numbers around 1860 from sites such as Turin Hill (Tillywhandland Quarry), by the likes of James Powrie (1815-1895) (Davidson and Newman 2003) and the Rev. Hugh Mitchell (1822-1894) of Craig. So it is unsurprising that the LORS fishes are meagrely represented in Miller's collection.

Other specimens of *Cephalaspis* are placed in desk-case 121 to illustrate Miller's *Old Red Sandstone*.

The bottom of desk-case[65] 46 is used to receive an overflow of large specimens of Lower and Middle Old Red Sandstone fossils from this and the succeeding wall-cases. They are not arranged in any particular order.

Wall-case 47

MIDDLE OLD RED SANDSTONE. – That this is the subdivision that Miller made more particularly his own is demonstrated by the collection.

Plants. – *Caulopteris peachi*[66] Salter. A fern stem contained in a block derived from the Caithness flagstones of Middle Old Red Sandstone age found by Miller as a boulder in the upper Jurassic breccia exposed on the shore south of Helmsdale. This is evidently the specimen referred to as a 'pebble occupied by an Old Red Fucoid' by Miller in his address on his retiring from the Chair of the Royal Physical Society of Edinburgh, published after his death (Miller 1892f, p. 373).[67] From the same source we find that he also found characteristic fishes of the Middle Old Red Sandstone contained in other flagstone masses enclosed in the 'Oolitic paste' or matrix filled with Upper Jurassic forms, and one specimen of flagstone, containing a characteristic fish, encrusted by *Thecosmylia*, an Oolitic coral; but these latter specimens have not been found in the collection.[68]

From letters written by Miller to the Duke of Argyll[69] and Sir R. Murchison (Bayne 1871, vol. II, pp. 431-436), it appears that those geologists were of opinion that the fossils enclosed in the blocks were not derivative but of Jurassic age; but Miller maintained that they were undoubtedly of Old Red Sandstone age and must have been derived from an old land surface of Caithness flagstone. Subsequent work[70] has fully vindicated Miller's contention.

Professor Judd[71] while afterwards studying the Jurassic rocks of East Sutherland showed that the Caithness-flagstone type of the Middle Old Red Sandstone had once extended much further to the south than at present and must have overlain the basement conglomerates of that formation now found resting on the old crystalline rocks. His work, and that done subsequently by the Geological Survey, has shown that the flagstones had been let down by a powerful fault roughly coinciding in direction with that which now bounds the Jurassic rocks. It was on to a land surface where the flagstones were so let down that the Upper Jurassic rocks gradually overlapped as it sank down and was eaten into by the encroaching sea.

Mr Murray Macgregor, of the Geological Survey, in a paper entitled 'An Old Shore Line' (Macgregor 1916), has described, – and almost made visible to us by photographs – how the Upper Jurassic breccia, described by Miller, must have been of the nature of scree material or talus which fell from adjacent flagstone cliffs. Not only this, but he shows to us that an outlying sea stack of flagstone comparable in some respects to the present 'Old Man of Hoy', after having been undercut by the sea fell and became completely buried under Jurassic and probably younger rocks, and that, after a lapse of numberless ages, during which our land was much affected by crustal movements, the prone giant has been once more uncovered in recent time by the planing down of the present foreshore by the insatiable sea. A copy of Mr Murray Macgregor's plate showing the breccia and the fallen stack is here reproduced [equivalent images in Figure 2].

?*Parka decipiens* Fleming. This specimen is doubtfully referred to *P. decipiens* from Caithness. If this be so in reality it is the only land plant yet known to be common to the Lower and Middle Old Red Sandstone of Scotland
Psilophyton sp. aff. *dechenianum* Carruthers from Caithness
?*P.* [illegible], several stems, one of which is dichotomous and
?*Calamites*, a fluted stem. Both the above are from Caithness
Some specimens of *Psilophyton* and the coniferous woody stem referred to above are placed in desk-cases 1[1]9, 120, 121, illustrative of Miller's *Old Red Sandstone*, *Footprints of the Creator*, and *Testimony of the Rocks*. A very fine slab of stems of *P. dechenianum* is nailed to [the] wall in the space between wall-cases 45 and 46.[72]

[64] Now Carmyllie.

[65] Presumably a slip for wall-case 46.

[66] More family history: the species was named in honour of Charles W. Peach (Anderson and Taylor 2008).

[67] This address took place on 22 November 1854 (Miller 1858b).

[68] Miller names the coral as *Thamnastrea*, and so does Peach elsewhere (section for wall-case 57). Concerning these finds, it is possible that Peach misinterpreted Miller's text, as Miller need not have taken home everything he saw and reported, in which case there would be fewer specimens than Peach assumed. But this definitely indicates the apparent loss even then of at least one specimen, the *Thamnastrea*, unless the Jurassic covering had been removed to get at the fishes (which seems unlikely given its interest).

[69] George Douglas Campbell (1823-1900), who succeeded to the Dukedom in 1847. Keen geologist, studying e.g. the Palaeogene leaf beds on the Isle of Mull.

[70] See e.g. Macgregor (1916) and Trewin (2002); as well as the modern view of underwater landslides, perhaps caused by earthquakes (see below), other explanations were suggested for the breccia, including mechanical action from the intrusion of granite, glacial action, and the effects of heavy rain and snow in a mountain district.

[71] Professor John W. Judd (1840-1916), Professor of Geology at the Royal College of Science, London. He specialised in igneous petrology, particularly that of the Tertiary rocks of Scotland (now Palaeogene), but also worked on the Mesozoic rocks of Scotland (Judd (1874).

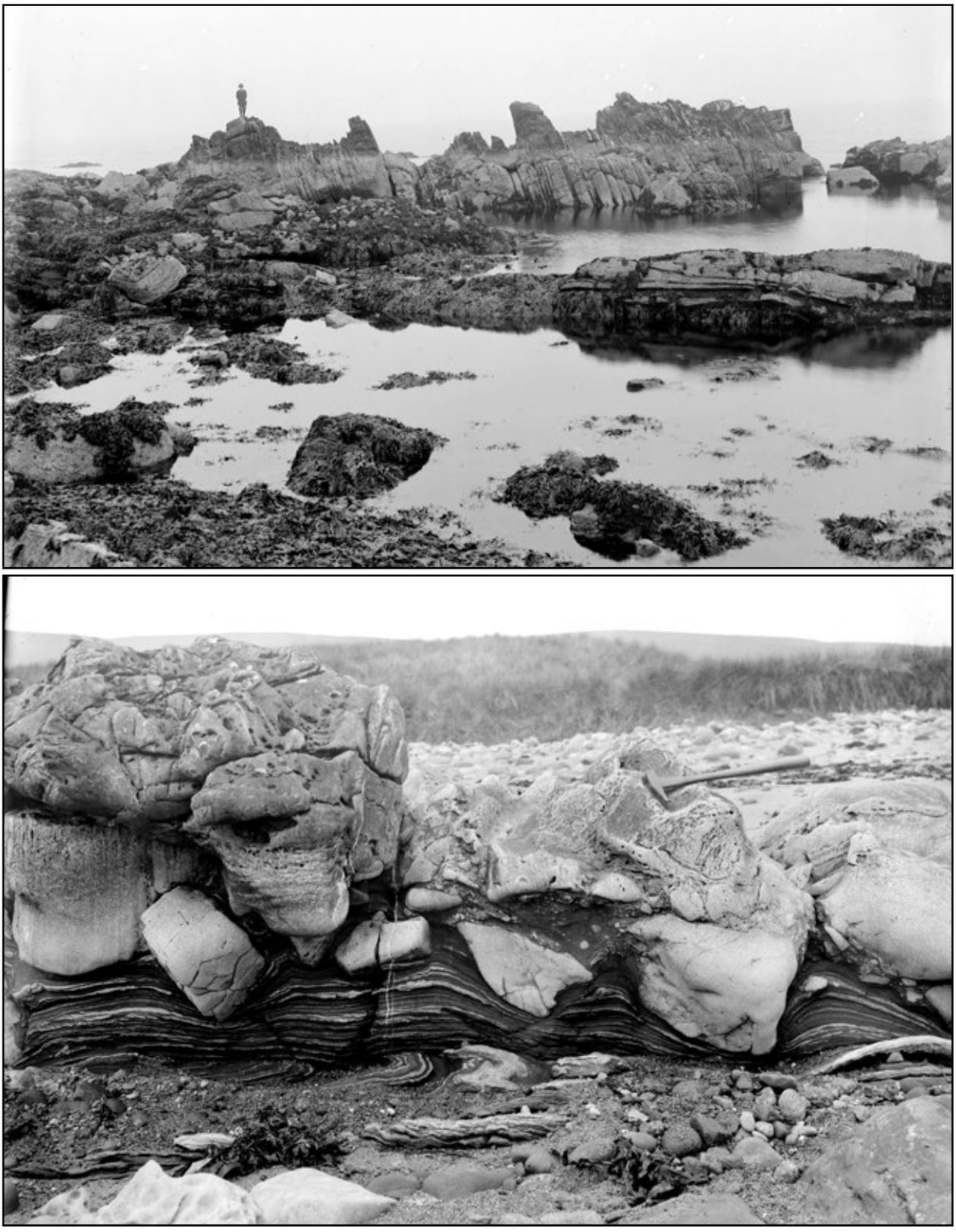


Figure 2. The photographs from Macgregor's (1916) paper which Peach intended to use in the Guide.
Upper image, the famous 34m long 'fallen stack' of Portgower, southwest of Helmsdale, Sutherland. Then, 1920, thought to be a collapsed subaerial erosion feature (like modern sea stacks such as the Old Man of Hoy in Orkney) of Jurassic times; today, 2017, considered to have slid down an underwater fault scarp slope, possibly because of seismic activity along the fault (Trewin 2002). BGS photograph P002203.
Lower image, angular blocks of Middle Old Red Sandstone fallen into and distorting contorted Jurassic mudstone in deeper waters; the shore at Kintradwell, 4km north of Brora, Sutherland. Then, 1920, considered to have accumulated as subaerial scree or talus (see text); today, 2016, considered to be an underwater accumulation at the foot of the Great Glen Fault scarp. BGS photograph P002205. Both images by R. Lunn, 1914, copyright and reproduced by permission of the British Geological Survey. CP17/044.

Crustaceans. – *Estheria murchisoniana* Jones. This small bivalve phyllopod crustacean is very common in some zones of the Flagstones of Caithness and Orkney, and doubtless formed part of the food of the fishes the remains of which are also entombed along with them. Another specimen figured by Miller in plate 5, figure 7 of his *Old Red Sandstone*, from Orkney, is shown in desk-case 121.

As may be seen from Miller's preface to the first edition of his *Old Red Sandstone* (and e.g. Miller 1892a, p. xxi), Miller was of the opinion that these small shells were those of a marine lamellibranch like *Venus*. Sir R. Murchison was of a like opinion and compared them with *Cyclas*. At the present day *Estheria* is confined to fresh water, thus affording a point to the argument that the Old Red Sandstone is an epicontinental deposit.

Fishes. – It is for the working out the wonderful fish fauna contained in the Moray Firth rocks of this age that Miller deserves the deepest gratitude of geologists. The collection is remarkably rich in genera, species, and in individual specimens.[73]

Diplacanthus (*Rhadinacanthus*) *longispinus* Agassiz is represented by several specimens. The type specimen described by Agassiz is placed in desk-case 122. Miller's figure of the type specimen is placed in desk-case 121.

Diplacanthus striatus Agassiz. Eleven specimens, preserved in nodules, from Cromarty, are placed in this case. The type specimen is placed in desk-case 122 and Miller's figure in desk-case 121.

Cheiracanthus murchisoni Agassiz, from Cromarty
C. latus Egerton, from Caithness
Acanthodes sp., from Caithness

Bottom of Case.

Large specimens of *Coccosteus*, *Pterichthys productus* Ag., and *Glyptolepis paucidens* Ag., all from the Middle Old Red Sandstone, are placed here for convenience.

Wall-case 48

This case is taken up almost wholly with a display of the remains of ostracoderm or cuirass-armoured fishes. These old world fishes seem to have taken [more] hold of Miller's wonderful imagination than any other of his Old Red fossils.

In the upper part of the case are shown several species of the genus *Pterichthys*, the external anatomy of which was more completely made out by Miller, than that of any of the other forms; in fact his restorations of this fish are even more correct than the figures given by Agassiz.

Pterichthys milleri Agassiz is represented by several specimens. The type specimen is shown in case 122, and the specimen figured by Miller in case 121. All these are from Cromarty and the south side of the Moray Firth. One specimen of *P. milleri*, from Bighouse in Sutherlandshire, is the first specimen of *Pterichthys* known from Caithness or Sutherland. Since Miller's time, *Pterichthys* has been found to occur plentifully at Achanarras in Caithness.[74] It was long known to be plentiful in the Flags of Skail[l] in Orkney.

Pterichthys oblongus Ag. is represented by several specimens from Cromarty. Specimens are also placed in desk-case 121.

Pterichthys productus Agassiz, several specimens from Cromarty and Morayshire.

Pterichthys sp. Several specimens of *Pterichthys* each showing some point in its anatomy are placed in this case.

Coccosteus decipiens Ag. is represented by 15 specimens from Cromarty. The type specimen also from Cromarty is placed in [the] type collection (case 122). Specimens from Cromarty illustrating Miller's restoration of *C. cuspidatus* Ag., a synonym of *C. decipiens* Ag., are placed beside Plate III of his *Old Red Sandstone*, in desk-case 121.

C. *decipiens* Ag. Five specimens, two from Orkney and three from Thurso, Caithness, are also placed in here.

The bottom of wall-case 48 is used for showing an overflow of large specimens from wall-case 49. These consist, for the most part, of detached plates of the large cuirass-armoured fish *Homostius milleri* Agassiz, a near ally of *Coccosteus* and [which] is one of the fishes out of which Miller constructed his 'Asterolepis'.[75] Most of the specimens were collected by Robert Dick from the shore east of Thurso in Caithness.

Cheirolepis trailli Agassiz. Counterpart specimens of this, the oldest known palaeoniscid fish, complete the case. This fish is named *C. cummingiae* Agassiz by Miller in his writings.

Wall-case 49

FISHES. – The top shelf of this case is made use of to show large specimens of *Coccosteus decipiens* Ag., in reality an overflow from case 48. They are all from Cromarty and Morayshire. Among them is a specimen

[72] Presumably the slab had holes bored for affixing to the wall with nails.

[73] This classification differs substantially from Miller's, as a result of the work of Traquair and others. It remains still somewhat different from that usual today, particularly in the ascription of the acanthodians to the selachians (sharks etc.).

[74] The Achanarras quarry was opened for flagstones at a later date than Miller's collecting activity, and hence it was unknown to him, as were the fine articulated specimens of *Pterichthyodes* from this site (Trewin 2003). Had he had their benefit … !

[75] Reconstructed on paper, not in a physical sense.

showing the 'nail-bone' on the underside of the median dorsal plate from Morayshire.

Coccosteus minor Miller. Several specimens of this small delicate form are shown, each of which illustrates some special anatomical point. Several specimens are also placed in desk-case 120 illustrative of Miller's type figure in his *Foot-prints of the Creator*.

This is the same form as that described by McCoy (1848, p. 298) under the name of *Coccosteus pusillus*; but Miller's name and figure hold the priority.

Homostius milleri Traquair, the largest of the cuirass-covered fishes from the Old Red Sandstone of Britain. Owing to its great size only detached fragments can be displayed on the narrow shelves of the case. The first two shelves are utilized for such fragments as show special anatomical features. More complete specimens of the head shield showing both surfaces are placed in desk-case 120 as they were used by Miller to illustrate his 'Asterolepis' in his *Foot-prints of the Creator*. Owing to exigencies of space a very large cranial buckler[76] is placed on the wall space between cases 45 and 46. All the specimens are from Thurso and most of them were collected by Robert Dick. As has been already stated several large specimens have been placed at the foot of wall-case 48.

Even finer specimens than any in the Hugh Miller Collection and which more completely demonstrate the mutual affinities of *Homostius* and *Coccosteus*, in that they show the relation of the median dorsal and dorsolateral plates to the cranial shield, are displayed in wall-cases in the General Collection of fossil fishes in the adjoining gallery.[77] Some of the finest of these were also collected by Robert Dick and acquired by the late John Miller[78] of Thurso and Burgo House, Bridge of Allan, who bequeathed them to the Royal Scottish Museum.

In the same case but underneath the specimens of *Homostius* are exhibited the remains of some of the oldest known Dipnoi or lungfishes from the Middle Old Red Sandstone.

Dipterus valenciennesi Sedgwick and Murchison, from the Caithness Flagstones. Several specimens are from the Banniskirk quarries where they were first known to occur. This is the same form as *D. macrolepidotus* Dall., figured by Miller in his *Old Red Sandstone*, Plate V, figure 1.
Dipterus sp. A species of *Dipterus* from Orkney is also shown here.

Some of the specimens exhibit the double dorsal fin from which the genus derives its name. The anatomy of the cranium is also well shown as also the arrangement of the palatal crushing teeth which are greatly more complex than those of its nearest living relation *Ceratodus forsteri*, the 'Barramunda'[79] of the Australian water-holes, which, with *Lepidosiren* of the Paraguay swamps, are the only existing lungfishes. Specimens of these recent fishes are shown in the adjacent Recent Fish Gallery[80] and anatomical preparations of *Ceratodus* showing its mouth arrangements are set out in the Type Hall off Gallery E on same floor.[81]

Several crania are placed in desk-case 120 as they were specially worked free from the matrix and figured by Miller in *Foot-prints of the Creator*. A few are also shown in a special collection set out in desk-case 119. In several specimens the position of the pineal or centrally placed eye is indicated which appears to have been protected by a small retractable bony plate.

The under part of the case (49) is utilized to receive an overflow of large specimens from wall-case 50 mostly given over to large fishes of the family Holoptychiidae.

Glyptolepis (*Holoptychius*) *elegans* Agassiz is represented by [five *deleted*] specimens from Cromarty.

Glyptolepis (*Holoptychius*) *leptopterus* Agassiz. Five specimens from Cromarty.

Glyptolepis (*Holoptychius*) *paucidens* Agassiz. A slab with scales showing the wrinkled markings of *Holoptychius*, from Caithness.

Cheirolepis trailli Ag. A specimen from Cromarty.

Wall-case 50

The top of this case is given over to the exhibition of large specimens of *Glyptolepis* (*Holoptychius*) *leptopterus* Ag. The rest of the upper shelves are taken up [with] fragments showing points in the anatomy of the large *Glyptolepis* (*Holoptychius*) *paucidens* Agassiz, the fish from which he

76 Buckler, an old type of shield; often used by such as Miller to talk about the head and thoracic armour of fossil fishes.

77 The 'gallery' was in fact the adjoining east balcony in the same gallery (Taylor and Anderson 2017).

78 John Miller F.G.S. (d. 1878), lawyer and keen geologist.

79 In fact a number of fishes go under that vernacular name. Recently, in Australia, one of us spotted barramundi with chips on a restaurant menu. He was most disappointed to be served some species of teleost rather than lungfish.

80 The Recent fish were on the long west balcony, adjacent; see Taylor and Anderson (2017, Figures 21, 23).

81 This harks back to another meaning of 'type' as an exemplar of a whole grouping of animals. This gallery was ‘to meet the needs of students of the general subject of Zoology […] Representatives of the existing groups of animals are here shown [… and] preparations are exhibited to demonstrate the special characteristics of each' (Anon. 1929, pp. 45-46). So, for instance, the crayfish exemplified the Crustacea, just as in zoology textbooks, school classes and the like. Surviving tablets with such things as the dissected appendages of the crayfish were still on show, though long moved to another gallery, in 2009 (pers. obs.). This was a long-standing concept in the museum (Anon. 1872, 1916, 1924; Traquair 1893a). Indeed, the displays in the original Natural History Museum in the University included a '*Typical* Collection of Animals [...] to illustrate the leading types of animal form' (Anon. 1858, pp. 11-15).

[Miller] supplied the jaws and body of his 'Asterolepis' of which *Homostius* supplied the cranial buckler.

Several jaws are shown with their two sets of teeth, an outside even row of small teeth and an inside row of large dendrodont, so-called reptilian, teeth set at intervals and arising out of pits.

On the lower shelves are shown the remains of other ganoid fishes.

Osteolepis macrolepidotus Agassiz is represented by several specimens from Fochabers, Morayshire and Orkney.

Osteolepis microlepidotus Pander. Several specimens from Orkney and Caithness, and *Osteolepis* sp. from Morayshire are placed here.

Several specimens of *Osteolepis* are laid out in desk-case 121 in illustration of Miller's restoration of *Osteolepis major* Ag. in his *Old Red Sandstone*, Plate IV. The osteology of the crania of *Osteolepis*, *Diplopterus*, and *Thursius* was minutely studied by Miller. The specimens figured by him in his *Foot-prints of the Creator* are placed in desk-case 120.

Genus *Thursius* Traquair [is] in part *Diplopterus*, and part *Osteolepis* of Miller's writings.

Thursius pholidotus Traquair. One of the zonal forms of the Thurso or middle group of the Middle Old Red Sandstone of the Moray Firth Basin is represented by three specimens from Caithness. Other specimens of this form are placed in desk-case 120.

Cheirolepis trailli Agassiz. This form has appeared under many synonyms. It is the oldest known member of the family Palaeoniscidae, which became abundant in genera and species in Carboniferous and Permian times, and whose existing allies are the sturgeons most of which are of fresh, or rather inland, water habit.

As already stated some specimens of *C. trailli*, for convenience, are placed at the bottom of wall-case 48.

In the bottom of the present case (50) are shown large specimens of *Diplopterus* from Cromarty, *Thursius pholidotus* from Caithness, and *Cheirolepis trailli*, in which the tail fin is well shown, from Cromarty.

Wall-case 51

UPPER OLD RED SANDSTONE. – This case contains a small but most interesting collection of fossils from the highest subdivision of the Old Red Sandstone of Scotland and Ireland.

Plants. – *Palaeopteris* (*Cyclopteris*) *hibernica* Forbes. Towards the top of this case are shown two slabs of red sandstone displaying fronds of this ancient fern from Prestonhaugh Quarry, near Dunse,[82] Berwickshire. These are evidently the specimens referred to by Miller in his *Testimony of the Rocks* as having been presented to him by James Stewart,[83] and more fully in his RPSE retiring address (Miller 1892f, p. 366). Beside these specimens are placed three fine slabs with *Palaeopteris hibernica*, from Kiltorcan in Ireland, whence Edward Forbes[84] obtained the material for his description of the species. The specimens here shown were doubtless presented by Edward Forbes after the interview with Miller recorded in the above address [also Miller (1890, pp. 411-413)]. The especial geological interest of the Berwickshire specimens is that they help to correlate the Upper Old Red Sandstone of Scotland with that of Ireland.

Specimens of this fern were said to have been got from a quarry on Rubers Law, situated between Jedburgh and Hawick, in Roxburghshire; but these seem to have been lost sight of. The Berwickshire specimens may now be considered as unique and of great importance.

A specimen of *Palaeopteris hibernica* from Kiltorcan is placed in desk-case [*blank*] as it is figured by Miller in his [*again blank*].

Fishes. – *Bothryolepis*[85] *obesa* Traquair. Six specimens from Prestonhaugh and Chirnside, both in Berwickshire, with fragments of this cuirass-armoured member of the family Asterolepidae are displayed in this case. The type specimens of the species are placed in desk-case 122. Some of these are evidently referred to by Miller in the above mentioned address [p. 366] under the name of *Pterichthys major*. The name of *Pterichthys major* adopted by Miller was the generally accepted one by most geologists till Traquair showed that it was applied to several species of the genus *Bothryolepis*.

Bothryolepis leptocheirus Traquair. This species is represented by detached plates on three slabs from the Heads of Ayr while the type specimens from the same locality are placed in desk-case 122.

Holoptychius nobilissimus Agassiz. A dendrodont tooth belonging to this species from Prestonhaugh, Berwickshire, is placed in this case but the scales referred to by Miller in his address cannot be identified. Scales from Clashbennie, Perthshire, are shown both in the present case and in desk-case 121 as they help to illustrate Plate X of the later editions of Miller's *Old Red Sandstone*.

Holoptychius flemingi Agassiz, a single scale from Dura Den, Fife, is the representative of the rich fish fauna that

[82] Now Duns.

[83] Miller (1890, pp. 410-412). He gives the name *John*: presumably John Stewart (1813-1867), Stranraer-born Lancashire merchant.

[84] Edward Forbes (1815-1854), Manx naturalist and palaeontologist, and briefly, before his early death, Professor of Natural History at the University of Edinburgh and ex officio Keeper of the Natural History Museum.

[85] A synonym for *Bothriolepis.*

has been unearthed from the Upper Old Red Sandstone of this famous locality.

Sauropteris favosus Agassiz. A jaw of this Rhizodont fish from Clashbennie, Perthshire, is shown in this case.

The bottom portion of case 51 is utilized as an overflow of Lower Carboniferous plants chiefly from the Burdiehouse Limestone, Midlothian,[86] including *Telangium* (*Sphenopteris*) *affine* Lind. and Hutt., stems of *Lepidophloios, Lepidodendron, Lepidostrobus* (fruit cones of *Lepidodendron*) and one specimen of a worm case, *Serpulites carbonarius* McCoy.

Wall-case 52

In arranging the Hugh Miller Collection it was found most convenient to group the fossils into Lower and Upper Carboniferous. This is in great part owing to the fact that in many cases the locality from which specimens came is not sufficiently exact to suit modern requirements as to the fixing of the particular narrower geological horizon or zone in which it occurred. Where the locality is more definitely stated, further subdivision according to the classification adopted by the Geological Survey is attempted and shown on the labels.[87]

LOWER CARBONIFEROUS. – This case is given over to specimens from the Lower Carboniferous rocks.

Plants. –[88] *Lepidodendron veltheimianum* Sternberg. A specimen of this plant is placed here
Sigillaria tesselata Brongniart. This is represented from the Water of Leith [and] referred to by Miller as *Ulodendron minus* in his *Testimony of the Rocks* (Miller 1890, pp. 419-420)
Asterocalamites tenerrima Ettingshausen
Sphenopterus dicksonides Göppert
Lepidophloios gracilis Carruthers. A row of specimens of stems [of] this form is shown

Corals. – Several specimens of *Dibunophyllum* from Chrichton[89] in Midlothian and a specimen of *Lithostrotion basaltiforme*, from the Silvermine, Linlithgow-shire,[90] are placed here to indicate that the Scottish 'Carboniferous Limestone' series of Scotland belongs to the '*Dibunophyllum* zone', part of the upper division of the Carboniferous Limestone of England and Belgium.[91]

Echinoderms. – This group is represented by a tablet with three specimens of *Codaster acutus* McCoy and a tablet with two species of *Aclinocrinus* from the Carboniferous Limestone of Derbyshire.

Brachiopods. – The brachiopods, chiefly from the Carboniferous Limestone of Crichton and Dryden in Midlothian, and Charlesto[w]n in Fife, are represented by the following genera and species, viz., *Orbiculoidea* (*Discina*) *nitida* Martin, *Strophomena* (*Leptaena*) *rhomboidalis* Wilckens, *Orthis* (*Schizophoria*) *resupinata* Martin, *Rhynchonella* (*Pugnax*) *pugnus* Martin, *Spirifera lineata* Mart., *Spirifera glabra* Mart., *Productus giganteus* Mart., *P. semireticulatus* Martin, *P. scabriculus* Mart., *P. punctatus* Mart., *P. longispinus* Sowerby, *P. cora*, and *Chonetes hardrensis* Phillips.

Lamellibranchs. – The bivalve molluscs are represented by *Nucula gibbosa* Fleming, and *Sanguinolites* sp., both from the Carboniferous Limestone Series of Midlothian.

Pteropoda? – Only one specimen of *Conularia quadrisulcata* Sowerby, from the Carboniferous Limestone of Ireland, is shown.

Gastropods. – These are poorly represented by *Bellerophon* sp., and *Pleurotomaria atomaria* Phillips, from the Carboniferous Limestone of Ireland.

Cephalopods. – This important group is represented by *Trigonoceras cariniferus*, a nautilus from Ireland, and two goniatites, viz., *Goniatites* (*Peronites*) *cyclolobus* Phill., and *Goniatites* sp., from the Carboniferous Limestone of Gilmerton in Midlothian.

The nautilus has been sliced and polished to show its septa and siphuncle. One half of the specimen is placed in desk-case 119 to illustrate the structure of Nautiloids.

The underpart of wall-case 52 is occupied by specimens of *Telangium affine* Lindley and Hutton, the old *Sphenopteris affinis* of Miller's writings, a *Lepidodendron* stem preserved in sandstone, and six large fragments of the great predatory fish *Rhizodus hibberti* from the Lower Carboniferous rocks of Burdiehouse and Gilmerton in Midlothian.

Wall-case 53
The chief part of this case is taken up with the marble statue of Hugh Miller mentioned in the introductory part of this catalogue.

In the available space beneath the statue are placed restorations of three of the characteristic fishes of the Old Red Sandstone. Above is shown a life-sized restoration of

[86] The type locality of the Burdiehouse Limestone is at Burdiehouse, near Straiton on the southern city boundary of Edinburgh. Limekilns are still evident but the excavations are long abandoned and infilled.
[87] This importantly shows the use of inference to document specimens, presumably without explicit indication that this had been done. This would not be considered good practice today, of course.
[88] On Miller's Carboniferous plants generally, see Anderson (2005).
[89] Presumably Crichton, a small village with local quarries in Lower Carboniferous limestone.
[90] Presumably Hilderston, West Lothian, near the former Petershill Reservoir.
[91] This presumably reflects the use of different Carboniferous stratigraphies by the Scottish and the English-and-Welsh parts of the Survey, a problem for instance encountered by Hugh Miller the younger in his work in the north of England (Horne 1897).

Holoptychius nobilissimus after Traquair, a characteristic predatory ganoid fish of the Upper Old Red Sandstone. Beneath are placed an enlarged restoration of *Pterichthys milleri*, after Traquair, the cuirass-covered fish that Miller is represented in his statue as discovering, and an enlarged restoration of *Coccosteus decipiens*, after Smith Woodward, another of the Middle Old Red Sandstone 'box-fishes'. The life-like character given to these restorations is due to the artistic colouring of the late Henry Brown, artist to this Museum.

Wall-case 54

LOWER CARBONIFEROUS. – The top shelf of this case is used as an overflow from case 52 to show special structures of some Lower Carboniferous brachiopods, viz., *Productus giganteus*, showing natural casts of muscular impressions on the interior of the ventral valve and also those of *Orthotetes crenistria*, on the interior of the same valve.

Fishes. – On the second shelf is placed a specimen from Carluke in Lanarkshire, showing the shagreen and double pronged teeth of a selachian known as '*Diplodus*', but supposed to be the dermal armature and teeth of the same fish as *Pleuracanthus laevissimus* Agassiz, the dorsal spine of which, from Burdiehouse in Midlothian, is shown next to it.

A very fine spine of *P. laevissimus*, from the Coal Measures of Dalkeith in Midlothian, is placed in desk-case 119 as it is figured and referred to in Miller's *Testimony of the Rocks*.

These [*presumably referring to the* 'Diplodus' *and* Pleuracanthus *specimens*] are followed [by] several unsymmetrical, evidently pectori-lateral, spines of *Gyracanthus* from Etal in Northumberland and from Burdiehouse in Midlothian some of which show rubbed and injured distal ends. These are followed by *Sphenacanthus* sp., a spine, from Burdiehouse, Midlothian, and *Cynapodius crenulatus* Traquair, from Gilmerton, Midlothian.

Uronemus splendens Traquair. A specimen of this dipnous fish showing its dentition, from Gilmerton, and another species *Uronemus lobatus* Traq., from Burdiehouse, both in Midlothian, are shown here. These are followed by the rhizodont fishes *Rhizodopsis sauroides* Will., counterparts of a specimen from Burdiehouse, Midlothian, and *Rhizodus hibberti* Agassiz, teeth and scales of.

Next these are placed specimens of the Osteolepid fish *Megalichthys laticeps* Traquair. Several specimens of this fish from Burdiehouse, Midlothian, showing the body, cranium, jaws with teeth, scales and fins are displayed in this case.

The under part of the case is taken up with the display of large specimens showing the jaws and teeth of *Rhizodus hibberti* from Gilmerton in Midlothian. Even finer specimens of this terrible fish are set out in the wall-cases of the adjoining gallery devoted to fossil fishes, the sight of which requires but little imagination to cause a shudder.

Wall-case 55

In this case the collection shows that a great increase in the members of the family Palaeoniscidae over those from the Old Red Sandstone has taken place. The family is here represented by several new genera and species as follows:-

Rhadinichthys ferox Traquair, Wardie, Midlothian
R. ornatissimus Traquair, Burdiehouse, Midlothian
Nematoptychius greenocki Agassiz, Wardie, Midlothian
Elonichthys robisoni Hibbert, Wardie and Burdiehouse, Midlothian
E. pectinatus Traquair, Wardie, Midlothian
E. bucklandi, Burdiehouse, Midlothian
E. (*Cosmoptychius*) *striatus*, Wardie, Midlothian

Many of the above specimens are shown by whole fishes.

The family Platysomidae is represented by *Eurynotus crenatus* Agassiz, from Burdiehouse, Midlothian. A specimen of this fish figured by Agassiz (1844-1845) in his *Poissons Fossiles du Vieux Grès Rouge*, Vol. II, p. 154, is placed in desk-case 122.

The under part of the case is, as usual, given over to large specimens, five of which show the jaws and clavicles of *Rhizodus hibberti*.

One specimen of what appears to be part of the cranium of an amphibian Labyrinthodont, probably *Loxomma*, from Midlothian, is of special interest as being one of the earliest finds of amphibian remains in the Lower Carboniferous rocks of Scotland.

Wall-case 56

UPPER CARBONIFEROUS. – The division line between the Lower and Upper Carboniferous rocks in Scotland is now drawn a little below the middle of the Scottish Millstone Grit or 'Roslyn Sandstone'[92] which marks a decided break both in their contained plant and animal remains.

PLANTS. – The present collection of plants bears out this point for it will be observed that not a single species of plant exhibited here has come up from the lower division. As usual large specimens which do not fit well into the space allowed on the narrow shelves are shown on the top shelf and may therefore be out of their botanical order. On it are placed several specimens of
Annularia radiata Brongniart[93]
Lepidodendron sternbergi Brong. (two specimens)
Calamites cistii Brong.
C. suckowii Brong.
all from the Coal Measures of Musselburgh in Midlothian.

[92] More usually 'Roslin Sandstone'.

On the next shelf are placed the following characteristic Upper Carboniferous ferns from the Coal Measures of Musselburgh, Midlothian, viz.

Sphenopteris obtusifolia Brong. (four specimens)
S. dissecta Brong. (three specimens)
Pecopteris arborescens Brong.
Neuropteris gigantea Sternberg
Alethopteris lonchitica Brong.
Mariopteris latifolia Brong.

These are followed by other Coal Measure plants from Midlothian:–

Pinnularia capillacea Lind.
Calamocladium (*Asterophyllites*) *equisetiformis* Schlotheim
Lepidodendron (*Sagenaria*) *aculeatum* Sternberg
Sigillaria elliptica

A fine collection of Coal Measure plants from Midlothian is placed in cabinets under the desk-cases.[94]

LAMELLIBRANCHS. – The bivalve molluscs are but poorly represented by a slab with *Naiadites* sp., another with *Carbonicola aquilina* and one of another species of the same genus, all typical Coal Measure forms.

FISHES. – The Selachians are represented by three lateral spines of *Gyracanthus formosus* one of which shows that it had been broken before being fossilized; three dorsal spines of *Sphenacanthus* and one of *Pleuracanthus laevissimus*; and also by the shagreen of some unknown shark or ray, all from the Coal Measures of Midlothian.

The lungfishes are represented by only one specimen of *Sagenodus* sp. from Dalkeith, Midlothian.

The ganoid family of the Rhizodontidae are represented by *Rhizodopsis sauroides* Will. (on three tablets), [and] *Strepsodus sauroides* Binney (two of the characteristic teeth). All the above are from the Coal Measures, Dalkeith, Midlothian.

The family Osteolepidae is represented by scales, jaws and the 'ring' vertebrae of *Megalichthys hibberti* Agassiz, the ridge scales of *Elonichthys* and one specimen of *Rhadinichthys*, all from the Coal Measures, Dalkeith, Midlothian.

The coelacanths are represented by eleven fragments mounted on card by Miller himself. A tablet with coprolites (fish dung) from the Coal Measures of Midlothian is shown here. Other specimens of coprolites from the same locality are placed in desk-case 11[8] forming part of a collection illustrating their structure.

In the under part of the case are placed large specimens of *Sphenopteris obtusifolia*, and *Sphenopteris latifolia.* A cast of the cranium of *Megalichthys*, and five specimens of fragments of *Megalichthys hibberti*, [are] all from the Coal Measures of Midlothian.

[*a deletion in the manuscript comments that Miller evidently was attracted to the local Carboniferous fish localities when he moved to Edinburgh, though '*we gather little about it from his writings*'*]

Wall-case 57

JURASSIC. – The Jurassic rocks of Scotland must have had a much wider extension than they possess at present. Owing to their weak power of resistance to denuding agencies only scattered remains are now left where they are protected either by sheets of Tertiary igneous rocks as they are in the Inner Hebrides, or where they have been let down amongst the more durable rocks of the old floor upon which they rest and carried below the level of active denudation, as they have been, along the east coast of Ross and Cromarty by the Great Glen Fault,[95] and, on the coastal plain of east Sutherland, by the powerful fault which bounds them on the west. It is the extension of this line of fault northwards that has determined the cliff faced coast of Caithness to at least as far north as Noss Head near Wick. The presence of Jurassic rocks above sea level in both the above mentioned localities is in all probability due to the fact that these regions have been raised by successive uplifts by at least one hundred feet in comparatively recent times so that the sea has not yet had time to cut its platform back to the lines of fault. The sea has almost done this in the neighbourhood of the Sutors of Cromarty and northwards from near Helmsdale has completed the task and wastes the older rocks on the further side of the fault.

It is fortunate for Scottish geology that Hugh Miller was born and bred at Cromarty. The opening chapter of his *Old Red Sandstone* shows that the observation of ripple-marks and sun-cracks in the Old Red rocks that he was quarrying on the first day he went to work for his living, and the find-

93 It's not clear from the manuscript whether 'several specimens' refers to *Annularia* alone.

94 Possibly in glass-topped drawers for public access.

95 William Quarrier Kennedy's classic paper on the Great Glen Fault (1946), which analysed the fault as a wrench fault with a lateral displacement of several dozen miles, credited Roderick Murchison and particularly Archibald Geikie with identifying the Great Glen as an eroded shatter-belt along the line of a fault. The Glen had of course long attracted attention before then, and interestingly Kennedy selected Miller's *Old Red Sandstone* of 1841 for the first cited account of the Glen as the line along which, seemingly, the 'volcanic agencies chiefly operated in upheaving the entire island from the abyss' and surviving as 'a sort of foot-track, hollowed by the frequent tread of earthquakes, to mark the course in which they journeyed' (Miller 1841, p. 104). Miller's reference is not surprising as the Fault continues north past Cromarty, near which the disrupted strata are well shown at Eathie. In fact, Miller commented on damage by an earthquake of 1816 at Inverness, on the line of the Fault, and especially the torsional displacement of the stone blocks forming the tolbooth spire, as well as a crack in a new building at Cromarty ([Miller] 1840; Miller 1893, pp. 429-430).

ing of an ammonite, fish scales and fossil wood in loose blocks from the superficial deposits overlying the rock,[96] were the chief factors that led to the development of his powerful but highly imaginative mind along lines that moulded his whole subsequent life. He soon discovered that not only scales but remains of whole fishes were to be found in plenty by splitting open the nodules of a belt of the Old Red Sandstone exposed in the cliff on the opposite side of the entrance to the firth from Cromarty,[97] while, on the Moray Firth side of the ridge of the Sutors, Jurassic rocks, teeming with ammonites, belemnites, bivalves, and fossil wood were exposed between tide marks at Eathie and Shandwick on each side of the Sutors. In his address to the RPSE (Miller 1892f, p. 370), he says 'The Lias of Eathie, near Cromarty, is one of the richest deposits in animal remains which I have anywhere seen'.

It is doubtless owing to the localities being within easy walking[98] distance of his native place that his collection contains so many ammonites and belemnites from the sections exposed on the shores of Eathie and Shandwick. So much is this the case, that, only part of them can be exhibited, the great part of them having to be stored in cabinets underneath the desk-cases.[99]

He afterwards visited the Sutherlandshire sections and collected the fine suite of Jurassic plants especially from the Kimmeridgian rocks of Helmsdale that, since his time, has afforded such excellent material for study by specialists in structural botany.[100]

As we learn from his *Cruise of the Betsey* he also visited the Western Islands with the result that his collection contains interesting material from the Lias of Pabbay[101] and from the 'Oolite' of Eigg.[102]

Plants. – On the top shelf are exhibited the following plants from the Kimmeridgian rocks of Helmsdale, Sutherlandshire.

Nilssonia sp. (labelled by Miller as '*Taeniopteris*')
Phenicopsis sp. (counterparts)
Taeniopterus sp. (three specimens and one of fossil wood)
Sagenopteris sp.
Laccopteris aff. *dunkeri* Schenk
Marattiopsis boweri Seward
Strobilites milleri Sew.
Cladophlebis denticulata Brongniart (six specimens)
Coniopteris hymenophylloides Brong.
Thinnfieldia sp.
Williamsonia scotica Seward. Cast of a famous cone; the actual specimen with slices and microscopic slides, as used by Professor Seward, are shown in desk-case 118[103]
Gleichenites sp.
Nilssonia sp. cf. *brevis* Brongniart (labelled by Miller as '*Equisites columaria*' [*recte Equisetites*])
Brachyphyllum sp.

Many of the Jurassic plants figured by Miller in his *Testimony of the Rocks*, some of which have since been figured by Seward, are placed in desk-case 119. Those figured by Seward only are shown in desk-case 118.

Corals. – Several specimens of corals from the ?Corallian, Upper Jurassic, rocks of Helmsdale are placed here.
Isastraea oblonga Fleming
Isastraea murchisoni

The specimen of *Thamnastrea* encrusting a pebble of Caithness flagstone from the Upper Jurassic breccia at Helmsdale mentioned by Miller in his address to the Royal Physical Society of Edinburgh (Miller 1892f, p. 373) has been searched for in the collection but has not been found.

Echinoderms and worms. – A few specimens from the Upper Jurassic rocks of Helmsdale in Sutherland are shown here.
Cidaris sp. (spines of *Cidaris* and other echinoid spines)
Serpulites sp.

Crustaceans. –
Eryon propinquus Schlot. (Jurassic, Solnhofen)
Estheria sp., Oxfordian, Eathie, Cromarty

Lamellibranchs. – Next to the above are shown the bivalve shells.
Gervillia sp., Great Estuarine Series, Eigg
Inoceramus sp., Oxfordian, Eathie, Cromarty
Pinna sp., Lower Lias, Pabbay, Skye
Pteria (*Oxytoma*) *inequivalvis*, Oxfordian, Eathie,

[96] Seen by Miller on different days in different quarries, one on the west coast of the Black Isle and the other on the east coast at Navity north of Eathie.

[97] Again, Peach is muddled. Miller's discovery of Old Red fishes was on the *south* side of the entrance to the Firth (and not in cliffs as noted earlier), though he did later find them near Eathie, and near the North Sutor on the opposite side. And even Miller's discovery of ORS fishes at Cromarty was a decade and more after his finding of ammonites and other fossils from Eathie (Taylor 2007).

[98] A boat trip, as on the Cromarty-Nigg ferry, would be needed to get to the North Sutor or Shandwick.

[99] This wording implies – but does not confirm – that those specimens were in locked drawers, i.e. not 'exhibited' in any sense.

[100] On Miller's Jurassic plants generally, see Anderson (2005). As well as Seward, Peach might have had in mind Seward's collaborator Nellie Bancroft (b. 1887), another Cambridge palaeobotanist (Seward and Bancroft 1913; Anderson 2005; Fraser and Cleal 2007, p. 74), and J. Theodore Richards, in 1882-1883 a graduate student and holder of the Falconer Memorial Fellowship in Palaeontology and Geology at the University of Edinburgh (*University of Edinburgh Calendar* 1882-83; Richards 1885).

[101] Off Broadford on Skye; now spelled Pabay. Not the Pabbay off Barra.

[102] On his Eigg fieldwork, see Hudson (2003).

[103] Some at least of the slides are still extant in the collection today.

Cromarty
Pteria costata Sowerby, Oxfordian, Eathie, Cromarty
Ostrea sp., Oxfordian, Eathie, Cromarty
Ostrea (*Ctenosteron*) *pectiniformis*, Corallian, Brora, Sutherland
Ostrea (*Alectrionia*) *gregaria* Sow., Great Estuarine Series, Eigg
Ostrea sp., Great Estuarine Series, Eigg
Pteria (*Oxytoma*) aff. *costata* Sow., Lower Oolite, Eigg
Gryphaea dilatata Sow., Oxfordian, Shandwick, Cromarty
Gryphaea cymbium Lam., Lower Lias, Pabbay, Skye
Gryphaea arcuata Lam., three tablets with seven specimens (the old *G. incurva*), Lower Lias, Pabbay, Skye
Gryphaea sp., one tablet with an Upper Jurassic form simulating *G. arcuata*, affording an example of 'Converging Differentiation'[104]
Pecten (*Chlamys*) aff. *subtextorius* Goldf., Corallian, Brora
Pecten (*Hinnites*) aff. *abjectus* Phill., Lower Oolite, Eigg
Pecten articulatus Schlot., Corallian, Brora, Sutherland
Pecten sp. (two specimens), Corallian, Brora, Sutherland
Pecten (*Camptonectes*) aff. *lens* Sow., Oxfordian, Eathie, Cromarty
Pecten sp., Lower Lias, Pabbay, Skye
Pecten inaequivalvis Sow., Lower Lias, Raasay
Cyrena sp. (one specimen with numerous individuals), Oxfordian, Shandwick, Cromarty
Lucina literata Phill., Corallian, Brora, Sutherland
Pholadomya sp. (two specimens), Oxfordian, Shandwick, Cromarty
Pholadomya aff. *deltoidea* Agassiz, Oxfordian, Shandwick, Cromarty
Pholadomya sp., Lower Lias, Pabbay, Skye
Pleuromya aff. *peregrina* d'Orb.

Gastropods. –
euomphalid shell, L. Oolite, Eigg
Pseudomelania sp., L. Oolite, Eigg
Natica sp., two specimens, L. Oolite, Eigg
Vivipara (*Talostoma*) sp. (two specimens with several individuals), Oxfordian, Eathie, Cromarty, and one tablet with 4 individuals, Oolite, Skye

The bottom of the case is as usual given over to large specimens which are not placed in zoological order, viz.:
one slab from the Oxfordian of Eathie with *Inoceramus* sp. and *Ammonites rotundus*
another slab with *Lima pectinoides* Sow.[,] *Plicatula* aff. *pectinoides* Lam., *Ammonites rotundus*, also from the Oxfordian of Eathie
Lima pecteniformis Schloth., from the Oxfordian, Eathie
Pinna sp. from the Lower Lias of Pabbay, Skye
Ostrea sp., a cast of the interior showing muscular impressions of both valves from the Upper Jurassic of Brora in Sutherlandshire
Lucina literata Sow., Corallian, Brora
Pecten sp. (three specimens), Oxfordian, Brora
a slab with *Lima pectiniformis* Schlotheim, and *Ammonites* (*Perisphinctes*) sp., Oxfordian, Eathie
Lima pectiniformis Schloth.[105] and a slab with *Pecten* (*Chlamys*) aff. *subtextorius* Goldf., from the Upper Jurassic rocks of Brora, Sutherlandshire.

It will be observed that some of the slabs have been got by splitting rolled masses from the beach.

Wall-case 58

CEPHALOPODS. – This case is mostly taken up with the exhibition of Jurassic Cephalopods.

The upper half is occupied by the Tetrabranchiate forms, viz., the Nautili, which, although the more ancient, are still extant, and Ammonites, which have been for long extinct. In the lower half are shown the Dibranchiate forms, chiefly Belemnites the ancestors of our Cuttlefishes. A few reptilian bones are shown on the lowest shelf.

Nautiloids. – This group is represented by two specimens of *Nautilus* sp., one from the Oolite of Eigg which shows its characteristic septa and siphuncle, and a smaller form from Eathie, Cromarty.

Ammonites. – Most of the ammonites are from Eathie, as might have been expected from its nearness to Cromarty and Miller's constant reference to the locality in his works. As already mentioned, the Jurassic rocks are only to be found on the shore at Eathie owing to their being weak structures which have readily succumbed to wave action and have been worn down to sea level back to the more resisting older rocks which have retarded though not arrested the backward planing of the sea, as evidenced by the fine photographs shown at the tops of the desk-cases [*recte* wall-cases], more especially in those of McFarquhar's Bed[106] and the Sutors. Several specimens are from Shandwick, where the Jurassic rocks occupy the foreshore on the downthrow side of the fault, and the Old Red Sandstone forms the line of cliffs. Many of the specimens show that they had been rolled on the beach and some of them must have been exposed for some considerable time before they had been split open by Miller, as the limestone has been bored by lithodomous creatures such as *Saxicava* and some boring isopod crustacean or worm. Some specimens illustrating these points are utilized in a special collection in desk-case 117.

As may be seen from the collection the geological horizon of the Eathie beds is well indicated by the presence of ammonites of the subgenera *Cardioceras* and *Perisphinctes*, and also of a specimen of Ammonites (*Cosmoceras*) *jason* Rein., showing that the main body of the rocks exposed are on the Oxfordian horizon. Several specimens of *Ammonites* (*Kepplerites*) *calloviensis*, however, seem to indicate that Kimmeridgian rocks occur along this shore as they are known to do near Helmsdale in Sutherlandshire. Miller considered that the Eathie beds

[104] Probably Peach meant 'convergent differentiation', then apparently a synonym for convergent evolution.
[105] Locality unclear; presumably Brora.
[106] Sea-stacks and arch near Cromarty, between the South Sutor and Eathie.

were 'Lias'; but some of those exposed at Shandwick he thought to be on a higher horizon which he correlated with the 'Oolite' of Brora.[107]

Ammonites (*Aspidoceras*) *perarmatus* Sow., from the Upper Oolitic rocks of Brora
Ammonites (*Schlotheimia*) sp., Lower Lias, Pabbay, Skye
Ammonites (*Cardioceras*) *cordatus* Sow., Oxfordian, Shandwick, Cromarty
Ammonites (*Perisphinctes*) sp., Oxfordian, Shandwick, Cromarty

These two latter forms indicate that part of the Shandwick rocks belong to the same horizon as those of Eathie.

Belemnites. – The Dibranchiata or two gilled forms are almost exclusively represented in the fossil state by their guards or belemnites popularly known as 'thunderbolts' and to which miraculous curing effects have been attributed as noted by Miller in his *Old Red Sandstone* (1892a, p. 41). His collection, almost entirely from Eathie, is a magnificent one and makes it easy for us to enter into his feelings on first visiting the Eathie shore as related on the same page.

Belemnites aff. *acutus* Mill., Oxfordian, Eathie, Cromarty. Several very stout forms having strong affinities with *B. acutus* are shown in this case. Others showing the structure of the guard and phragmacone are placed in a special collection to illustrate structures in desk-case 117.

Belemnites hastatus Blainville, Oxfordian, Eathie, Cromarty. Several small hastate[108] forms are placed here under this name and, like the cordate ammonites, indicate an Oxfordian horizon.

Belemnites (*Megateuthis*) sp., Oxfordian, Eathie, Cromarty. Some very fine specimens of this form are shown in boxes.[109] One box holds a card with five specimens mounted by Miller himself.

As stated above the collection of belemnites is a magnificent one. Only a portion of it is on view, the rest being stored in Cabinet.[110]

One interesting specimen showing the pro-ostracum and the position of the ink-bag of one of these ancient 'squids' is placed in desk-case 117.

The whole collection awaits some future specialist who will find in it a mine of wealth to draw on for the study of the variation of forms within a narrow zone. A like thing may be said of the extensive collection of ammonites from the Eathie shore.

Fishes. – Only a meagre collection of fish remains appears to have been made by Miller from the Jurassic rocks.

Hybodus sp., Bathonian (Oolite), Eigg. Teeth and spines of this ancient shark, which appears to have made the belemnite cuttlefish its prey, as shown by Campbell Brown[111] from remains from Solnhofen, are placed here. The teeth found in a bone bed on the shores of Eigg are likened by Miller in his *Cruise of the Betsey* to 'scupper nails'.

Dapedius pholidotus Agassiz (scales of this ganoid fish), Oxfordian, Eathie.

Reptilia. – Reptiles are represented by a few specimens of the vertebrae of *Ichthyosaurus* sp. from the Oxfordian of Eathie near Cromarty. Some of these vertebrae are placed in structure-case 117 to illustrate their amphicoelous[112] character. They are probably those referred to by Miller in his address to the Royal Physical Society of Edinburgh (Miller 1892f, p. 371), as having been dug up in a hopeless sinking for coal in the Eathie beds.[113]

A few crocodilian bones[114] are also shown from the Island of Eigg the finding of which is mentioned by Miller in his *Cruise of the Betsey*, p. [*blank, but in fact* 1858a, pp. 75-80]. Some of these bones are also shown in case 117.

Wall-case 59

CRETACEOUS. – The upper part of the case is taken up with Cretaceous forms mostly from England. The top shelf is occupied by large specimens that cannot be shown on the smaller shelves and are not arranged in zoological order. All these are from the Chalk of England except one specimen of a sea-mat from the Cretaceous of Germany. They are as follows.

Inoceramus sp., a characteristic bivalve, from the Chalk of England
Echinocorys (*Ananchites*) *ovatus* Serke. Four of these characteristic Cretaceous sea urchins are mounted on one tablet
Ammonites (*Acanthoceras*) *rotomagensis* Brongniart, a characteristic zonal form of one of the subdivisions of the Cretaceous Formation

107 The Eathie beds are now considered to be Kimmeridgian.
108 Hastate: like a spear point with flaring lobes at the base.
109 See footnote 122 for an explanation of the boxes.
110 This confirms storage of at least some Miller material in cabinets, though not where those particular cabinets were (see introduction). It also seemingly indicates that those particular cabinets at least were kept locked.
111 Brown (1900) described a species of *Hybodus* from the Upper Jurassic Solnhofen Limestone of Bavaria; however, the specimen of *Hybodus* with belemnites in its stomach, which Brown also described in the same paper, is not from Solnhofen but the Lower Jurassic of Holzmaden in Baden-Württemberg.
112 Hollow on both of the two faces abutting the adjacent vertebrae.
113 See footnote 177.
114 In fact, mostly or all plesiosaurian.

The next two shelves hold a very special collection of Cretaceous fossils from Aberdeenshire, one lot from Moreseat, near Cruden, indicating a Greensand (Lower Cretaceous) horizon, and the rest contained in rolled flints, not in situ, are from near Peterhead and doubtless have been derived from the Upper Chalk.

Those from Moreseat are as follows, viz:–

Thecosmilia sp., a coral and *Echinospatagus* (*Toxaster*) *complanatus* Agassiz (a sea urchin). Both are mounted on one tablet.
Pecten sp.
Venericaudia sp.
Tellina sp.

When sinking a pit to accommodate a millwheel at Moreseat, fossiliferous rocks were encountered which were studied by William Ferguson of Kinmundy who described the deposits and their fossils which were shown to belong to the Greensand division of the Cretaceous Formation. This is referred to by Miller in his address on 'The Fossiliferous Deposits of Scotland' (Miller 1892f, p. 375) where he says it 'seems to be almost exclusively a re-formation of the Greensand'. This doubt, as to whether the fossiliferous rock is in situ or not, still exists.[115] If it be in place, it is the only known occurrence of Cretaceous rocks on the east side of Scotland. On the other hand it may be a large iceborne boulder. Large masses of Jurassic rocks are known to occur as boulders at several places on the south side of the Moray Firth. One of these at Linksfield in Morayshire, so large that it had been quarried for time out of mind, proved to be a transported mass with boulder clay beneath it resting on a striated surface of Upper Old Red cornstone, as shown by Miller (1892f, pp. 373-374).[116]

Other large masses of transported Jurassic rocks occur stranded on the coastal plain south of the Moray Firth. One well known example occurs at Plaidie.[117]

These masses appear to have been caught up by the ice-sheet which filling the Moray Firth fanned outwards on to the land carrying plentiful recognizable rocks from central Ross-shire with it.

During the examination of Caithness by the Geological Survey, a large mass of friable sandstone with fossils of Neocomian age was met with at Levad,[118] over ten miles inward from Lybster, on the east coast. So large is the mass that it had been long quarried for the sharp sand it afforded which was exclusively used in the sawing of the flagstones at the large pavement works at Thurso. A suspicion that the mass was not in situ led to the formation of a Committee of Members of the British Association and funds were granted to have borings made through the mass.[119] This was done with the result that it was found to rest on the shell bearing Boulder Clay which clothes the greater part of the plain of Caithness and which at Levad lies upon the flagstone type of rock which builds up [the] great part of the Middle Old Red Sandstone of Caithness. Thus it was satisfactorily proved that the mass was not in situ but was only a boulder in the Shelly Boulder Clay left by the ice-sheet which on that side of the Moray Firth had moved north-westward across the Plain of Caithness. That its origin was in what is now the bed of the Moray Firth gains support from the fact that fishermen dredge and bring up with their lines large masses of white chalk from the north side of the narrow deep the bottom of which is much below the general level of the Moray Firth or the North Sea outside. This valley like trench extends in an east and west direction at a distance of about twenty miles to the north of Fraserburgh.[120] The north side is particularly steep and suggests that an escarpment of Chalk actually exists there at present.

In desk-case 116 are exhibited a set of striated boulders of Chalk from the Shelly Boulder Clay of Freswick[121] in the north of Caithness, that afford another item of evidence in favour of Chalk being in situ on the bed of the Moray Firth in Glacial time.

To return to case 59, the greater part of the Scottish Cretaceous specimens are from loose chalk flints from near Peterhead, Aberdeenshire. These are mounted on eleven tablets several with unnamed sponges and the rest with the following, viz.,

Cidaris sp. (spines)
Micraster sp.
Terebratula sp.
Two tablets with unnamed Polyzoa probably those referred to by Miller (1892f, p. 375) as '*Flustra*'
Inoceramus sp.

Thick beds of Chalk flint gravel occur on Stirling Hill near Peterhead and gravel with occasional flints were observed by Miller to the south of that place (1892f, p. 375). These chalk flints have a much wider distribution than this however, but as they become fewer and fewer in the direction

115 Moreseat is 10km south-west of Peterhead. The British Association funded the digging of a shaft in 1896 (Jamieson *et al.* 1898), and more recent excavations have shown that the phenomena are due to a group of Cretaceous erratics (Hall and Connell 1982).
116 'Discussed' would be more accurate than 'shown', as Miller did not claim to be making the original observations. For Linksfield, see also Miller (1858a, pp. 199-202, 280-282).
117 Now Plaidie, a few km north of Turriff.
118 Now Leavad.
119 Peach might have been thinking of Moreseat (above). Ten boreholes were indeed drilled at Leavad in 1910, but the funding came from the Royal Society (Tait 1912).
120 Presumably the Southern Trench, a 'favourite fishing ground with the boats from Banff and Sandend' (Hydrographic Office 1868, p. 109) – so perhaps something which Charles Peach picked up from his contacts with the local seamen at Peterhead.
121 Freswick lies on the east coast of Caithness just south of John o' Groats.

of the Moray Firth they do not seem to have been brought from the north like the other secondary boulders already mentioned but rather suggest that they are the insoluble remanié of a once widespread coating of Chalk over what is now the coastal plain and the low plateau of East Scotland.

The consideration of these points lends additional interest to the problem of whether the Lower Cretaceous mass at Moreseat is a relic of this once widespread covering or a boulder comparable to that of Levad in Caithness and like it brought inland by glacier ice from the Moray Firth.

GAULT. – Succeeding to the fossils found in the loose flints is set out a collection of Lower Cretaceous Gault from England containing

Actinoceramus sulcatus Park
Ammonites sp.
Ammonites (*Hoplites*) *bifurcatus*
Ammonites (*Hoplites*) *tuberculatus*

CHALK. – A small collection of fossils from the Chalk of England succeeds to that from the Gault and contains

Sponges. –
Eight boxes[122] of fossil sponges are set out of the following genera, viz., *Jerea, Pleuronella, Doryderma, Phymatella, Collaptium, Ventriculites,* and one specimen of a *Belemnitella* bored by a sponge.

Worms. – The worms are represented by a specimen of *Serpula gordialis* Schlotheim.

Echinoderms. –
Several unnamed crinoid stems are shown followed by
Marsupites sp. (cup)
Pentagonaster sp., and other star-fish ossicles
Echinocorys (*Ananchites*) *ovatus*
Echinoconus sp.
Cidaris sp. (spines) and cidarid spines from the Desert of Sinai[123]
Cidaropsis doma Desmarest
Cyphosoma koeningi Mantell
cidarid plates
Micraster cor-anguineum – six specimens of this characteristic zonal form

Brachiopods. – These are represented by the following forms: –
Rhynchonella plicatilis, var. *octoplicata* Sowerby
Rhynchonella sp.
Terebratula sp.
Terebratula carnea

Lamellibranchs. – Those are shown by the following, viz:
Exogyra sp.
Ostrea sp.
Gryphaea sp.
Inoceramus labiatus Schlot.
Pecten sp. (three specimens)
Arca sp.
Spondylus spinosus, Sow.

Cephalopods. – There is only a meagre representation of these, viz: –
Turrilites sp.
Belemnitella sp. (one box with eight specimens)

Fishes. – The fishes are but poorly represented by the following
Oxyrhina mantelli Ag. (teeth of a shark)
Holopterus laevissimus Mantell
Holoplax sp.
and some debris and coprolites of Fishes. Some of the coprolites containing debris of fishes are placed in structure case 117.

Desk-Case 116

TERTIARY. – The General Collection is continued in desk-cases 116, 115, 114 on the west side of the gallery.

OLIGOCENE. – At the extreme southern end of desk-case 116 a small collection of freshwater and land gastropods from the Headon Beds of the Hampshire Basin is laid out. They belong to the following genera, *Limnaea, Vivipara, Planorbis,* and *Helix*. There is no indication as to how Miller obtained this small collection.[124]

MIOCENE. – The Oligocene specimens are followed by a collection of marine molluscs from the Miocene rocks of the Gironde, France.[125]

Lamellibranchs. – These are represented by the following, viz.,
Pinna nobilis
Ostrea
Nucula marginata
Lucina columbella
Lucina hiatteloides
Lucina sp.
Venus radiata
Venus casinoides
Donax elongata
Donax anatina

[122] Some smaller specimens, especially the Post-glacial shells from Fairlie, etc., seem to have been displayed in small card boxes inside the display cases, perhaps nested in cotton wool, and perhaps under glass lids. Many such specimens were still, in 2009, in such boxes with labels which appear to derive from this Miller display. This style might have been to avoid gluing them to wooden tablets. Many of these shells still retain the original friable sediment within them, so boxing also prevented this material from spilling out into the display case. This style was used for various specimens from different ages, such as some Jurassic belemnites (see wall-case 58).
[123] Probably amongst the Holy Land, Egyptian and Levantine fossils sent to Miller by the Reverend Dr John Wilson (1804 -1875), Scots missionary, educator and orientalist in India (Miller 1858a, p. 63, 1889a, p.73, 1890, pp. 39-41; Smith 1878, pp. 419-420).

Cardita pinnula
Grateloupia donaciformis
Lichenia elliptica
Corbula striata

Scaphopods. – Only a single species of this group is shown, *Dentalium pseudentale*.

Gastropoda. – These are represented by the following genera and species:-
Monodonta (*Trochus*) *patula* Brocchi
Calyptraea deformis
Rissoa cimex
Turritella cathedralis
Turritella arachnoides
Cerithium pictum
Cerithium sp.
Melangena armata
Buccinum baccatum
Buccinum politum
Tudicula rusticula Bart.
Fusus curvatus
Fusus burdigalensis
Cancellaria acutiangula
Ancilla glandiformis Lam.
Terebra cineria
Terebra pertusa
Terebra plicaria
Pleurotoma denticulata
Pleurotoma semimarginata
Pleurotoma ramosa Bart.
Pleurotoma vulgatissima
rugiculid shell

From the above collection it is evident that in Miocene time the latitude of Bordeaux enjoyed a warmer climate than it does at present for several of the genera of shells especially the gastropods are now confined to tropical or subtropical seas.

PLIOCENE. – This period is represented only by a small collection of fossils from the Red Crag of East Anglia, so-called because the fossils are usually stained with iron oxide. The fossils are all marine and in marked contrast to those of the preceding Miocene ones are of cold water habit a point perhaps not due to difference of latitude but more probably to a general cooling down heralding the approach of the Glacial Period.

Crustacea. – This group is represented by a single barnacle, *Balanus* sp.

Lamellibranchs. – This group is represented by:-
Glycimeris pilosus
Cardita senilis Lam.
Cardium parkinsoni Sow.
Cardium edule Linn.
Astarte islandica
Astarte obliquata Sow.
Astarte omalii
Dosinia lentiformis

Gastropoda. –
Nassa propinqua
Nassa reticosa
Purpura lapillus Linn.
Purpura tetragona
Neptunea antiquata (the old '*Fusus contrarius*')
Litorina litorea Linn.[126]
Natica multipunctata Linn.
Cerithium tricinctum Broc.

Two small collections of shells made by Miller from Gamrie and Castleton King Edwards in Banffshire, to be described in the sequel [*i.e. later text*] along with the Glacial deposits, may be of Pliocene age.

POST-TERTIARY (Glacial) Deposits. – Following upon the collection of Crag Fossils are shown several collections of glaciated stones, fossils and shells from the Boulder Clay.

GLACIATED BOULDERS from Portobello. The next collection shown in desk-case 116 is that of a small group of glaciated stones collected by Miller from the Boulder Clay exposed on the foreshore at Portobello.

The travel of the beach material on the foreshore of Portobello is generally from east to west in the direction of the incoming of the strongest waves. Occasionally strong westerly winds cause the beach deposits to be swept back and thus to expose older formations, which over a wide space, consist of Boulder Clay. Miller was in the habit of roaming over such bared surfaces and was thus enabled to make many valuable observations as to the striation of the enclosed boulders. He observed that most of the boulders, great and small, were striated more or less all over and lay in the deposit with little observable direction. During some of his visits he found that some of the stones were facetted as well as striated and when many of these were examined he observed that the facets were all striated in one common easterly and westerly direction. To such surfaces he applied the name of 'striated pavements'. From what he saw he considered that the stones fixed in the boulder clay had been passed over by rafts of icebergs driven from west to east in the direction of the 'Drift' which was then the generally accepted opinion of the origin of the boulder clay. Most geologists now favour the view that it is the

124 Perhaps another gift from an amateur. But, subject to investigation of the specimens, another possibility is that they were bought from Edward Charlesworth (1813-1893), variously museum curator and natural history dealer, who traded in such fossils, sometimes under the title of the 'British Natural History Society' (Cleevely and Cooper 1981; Taylor and Anderson 2017). Miller was not however on an 1851 list of subscribers in his area for Tertiary material (Cleevely and Cooper 1981, p. 104).

125 Miller is not known to have travelled beyond the British Isles, so this might have been another purchase from Charlesworth.

126 More usually *Littorina littorea*.

product of land ice. In his address to the Royal Physical Society of Edinburgh (Miller 1892c, p. 313), he says when describing his fossil hunting expedition to the Girvan district 'I found here, at the height of many hundred feet over the sea, the boulder clay, with its characteristic pebbles scored and polished, and in most cases bearing their striae in the line of their longer axes.' The pebbles (a, b, c, d, and e) selected by him from the Portobello [beach] bring out this point and one of them, in addition to being striated all over, is facetted on one side showing that it had been fixed in the boulder clay after having been glaciated in the ordinary way and then been facetted.[127]

a. This is a limestone boulder with encrinite ossicles from the Carboniferous Limestone of the Central Valley and measures 7½ x 5 x 2½ inches. It shows the characteristics of a glaciated stone of those dimensions. Owing to its fine grain and hardness it has been polished as well as striated and is most ice smoothed on its flat faces. Its sides show that they have been joint faces and are only slightly abraded while all sharp edges and angles have been strongly bevelled off. The stone is not much longer than broad. The striae seen on its flat surfaces have no definite direction but they have a tendency to run either in the direction of the longer axis or oblique to it.

b. This boulder of clay ironstone, of Carboniferous age, affords a marked contrast to the above for it is much longer than broad and measures 7½ x 3 x 1 inches and the striae on all its faces run more or less parallel to the long axis showing that it has been free to accommodate itself in the direction of least resistance to the striating agent.

c. This is a boulder of Carboniferous black shale, evidently a poor oil shale, and measures 5 x 4 x ¾ inches. It is soft but tough and in consequence is much rubbed and the striae are much more deeply cut than in the other stone. There is a tendency for the striae to follow the long axis but none of them coincide with it and many of them run directly athwart it.

d. This has been a Carboniferous clay-band ironstone nodule, broken across at one end and somewhat decomposed before being glaciated. It measures 6 x 4 x 1½ inches at its thickest and tapers towards each side. It is irregularly striated on all sides but the edges of the broken end have been scrubbed away. The striae run in almost all directions though there is a tendency for most of them to be at slight angles to the longer axis.

e. This is a small Carboniferous limestone boulder with crinoid ossicles measuring 4 x 2 x 1½ inches. It is more or less striated with fine scratchings on all its sides with a tendency for the striae to run in the direction of the long axis. One side, however, is facetted and deeply scored across in one determinate direction showing that the boulder has been firmly embedded and the facet cut after the boulder had been striated in the usual way. This facetted stone is one of the cobbles of Miller's 'Striated Pavement'.

BOULDER CLAY OF CAITHNESS. – The Portobello striated stones are followed by several collections from the Boulder Clay of Caithness.

STRIATED CHALK BOULDERS. – Next to the Portobello striated boulders are exhibited a group of glaciated boulders of Chalk and Chalk-flint from the Boulder Clay of Freswick Burn in Caithness, probably derived from Cretaceous rocks now submerged beneath the waters of the Moray Firth and carried on to the promontory of Caithness by the Moray Firth Glacier at a time when the Scottish ice was confluent with the great ice-sheet, [which] starting from Finland and Scandinavia filled the North Sea and escaped westwards across the Shetland and Orkney Islands.[128]

JURASSIC FOSSILS. – This is followed by a small collection of fossils from the Jurassic rocks of the Moray Firth Basin and found as boulders in the shelly Boulder Clay of Caithness.

Peuce lindleyana (fossil pine wood)
Ammonites cordatus
Belemnites sp. (well glaciated and striated)

GLACIATED SHELLS. – Next [to] the Jurassic fossils is laid out a small collection of broken and glaciated shells chiefly portions of *Cyprina* (*Arctica*) *islandica* to show that they have been treated as boulders by the ice which laid down the Boulder Clay of Caithness.

This is followed by groups of glaciated shells gathered by Dick from the Boulder Clay [of] (1) Thurso River, just above Thurso, (2) from Dirlot about twenty miles up the river, and (3) from Halkirk about midway up. The shells comprise *Cyprina islandica*, *Arca*, *Astarte*, and *Turritella*. Next is set out a group of special interest as it is accompanied by a letter from Dick to Miller showing that it was gathered by him in two hours from the Boulder Clay banks of the river just above Thurso. This was done by Dick to show how thickly fragments of shells occurred in the dark boulder clay of Caithness. Appended to the letter is a note by C. W. Peach.[129]

To this succeeds a collection from the Boulder Clay of Acharynie situated about the centre of the County of Caithness, containing the following shells: –
Cyprina (*Arctica*) *islandica*

[127] Those phenomena were later reinvestigated by Hugh Miller the younger (1884, 1885a, 1885b). We wonder whether the facetting of stones fixed in clay might have something to do with sand borne on prevailing winds (onshore breezes?) in periglacial conditions - but perhaps we are biased by childhood memories of wearing shorts in the bracing climate of Scottish East Coast seaside resorts.
[128] Ben Peach and John Horne (1881) studied ice-flow over Caithness, and Charles Peach had of course been one of the pioneers of study, alongside Robert Dick, of the glacial deposits of the county, at a time when the very existence of fossils in the Boulder Clay was a surprise.

Saxicava (*Panopaea*) *norvegica*
Tellina solidula (one bored by gastropod ?*Natica*)
Yoldia arctica
Cardium edule
Astarte elliptica
Turritella terebra (*T. communis* of Miller)

General Collection of Shells from the Boulder Clay of Caithness: –

This [material from Acharynie] is succeeded by a general collection of Boulder Clay shells from various localities in Caithness arranged systematically.
Box with *Melobesia* (a calcareous alga) and *Balanus* (a cirripede)
Nuculana minuta Müll.
Pecten varius Linn., var. *islandicus* Müll.
Mytilus edulis Linn.
Arctica (*Cyprina*) *islandica* (glaciated hinge and part of shell)
Arctica (*Cyprina*) *islandica*
Astarte borealis Chemn.
Astarte sulcata da Costa
Astarte compressa Mont.
Box with *A. sulcata* var. *elliptica* Forbes and Hanley
Tellina balthica Linn., var. *udevallensis* Forbes
Tellina calcarea Chem.
Cardium echinatum Linn.
Cardium edule Linn.
Mya truncata Linn., var *udevallensis*
Mya truncata Linn., var *udevallensis*
Saxicava sulcata
Saxicava (*Panopaea*) *norvegica* Spense
Dentalium entale Linn.
Patella vulgata Linn.
Litorina litorea Linn.
Natica alderi Forbes
N. catena da Costa
Buccinum undatum
Turritella terebra = T. communis
Aporrhais pes-pelecani Linn.
Nassa incrassata Strom
Neptunea (*Fusus*) *antiqua* Linn.
Bela turricula Mont.

An analysis of this collection of shells shows that they are mostly inhabitants of water deeper than that part exposed between tides, only two denizens of the littoral zone, viz. *Litorina* (the Periwinkle), and *Patella* (the Limpet) being represented. Very few specially Arctic forms appear and most of the shells are those of our present Scottish seas. The mode of their occurrence, embedded in Boulder Clay full of travelled glaciated boulders, precludes the possibility of their being in situ and the abundance of glaciated portions of shells shows that they have been subjected to the grinding of the ice-sheet. In fact most of the shells are to be looked on as individual boulders just as much as the specimens of Jurassic wood, ammonite, belemnite, or the chalk and flint or even any of the striated and travelled stones found in the dark clay.

Some of the bivalves such as *Astarte*, [and] *Tellina* and spiral gastropods especially *Turritella* contain a fine sandy silt evidently the remains of the matrix in which they were embedded when caught up by the ice. In fact the collection shows that the Moray Firth had existed as a sea inhabited by just such a molluscan fauna as that which is now to be found in it. The shells appear to have been embedded in sediments which rested on fossiliferous rocks ranging in age from Pliocene to Jurassic and even earlier time, all of which had been in turn caught up by the ice, carried forward by it and scattered over the low ground of Caithness as well as on to the counties bounding the Firth to the south. This is in keeping with the observations of others. C.W. Peach has recorded[130] the finding of *Fusus* (*Neptunea*) *antiquus*, var. *contrarius*, stained red and containing a red sand, leaving no doubt that it had been derived from a Red Crag deposit of Pliocene age which must have been extant in the Moray Firth Basin where the ice sheet filled it and brimmed over on to the flat of Caithness.

Dr Brady's examination of the Foraminifera from the Caithness Boulder Clay shows that it contains forms ranging from those of the present day to Cretaceous and even older time.[131] [*Some text deleted here: Peach had evidently intended to include Dr Lee's list of microfossils from the borings at Leavad, but thought better of it.*]

The collection of fossils from the Boulder Clay of Caithness is followed by two very interesting collections of shells from Gamrie and King Edward in Banffshire.

The mode of occurrence of the beds in which the shells were formed is well described by Miller (1892f, p. 377): 'The boreal shells of Banffshire (which occur at Gamrie in a finely stratified sand, two hundred and thirty feet over the sea, and at Castleton King-Edward in a similar deposit of very considerable elevation and at least six miles inland), lie deep, - though exposed laterally in sections, - in the Pleistocene deposit. At Castleton I found the shells within a few feet of the underlying Grauwacke rock, and an immense deposit of beds of sand and clay, and over all a thick bed of partially consolidated ferruginous gravel

129 See Taylor and Anderson (2017, Figure 25) for a photograph of this historical treasure.

130 No published reference so far traced, unless this is what Charles Peach meant when he said 'I found at Wick one piece from the Crag, known to be so by a characteristic fossil embedded in it' (Peach 1867a, p. 38). So this may possibly be from (otherwise) unpublished information. Ben Peach and John Horne (1881, p. 343) used data from Charles's collection for research on the Drift fossils.

131 Henry Bowman Brady (1835-1891), Newcastle pharmacist and keen micropaleontologist working on foraminifera in particular. Source uncertain, perhaps Brady pers. comm. to Ben Peach. But note that Ben Peach and John Horne's review of the glaciation of Caithness (1881, pp. 342-343 and 343fn.) includes a listing of Drift foraminifera which seems to be based in part on that in Crosskey and Robertson (1868, pp. 125-127), for whom Brady determined the forams (Crosskey and Robertson 1867, p. 270). He also helped Charles Peach (1867b, p. 401).

lying above them.' At Gamrie the fossiliferous sand is overlain by thirty feet of Boulder Clay. Some of the shells have been broken into fragments although both valves are together and filled with silt showing that the beds must have suffered great compression from the ice-sheet.

Collection of shells from Gamrie, Banffshire.

Lamellibranchs. –
Cyprina (*Arctica*) *islandica* Linn. (broken shells; mostly the thick hinged portions)
Venus ovata Penn.
Astarte borealis Chemn. (one shell bored by *Natica*)
Tellina calcaria Chemn. Several of these are embedded in a brown sandy matrix, while others, with both valves in place are filled with it and lie in the position in which they lived and died. Many of the shells have been broken and shattered after having been embedded
Tellina (*Gastrana*) *balthica* Linn.
Cardium edule Linn.
Cardium norvegicum Spengler

Gastropods. –
Natica alderi Forbes
Natica (*Amaura*) *islandica* Gmelin
Turritella terebra Linn. (the *Turritella communis* of Miller)
Buccinum undatum Linn.
Sipho gracilis
Sipho propinquus Alder
Bela turricula Montfort
Bela turricula Montfort (smooth variety)

Collection of shells from Castleton, King Edward, Banffshire.

Crustacea. –
Balanus balanoides, Linn.

[Lamellibranchs. –]
Tellina calcaria Chemn.
Tellina (*Gastrana*) *balthica* Linn. (one box of good specimens)
Astarte borealis Chemn.
Cyprina (*Arctica*) *islandica* Linn. (broken fragments mostly hinges)

Scaphopod. – *Dentalium entale* Linn.

Gastropods. –
Natica alderi Forbes
Natica (*Amaura*) *islandica* Gmelin (in two boxes)
Natica sp.
Turritella terebra Linn.
Buccinum undatum Linn.
Neptunea (*Fusus*) *antiqua* Linn.
Bela turricula Mont.
Sipho propinquus Alder
Sipho islandicus Chemn.

The occurrence of this group of shells – none of which is of littoral habit and which, according to the late Gwynn Jeffreys,[132] shows no very marked Arctic condition although Miller considered their facies to be highly Arctic – in a hardly compacted set of sediments underlying Boulder Clay, and situated at a greater height above sea level than any of our known Raised Beaches is most interesting and, at the same time, puzzling. Only one thing is plain, the deposits in which they occur were laid down prior to the production of the Boulder Clay which overlies them. If they be in situ they are either remnants of a Pliocene deposit or of Interglacial age the former being the more probable presumption. On the other hand they may be transported boulders but the uncompacted nature of the sediments and the undisturbed condition of the shells militate strongly against such an explanation. Should they ultimately prove to be Pliocene deposits in situ, they would supply strong evidence in support of the hypothesis, held by some geologists, that the coastal plain around the Moray Firth is part of the Pliocene plane of denudation which is so well displayed in Cornwall.[133]

Desk-case 115

CLYDE GLACIAL SHELL BEDS of the Hundred-foot Raised Beach.

This case contains a magnificent collection of Arctic shells from the Glacial Shell Beds of the Clyde Basin which represents the under-low-water deposits of what is known as the Hundred-foot Raised Beach. The finest of these is from Fairlie, in Ayrshire, the recording of the first discovery of which is here given in Miller's own words: 'I had the pleasure of laying open, two years ago, at Fairlie, on the Ayrshire coast, a virgin deposit unknown before, in which I found continuous scalps of *Pecten Islandicus* still occupying the place in which they had lived and died, and with their upper valves covered with large balanae, such as we now dredge up from the outer limits of the laminarian zone, and all fresh and unbroken. Huge *Panopaea* were there sticking fast in an unctuous clay, with their open siphuncular ends turned upwards; and entire specimens of *Cyprina Islandicus* and *Modiola modiolus*, with their valves still connected by the sorely decayed ligament. *Tellina proxima* was abundant, but reduced in size to little more than half the Gamrie dimensions. I found *Astarte elliptica* the prevailing *Astarte*; and groups of younger *Cyprina* huddled together in the character - which they do not now assume on our coasts - of gregarious shells' (Miller 1892f, p. 379).

How fitting is this graphic description is well brought out

[132] John Gwyn Jeffreys (1809-1885), lawyer and renowned conchologist. Peach's father Charles knew him, accompanying him on a dredging trip to the Shetlands in 1864 (Anderson and Taylor 2008; Anderson and Lowe 2010).
[133] Cf. the work of one of Peach's Survey contemporaries, George Barrow (1908), on ancient marine platforms in Cornwall.

by the study of the collection from Fairlie, which is as follows.

Echinoderms. – *Echinus* (spines of)

Lamellibranchs. – *Nucula nucleus* Linn.
Nuculana minuta
Ostrea edulis Linn.
Pecten varius Linn., var. *islandicus*. Some of these are very fine and mostly show both right and left valves. One specimen holds, between the valves, a fine silty matrix which has been sinuously burrowed by marine worms. Another of the shells supports fine specimens of the acorn-shell *Balanus porcatus* da Costa. Two other shells also have this barnacle attached, and as they are always on the right hand shell it is evident that this was the uppermost one during life. In all three, both valves were still attached. In one box there are two single valves, one of which has serpulae on the inside of the right valve and another with both serpulae and *Balanus* on the outside of the left valve, showing that both had been detached and turned over before the growth of the serpula[e] and barnacle. The one with the serpulae and barnacle has been much corroded since the attachment of the serpulae, which have preserved the radiating ridges of the shell, while the barnacle had only attached itself after the shell had been corroded. The interior of the shell has also been corroded by solution
Pecten maximus. A specimen showing both valves which evidently had been attached when unearthed
Anomia patelliformis Lam. One of the valves supports serpulae on the outside of the convex valve
A. ephippium Linn.
Cardium norvegicum Spengler. Two specimens but not complementary valves
C. echinatum Linn.
Modiola modiolus Linn. Two boxes each with two specimens, with both valves now detached but evidently together when found
Modiola modiolus. Two boxes with very fine specimens with both valves detached. These appear to be somewhat thinner in the shell than usual
Modiola modiolus Linn. (two boxes, one with small specimens, both valves still attached. One holds enclosed sediment)
Lucina borealis Linn. (two specimens with both valves attached and enclosing sediment)
Venus fasciata da Costa
Venus casina Linn.
Astarte compressa Mont. (several specimens with valves attached)
Astarte sulcata da Costa, var. *elliptica* Brown (valves mostly together and enclosing same kind of sediment as *Pecten varius*)
Tapes virginius Linn. (two specimens showing both valves)
Tellina calcaria Chemn. (several specimens with most of the valves together and containing sediment)
Solencurtus antiquatus Pult.
Psammobius feroensis Chemn. Those species that show by their pallial sinus that they were supplied with siphons and were in the habit of burying themselves end on are mostly found with both valves together
Lutraria elliptica Risso (one box with two extra large individuals)
Mya truncata Linn. var. *udevallensis* Forbes
Saxicava rugosa Linn. (one box with extra large specimens)
Saxicava (*Panopaea*) *norvegica* Sprengel (two boxes of splendid specimens)
Pholas candida Linn.
Pholas dactylus Linn.
Scrobicularia piperata Belon

Gastropods. – *Cryptodon flexuosus* Mont.
Acmaea virginea Müll.
Bittium reticulatum
Natica sp.
Aporrhais pes-pelicani Linn.
Nassa reticulata (two very fine specimens)
Neptunea (*Fusus*) *antiqua* Linn.
Trophon clathratum Linn.
Fornatina lamellata Phil.

Vertebrates. – Intervertebral disc of Porpoise

The collection from Fairlie is followed by a small one from the Clyde Glacial Shell Beds of the Hundred-Foot Raised Beach, Rothesay.

Modiola modiolus Linn. (small form)
Nerita affinis Gmelin and *Natica clausa* Brod. and Sow. (in same box)
Fusus buccinatus Lam.
Gibbula tumida Mont.

SCROBICULARIA in Portobello Brick-Clays. – There succeeds to the shells of the Clyde Glacial Beds a collection of several individuals of the bivalve *Scrobicularia piperata* Bellon, collected by Miller 'from the brick clays behind Portobello' as he tells us (1892f, p. 380). These are cut out by him so as to show the shells in their natural upright position in the clayey silt. It is evident, from what he says further in the same address, that he considered them to be of the same age as the Portobello Brick Clays which are now known to be part of the deposits of the Hundred-foot [Raised] Beach. He says (p. 381), 'The *Scrobicularia* of Portobello, for instance, were the inhabitants of a muddy estuary, which ran along what is now the flat, winding, willow-skirted valley that runs inland towards the village of Easter Duddingstone; but ere the last upheaval of the land they must have been dead for ages; for how can we otherwise interpret their position in the brick-clay, with from six to eight feet of an argillaceous deposit, of apparently slow formation, resting over them'.

It will be observed that many of the shells still retain their periostracum or chitinous outer membrane while those of the Clyde Shell Beds have all lost theirs. This may either be due to difference of age or to the character of the enveloping sediments. The tough Portobello clays would prevent passage of water and thus act as a preservative. There is a tendency for present day geologists to consider that these shells belong to the Twenty-five-foot Raised

Beach; but Miller leads strong evidence in favour of his opinion.

Desk-case 114

TWENTY-FIVE-FOOT RAISED BEACH. – This case begins with a collection of shells from the Twenty-Five-Foot Raised Beach, Filli[e]side, lying between Leith and Portobello, Midlothian.[134]

Sponge. –
Cliona coelata Grant. A sponge boring into oyster shells

Lamellibranchs. –
Ostrea edulis Linn. (two boxes of large oyster shells)
Pecten maximus Linn. (fragments of)
Pecten pusio Linn.
Pecten opercularis Linn.
Pecten varius Linn.
Cardium edule Linn.
Cardium echinatum Linn.
Scrobicularia piperata Belon
Mya truncata Linn.
Tellina (*Gastrana*) *balthica* Linn.
Saxicava rugosa Linn. (boring into limestone boulder)
Saxicava rugosa Linn.
Ensis (*Solen*) *ensis*

Gastropods. –
Patella vulgata Linn.
Tectura testudinalis Müll.
Litorina litorea Linn. (two boxes)
Gibbula (*Trochus*) *cineraria* Linn.
Turritella terebra (two boxes)
Purpura lapillus Linn.
Nassa incrassata Strom. Note the difference in size from those of the Clyde Glacial Shell Beds
Ocinebra erinacea Leach
Buccinum undatum Leach

This collection is followed by a small one from the Twenty-Five[-Foot] Raised Beach Deposits of Granton, Midlothian.

Lamellibranchs. –
Nucula nucleus
Venus gallina Linn.
Venus fasciata da Costa
Corbula gibba Olivi
Lucina borealis Linn.
Tapes pullastra
Mactra subtruncata da Costa

Gastropods. –
Aporrhais pes-pelicani Linn.
Litorina litorea Linn.
Purpura lapillus Linn.

This is followed by a small collection from the Twenty-Five-Foot Raised Beach at Queensferry, Fife.[135]

Anomia patelliformis Linn.
Anomia ephippium Linn.
Pecten pusio Linn.
Cardium aculeatum Linn.
Corbula gibba Olivi
Thracia convexa W. Wood
Saxicava rugosa Linn.

Scaphopod. –
Dentalium entale

[Gastropods. –]
Emarginula fissura Linn.
Turritella terebra
Nassa reticulata
Ocinebra erinacea
Trivia (*Cypraea*) *europea*

Vertebrata. –
Horse tooth

This is followed by a small collection of shells from a Raised Beach at Fearn, Ross-shire.

Mytilus edulis
Cardium edule Linn.
Tapes pullastra
Mactra subtruncata da Costa
Pholas candida
Litorina litorea

The consideration of the shells from the Twenty-Five-Foot Raised Beach of the Forth and Cromarty Firth districts makes it plain that at the period of its deposition our present shore shells had thoroughly established themselves and that the arctic forms, so abundant in the Clyde Beds of the Hundred-Foot Raised Beach, had migrated to colder water than that which washed our eastern shores. From this it may be inferred that they had also left our western coast, the waters of which, owing to the Gulf Stream, must have been even warmer than those of our east coast.

GNAWED HAZEL NUTS. – The next exhibition [*i.e. exhibit*], one of shells of hazel nuts gnawed by 'mice', collected by Miller from the deposits of the Twenty-Five-Foot Raised Beach, Portobello, Midlothian, affords us a little light as to the plants and land animals that inhabited [the] country at the time of their deposition.

In the address to the Royal Physical Society so often referred to above (Miller 1892f, p. 381), Miller writes, 'In some of these old estuary deposits, – such as that of Portobello, – we find interesting remains of the aboriginal

[134] For this and other Firth of Forth localities, see also Miller's *Edinburgh and its neighbourhood* (1891).
[135] North Queensferry is in Fife; South Queensferry is on the south side of the Forth.

trees of the country, – boles of oak, birch, alder, the Scotch fir, and the yew, – with handfuls of sorely blackened hazel-nuts, and the trunks and branches of a dwarfish hawthorn, converted into a glossy substance, nearly resembling jet'.

FRESH-WATER SHELLS FROM THE 'MEADOWS', EDINBURGH. – The next exhibition brings us down to modern times. It is that of a group of fresh-water shells from the lake deposits of the 'Meadows', within the City of Edinburgh, the site of the Borough Loch which was drained 1722-1740.[136]

The shells are shown as mounted on a card by Miller himself.[137]

1. *Pisidium pusillum* Gmelin
2. *Physa fontinalis* Linn.
3. *Planorbis complanatus* Linn.
4. *Limnaea peregra* Müll.
5. *Zonides* sp.
6. *Valvata piscinalis* Müll.

A second group of fresh-water shells mounted on a card by Miller himself is also exhibited. No locality is given but presumably they are from the same source as the above. Unfortunately the black surface of the card has in places curled off carrying some of the specimens with it. The forms still attached are,

Pisidum pusillum Gmelin
Sphaerium sp.
Limnaea peregra Müller
Limnaea stagnalis
Planorbis complanatus Linn.
Physa fontinalis Linn.
Zonides sp.
Valvata piscinalis Müller

A third exhibition of fresh-water shells is a box of shell-marl with *Limnaea* and *Valvata* from the Walk Mill, Cromarty, [which] must have come from the site of some silted up or drained lochan.[138]

It must be borne in mind that although the Borough Loch was drained in 1740 to give place to the 'Meadows' it may have existed ever since the retreat of the great ice-sheet of the Glacial Period from the neighbourhood of Edinburgh and prior even to the elevation of the first of the raised-beaches now known as the Hundred-Foot Raised-Beach, the deposits of which contain a highly arctic fauna. The researches of the late James Bennie[139] of the Geological Survey, into the deposits of the old drained and silted up lochs in Edinburgh and its immediate neighbourhood, more especially those of Corstorphine Loch, the drainage of which was commenced in 1680, show that the lowest deposits of that loch, immediately overlying the boulder clay, contain alpine plants such as *Salix polaris*, a willow now only known in Arctic regions, *Salix herbacea*, and *Betula nana* (Dwarf-Birch) now confined to our mountain tops, besides other Arctic and Alpine forms. The accompanying animal remains are also extremely Arctic in character, for he found innumerable remains of *Apus glacialis* a phyllopod crustacean now confined to Spitzbergen, Greenland and other Arctic lands. With these he got the jaws with the unmistakeable teeth of the Arctic Lemming. This conjunction of plants and animals renders it almost certain that an arctic flora existed on the low grounds as far south as Edinburgh at the time of the deposit.

In connection with this it may be legitimate to mention here the finding of the cannon bones of reindeer from what had been a wolf's den in a cleft of the rocks of the Pentlands, above Dreghorn Castle, by the late Mr Simson, of the Anatomical Department of Edinburgh University.[140]

GUIDE TO THE HUGH MILLER COLLECTION. PART II. SPECIAL COLLECTIONS

Desk-case 122, Type Case

This case contains most of the specimens used by the great Swiss naturalist Agassiz, Hugh Miller, Sir Philip Egerton, and Dr Ramsay H. Traquair for the descriptions and figures used by them in founding new species, genera, and, even, families of Palaeozoic fishes. It is therefore the most interesting and, certainly, most valuable case in the whole Hugh Miller Collection. To us it has a special interest in that it shows that most of the specimens were collected while he was still at Cromarty.[141] It also brings out plainly the keen interest he himself took in the working out of the structure of the ancient cuirass-covered fishes *Pterichthys* and *Coccosteus* in that many of the specimens have their separate plates[142] lettered and numbered by his own hands.

It also contains the type specimen of *Coccosteus minor* upon which he founded the species which still bears the

136 To the south of the Old Town. Again, Peach missed a useful reference: Miller (1891, pp. 134-147).

137 See the card illustrated by Knell and Taylor (2006, fig. 7) and Taylor and Anderson (2017, Fig. 9).

138 Waulkmill (Scots): stamping mill. It is not clear where this mill was, or if it was even in the burgh as opposed to parish or 'county' of Cromarty. The fossils might well be from what was, so far as is known, the nearest waulkmill to the burgh, which was almost 10km away at Braelangwell on the other side of Jemimaville. Here a deposit of shell marl was used for manure during the 18th Century. Other shell marl deposits existed at Meikle Farness (or Davidston), nearer Cromarty proper but with no waulkmills known (Alston 2006; David Alston, pers. comm. 2010). But mills were common and easily converted to and from the waulkmill variety.

139 James Bennie (1821-1901) was a keen amateur in the Hugh Miller mould and inspired by his writings; he later became a fossil collector for the Geological Survey. He was especially interested in Quaternary geology, notably assisting James Croll, the exponent of orbital variation driving climatic changes such as ice ages (Horne 1903). Bennie's research included postglacial lakes around Edinburgh such as Corstorphine, to the west of the city centre (e.g. Bennie and Scott 1891; Bennie 1894, 1896).

140 James Simpson (died c. 1901), Assistant Curator at the Anatomical Museum of the University of Edinburgh, and keen geologist (H[epburn] 1901). Reindeer: Simpson (1887).

name given by him and supersedes that of *C. pusillus* of McCoy. Since Miller's time, this species has been established on palaeontological grounds by Dr Traquair as one of the zonal forms which distinguishes a subdivision of the Middle or 'Thurso' group of the Middle Old Red Sandstone of the Moray Firth region.

Most of the specimens have attached labels in Miller's handwriting, but, unfortunately, many of them are scarcely readable, chiefly through the fading of the ink.

Special attention is drawn to type specimens by large red coloured discs with the word TYPE in bold lettering, a practice general throughout the adjacent Fossil-fish Gallery.

Type specimens of the genus *Coccosteus* are set out at the left hand side of the case.

Those used by Agassiz for his description and figures of *Coccosteus decipiens* are shown on three tablets somewhat apart from each other owing to exigencies of space. They were figured in his great work *Poissons Fossiles du Vieux Grès Rouge* (1844-1845, Tab. X, figs. 1, 2, 3, and 4).

The type specimens upon which Sir Philip Egerton founded his species *Coccosteus milleri* are shown on two separate tablets. They were described and figured by him (Egerton 1860, figs. 1 and 5).

Plaster casts of *Coccosteus milleri* Egerton, coloured and lettered by Miller and corrected by Dr Traquair, are shown in next case (121).[143] The species is now obsolete as it has been shown to be the same as *C. decipiens* Agassiz.

One of Sir P. Egerton's type specimens shows faecal matter between the dorsal and ventral plates in which is seen the debris of small shells like those of bivalve crustaceans and a coiled tube like *Spirorbis* a tubicolar worm. Reference will be made to a similar occurrence of faecal matter in [a] specimen of *Coccosteus* as observed by Miller which is now placed in next desk-case 121.

Next to the type specimens of *Coccosteus* are placed those of *Pterichthys*.

Pterichthys milleri Agassiz, is represented by the two type specimens of this form described and figured by Agassiz (1844-1845) in his *Poissons Fossiles du Vieux Grès Rouge*, Tab. I, figs. 2 and 3.
A third specimen, preserved in the round, is the type specimen of his *P. testud*[*in*]*arius*, Tab IV, figs. 1-3 of the same work. This specimen is figured also by Dr Traquair in his Palaeontographical Society Monograph on the 'Fishes of the Old Red Sandstone, Part 2. Asterolepidae' (Traquair 1894-1914).

Pterichthys productus Agassiz. A specimen figured by Traquair (1894-1914, Pl. XXI, fig. 4).

Counterparts of a specimen of *P. milleri* showing plates numbered by Miller are followed by a specimen of *P. milleri* used by Agassiz (1844-1845, Tab. I).

Diplacanthus striatus, Agassiz. Two type specimens figured by Agassiz (1844-45, Tab. XIV, figs. 1 and 2).

Diplacanthus (*Rhadinacanthus* Traquair) *longispinus* Agassiz, type specimen figured by Agassiz (1844-1845), and by Miller in his *Old Red Sandstone*, Pl. VIII, figs. 1 and 3.

Diplacanthus tenuistriatus Traquair. One of the type specimens described and figured by Traquair (1894, p. 254).[144]

Cheiracanthus murchisoni Agassiz. Placed here to fill up space.

All the above types described by Agassiz are from the Middle Old Red Sandstone of Cromarty.

Bothryolepis[145] *obesa* Traquair. Type specimens showing natural mould and plaster cast of anterior median dorsal plate, figured by Traquair from plaster cast (1894-1914, Pl. XXVII, fig. 3; see also Traquair 1893b, p. 285). This specimen is from the Upper Old Red Sandstone, Jedburgh, Roxburghshire. Another type specimen of natural mould and plaster cast of the left dorso-lateral plate, figured by Traquair (1894-1914, Pl. XXVII, fig. 4), from the Upper Old Red Sandstone of Chirnside, Berwickshire. Also a specimen from Harelaw, Chirnside, Berwickshire showing interior surface of broken proximal segment of pectoral appendage.

Bothryolepis leptocheirus Traquair. One slab showing detached plates and brachial appendage. Type specimen described by Traquair (1893b, p. 286), and one type specimen of pre-median plate and three type specimens of pectoral appendage figured by Traquair (1894-1914, Pl. XXIX, figs. [1], 2, 4, 5). All these specimens are from the Upper Old Red Sandstone of the Heads of Ayr.
Uronemus lobatus Traquair. Two specimens from the

[141] A fair proportion of Miller's type and figured specimens were not collected during his Cromarty years, or even from the ORS at all. But some were indeed collected before he moved to Edinburgh, as shown by their incorporation in the first edition of *The Old Red Sandstone* (Miller 1841).

[142] i.e. skeletal plates rather than plates in his books, at least in this case.

[143] One wonders how Peach knew Miller had lettered the casts. Had he seen them as a youngster? Miller certainly made, or had made for him, casts of his specimens (Egerton 1848; Young 1866, p. 314). Presumably those are included amongst the surviving casts, though further work would be needed to identify them from others that might have been made later.

[144] Not actually figured by Traquair.

[145] Now *Bothriolepis*.

Burdiehouse Limestone of Lower Carboniferous age, described by Traquair (1871, Pl. XIV, figs. 1 and 2) under the name of *Phaneropleuron elegans*.[146]

Megalichthys laticeps Traquair. The type specimen described and figured by Traquair (1884, p. 115, Pl. V, fig. 3), from the Burdiehouse Limestone of Lower Carboniferous age.

M. laticeps Traquair. A specimen of the whole fish, the type specimen described and figured by Dr Traquair, ibid., fig. 1, also from the Burdiehouse Limestone.

Rhadinichthys ferox Traquair. Counterparts in ironstone nodule from the Lower Carboniferous, Wardie, Midlothian – the type specimen described and figured by Traquair (1877-1914, p. 153, Pl. XXIV, fig. 1; see also *Proceedings of the Royal Physical Society of Edinburgh*, Vol. IX, 1887, p. 483[147]).

Rhadinichthys ornatissimus Agassiz. Specimen and counterpart figured by Traquair (1877-1914, Pl. XXVIII, fig. 2).

Elonichthys robisoni Hibbert. Two specimens from the Lower Carboniferous of Burdiehouse figured by Traquair (1877-1914, Pl. VIII, figs. 2 and 4).

Cosmoptychius (*Elonichthys*) *striatus* Agassiz, from the Wardie Shales, Lower Carboniferous. This is the specimen referred to and figured by Traquair (1877-1914, p. 44, Pl. III, fig. 2).

Gyracanthus. Spine, split up middle and showing its internal structure, placed here to fill up space.

[Desk-case 121]

[*The entire section for desk-case 121, i.e. pp. 76-82, is missing from the manuscript, as it evidently was when the typescript was prepared. However, cross-references elsewhere in the Guide allow a partial reconstruction of content. It appears that the case displayed specimens and diagrams 'illustrative' of Miller's book* The Old Red Sandstone, *including at least:*
– Parka decipiens
– *probably* Psilophyton
– Estheria *(figured specimen)*
– Cephalaspis
– Diplacanthus *(figures of)*
– Pterichthys milleri *(figured specimen)*
– Pterichthys oblongus
– Coccosteus decipiens *(specimens relating to Miller's restoration of* 'C. cuspidatus'*, plaster casts of* 'Coccosteus milleri' *coloured and lettered by Miller and corrected by Traquair, and a specimen showing intestinal contents)*
– Osteolepis *(specimens and Miller's restoration)*
– Holoptychius nobilissimus *(scales from Clashbennie)*]

Desk-case 120

FOOT-PRINTS OF THE CREATOR. – This case is arranged to illustrate Hugh Miller's *Foot-prints of the Creator*. Miller's figures shown here [i.e. in exhibition] are taken partly from the edition of 1849 and partly from that of 1861; but this makes no material difference as they are printed in both editions from the same blocks.[148]

THE 'ASTEROLEPIS OF STROMNESS'. – The larger part of the case is taken up with the illustration of Miller's 'Asterolepis' to which he devoted a chapter of his book. Subsequent research has demonstrated that he built up his gigantic form out of the remains of two widely separate fishes, the one *Homostius milleri* Traquair, an ostracoderm cuirass-covered fish allied to *Coccosteus*, and [the other being] *Glyptolepis* (*Holoptychius*) *paucidens* Agassiz, a crossopterygian predatory ganoid.

Miller conceived that the cranial buckler of *Homostius* was that of a fusiform fish like *Holoptychius nobilissimus*, a plaster-cast restoration of which is displayed in wall-case 53. The true *Asterolepis* of Eichwald belongs to the same order as the cuirass-covered *Pterichthys*. As its name implies its plates are covered by similar star-rayed tubercles to those of *Homostius* hence Miller's mistake.

Plates of two species of *Bothryolepis*, the *Pterichthys major* of Miller's writing, a nearly allied congener of the true *Asterolepis*, are shown in the Type collection in desk-case 122 and in wall-case 51 on which the same type of tubercles are also observable.

Homostius milleri Traquair. – The most conspicuous specimens in this case are the two which show the cranial buckler of this fish, the one, as viewed from above, and the other from beneath. They were used by Miller to illustrate his 'Asterolepis' and are reproduced in figs. 28 and 29 respectively, one fifth of natural size.

A plaster cast of the specimen showing the underside of the cranium, coloured and lettered by Miller to show his interpretation of its anatomical structure, is represented by woodcut figure 31 on the same relative scale. Accompanying the cast and woodcut is the cranium of a recent codfish coloured and numbered by him to illustrate the correlations of its bony structures with those of his 'Asterolepis'. The upper surface of it is represented with its bones lettered in fig. 10 and affords an index to what

[146] Interestingly, Traquair notes that Charles Peach (who had of course curated the collection) recognized the fossils and drew his attention to them.

[147] Possibly an error for Traquair (1877, p. 435).

[148] The illustrations were cut out of copies of the book and pasted onto wood or card tablets, used with specimens, printed labels and texts on similar tablets to create the display in a modular manner. What are evidently some of the same illustrations, labels and tablets still survive in the collections beside their specimens.

[149] In fact there are two bones in the figure.

Miller supposed the plates of his fossil fish to represent.

To the left of the large specimens mentioned above are placed separate plates of *Homostius* figured by Miller. One of the largest of these, probably a median ventral plate, supposed by Miller to be a palatal plate of his 'Asterolepis', supplies the material for his fig. 37, one fourth of natural size, linear.

The underside of a median dorsal plate showing the position of the 'nailbone' and figured by Miller as 'hyoid plate of Thurso Asterolepis' is represented by fig. 51, one fourth of natural size, linear.

To indicate the true position of this plate and the relation of *Homostius* to *Coccosteus* a specimen of the median dorsal plate of *Coccosteus decipiens* is placed in juxtaposition with that of *Homostius*. Both the plates are turned with their back ends reversed so as to show in the same position as in fig. 51.

Near the above are placed two undetermined bones of *Homostius* figured by Miller as 'internal bones of Asterolepis', fig. 46.

Figure 42 is that of a lateral plate of *Homostius* described by Miller as 'non-descript latero-hyoidal plate of Asterolepis'.

Maxillary bone of *Homostius* described by Miller as 'latero-cerebral plate of Asterolepis' is shown in fig. 45b. Also an undetermined bone figured as 'clavicle' of Asterolepis, fig. 45a.

Fig. 44 is that of an undetermined bone described by Miller as 'dermal bone of Asterolepis'.[149]

Fig. 43 is that of an undetermined plate of *Homostius* described by Miller as 'Shoulder (i.e. coracoid?) plate of Asterolepis'.

Figure 38 is that of another undetermined bone described as 'maxillary bone?' by Miller.

Figure 39 is that of a plate described by Miller as 'operculum of Asterolepis'.

Glyptolepis paucidens. - The remains of *Homostius* extend from the left to about the middle of the case beyond which they are succeeded by those of *Glyptolepis paucidens* Agassiz, which supplied the jaws, scales, and internal bones of Miller's 'Asterolepis'.

Glyptolepis (*Holoptychius*) *paucidens* Agassiz. A very fine mandible with its double row of teeth is accompanied by figs. 32 and 33 showing the inner and outer aspect of the jaw. Fig. 35 showing transverse sections of the jaw with both 'ichthyic' and 'reptilian' teeth as well as magnified 'ichthyic' teeth separately. Fig. 34 is that of a section of one of the 'reptilian' teeth, magnified twelve diameters, which exhibits its highly complex dendrodont character.

Scales of *Glyptolepis paucidens* are shown on [a] tablet exhibiting their outer and inner surface in illustration of fig. 26 (natural size) and as magnified four diameters in fig. 27. These all show the holoptychian ornamentation of their exposed parts the amount of imbrication and the arrangement of the scales. A second tablet with five other scales is also placed in the case for comparison. Beside these tablets is one with a compound interspinous bone of *Glyptolepis paucidens* for the support of one of the median fins. This bone is represented by Miller's fig. 48 (half size) and described by him as 'Ischium of Asterolepis'. Fig. 47 (half natural size) is that of a portion of a palatal bone and an undetermined bone of *G. paucidens* described as 'Internal bones of Asterolepis'.

Very fine specimens of both the fishes which were combined in Miller's 'Asterolepis' are shown in the general collection of Fossil Fishes in the adjoining Gallery. The finest specimens of *Homostius milleri* there shown were collected by Robert Dick from near Thurso, and presented to the Museum by the late John Miller of Thurso, and afterwards of Burgo House, Bridge of Allan, and are now placed in Wall-cases 15-16.[150] Several specimens of *Glyptolepis paucidens*, nearly whole, are shown in the lower part of wall-case 9 as well as very fine specimens of other species of the same genus.

Next to the specimens of *Glyptolepis* in desk-case 120 is shown an interesting tablet with portions of the shagreen of recent dogfish side by side with that of such fossil selachians as *Cheiracanthus* and *Acanthodes*, as mounted on card by Miller himself. With these are placed figures 2, 3, 4, 5, 7 and 8.[151] Fig. 2 [is] 'Shagreen of Thornback' (*Raia clavata*) to compare with shagreen of *Sphagodus*, a placoid of Upper Silurian age. Figure 3 is that [of] scales of *Acanthodes* to compare with shagreen from the snout of the recent *Scyllium*.[152] Fig. 4 compares scales of *Cheiracanthus* with shagreen from the snout of the Recent *Spinax*.[153] Figure 5 comparative sections of shagreen of *Scyllium* and *Cheiracanthus*. All the sections are magnified eight diameters. Figure 7 shows the osseous points of [the] placoid cranium, magnified 12 diameters, and Fig. 8, the centra of vertebrae of *Spinax acanthias*, the Piked Dogfish, and Thornback (*Raia clavata*) respectively, natural size.

Osteolepis. – The next tablet is devoted to the illustration of this ganoid fish, and on it is a card mounted with the

[150] i.e. of the Fossil Fish display on the east wing of the same balcony, as specifically noted by Anon. (1924, p. 31).

[151] i.e. again using Miller's illustrations, right down to the numbering. This, and the others immediately following, are from *Footprints of the Creator* as previously noted.

[152] The Houndfish or Dogfish.

[153] Lantern shark.

scales of *Osteolepis* by Miller himself showing the rhomboidal side scales, and three ridge scales in conjunction, showing their mode of overlap. Figure 6 represents scales of *Osteolepis* (natural size) and one detached scale, magnified two diameters. Beside these for comparison are placed some scales of *Glyptolepis leptopterus*.

Figure 12 shows the upper side of the cranium of *Osteolepis* and fig. 13 its head in profile. Figure 56 is that of its tail fin. Although no actual specimens have been identified as those from which Miller drew up his figures yet it is easy to supply specimens from his collection that illustrate the points shown in them. A specimen of *Osteolepis macrolepidotus* Agassiz from Orkney showing part of the body with a row of six sided ridge scales, overlapping rhomboidal side scales, the cranium with the eye orbits, gill covers, and the upper and lower jaws is placed beside the figures. Another specimen showing the underside of the head with the jugular and other plates numbered by Miller himself is probably one from which he has drawn up his fig. 14.

Dipterus. – A considerable part of the remaining space is taken up with Miller's illustrations of this ancient lungfish.

One tablet shows the cranium of *Dipterus valenciennesi* Sedgwick and Murchison from Caithness from which figure 20 (half size) is taken. Beside the figure is placed a plaster cast of the specimen coloured and lettered by Miller himself to illustrate his ideas of the position and homologies of the different plates. On the actual cranium there is visible a small, almost centrally placed, plate evidently covering the pineal eye, which though not numbered by Miller is distinctly seen behind the plate numbered 2 by him.

Next to the above is placed a very fine specimen showing the palatal aspect of the cranium bearing the fan shaped palatal crushing apparatus which is much more complex than that of its only living congener *Ceratodus forsteri*, the 'Barramunda' of Australia. The specimen shows the bony maxillary portion of the head without teeth suggesting the idea that this fish like *Ceratodus forsteri* subsisted greatly on decaying vegetation. The almost circular hole at the back end of the specimen is no doubt the foramen magnum leading into the brain cavity. Miller's fig. 21 is that of this specimen half size. This specimen afforded to Dr Traquair the material for his description published in Traquair (1878, Plate III, fig. 1).

On [the] next tablet are shown both lower jaws of *D. valenciennesi* still held together at the symphysis although somewhat twisted and crushed together. On one jaw is visible the arrangement of tubercles or teeth that played into the fan like structures on the palate above. This specimen is figured by Miller, fig. 22.

A specimen of *Ceratodus forsteri* is exhibited in the adjacent Recent Fish Gallery. The arrangement of its crushing teeth is shown in the Type Hall on same floor. For figures of the crushing apparatus of *Ceratodus* see Zittel (1900-1902, vol. II, p. 65, fig. 119).

Thursius pholidotus Traquair. – Two tablets with specimens of this fish from the Caithness flagstones, which Miller evidently considered to belong to the same genus as his *Diplopterus* from Cromarty, are placed in this case. Dr Traquair has subsequently made out that the fish from Caithness differs from *Diplopterus* and has proposed for its generic name that of *Thursius*. Dr Traquair has also pointed out that *Thursius pholidotus*, the form here shown, is characteristic of the Thurso or Middle Group of the Moray Firth Middle Old Red Sandstone.

Two of the cranial bucklers, one whole and the other broken, are accompanied by Miller's figures 16, 17, and 18. Fig. 16 is drawn from the whole cranium showing the arrangement of the plates of the cranium according to his interpretation. Fig. 17 is evidently from the same specimen, while fig. 18 is that of the broken specimen showing the snout end. On both specimens, the position of the pineal or median eye is well displayed.

On a second tablet are placed portions of heads of *Thursius* considered by Miller to be those of *Osteolepis* from which his illustration fig. 13 is taken. One of the specimens shows the cranium, the other shows the position of the mandibles and jugular plates.

Figures 66, 67 are those of *Cephalaspis* and are not accompanied by any specimens. The Miller Collection is singularly poor in specimens from the Lower Old Red Sandstone of the Central Valley of Scotland; but two species of *Cephalaspis* are shown in wall-case 46 and a specimen of *C. lyelli* is exhibited in desk-case 121.

Cryptogamous land-plant. – Figures 61 and 62 are those of a specimen of cryptogamous land-plant *Psilophyton dechenianum* Carruthers, figured by Miller as 'Fucoids of the Lower Old Red Sandstone'. The specimen of which figure 61 is much reduced is too large for the cases and is placed on the wall at the east end of the gallery. It was found by Robert Dick in the Caithness flagstones near Thurso as told by Miller (Miller 1896, pp. 186-188). Figure 62 is that of a portion of the same specimen on a larger scale.

Figures 63-65 [*recte* 64-65] are from a specimen of undoubted land plant with its microscopic woody structure still preserved. It is from the Middle Old Red Sandstone of the Black Isle, near Cromarty, and described by Miller (1896, pp. 188-189 [correct pagination appears to be pp. 192-195]), and considered by him as 'the veritable [*recte* venerable] Adam of the Forest'.[154] Its structure under the microscope is shown in figures 64, 65. This specimen is also referred to in the *Old Red Sandstone* (Miller 1892a, pp. 117-118fn): it is stated that microscopic sections of the wood were submitted to Professor William Nicol, of Edinburgh, the highest authority on the subject at that time, whose decision – given in a letter dated Edinburgh, 19th July, 1845 – is as follows: – 'I have examined the structure of the fossil-wood which you found in the Old Red Sandstone of Cromarty, and have no hesitation in stating, that the reticulated texture of the transverse sections, though somewhat compressed, clearly indicates a conifer-

ous origin; but as there is not the slightest trace of a disc to be seen in the longitudinal sections parallel to the medullary rays, it is impossible to say whether it belongs to the Pine or Araucarian division'. (Signed) William Nicol.

Desk-case 119

THE TESTIMONY OF THE ROCKS. – Desk-case 119 is given over to the illustration of Hugh Miller's last work, the *Testimony of the Rocks* (Miller 1890, published in 1857).[155]

For the illustration of his first chapter on the 'Palaeontological History of Plants and Animals' he has mostly made use of material outside his own collection; but the specimens employed for his figures 2, 3, 11, 12 and 13 of that chapter are shown, either in the present case (119) or in case 120. Figure 57 is evidently compiled from several specimens in his collection while the original of fig. 58 is placed in the present case (119). The greater part of the case is therefore devoted to the last two of his lectures entitled 'On the Less Known Fossil Floras of Scotland' (Miller 1890, pp. 383-454).[156] The fossil plants used in illustration of these chapters are derived from the Old Red Sandstone, Carboniferous and Jurassic Formations.[157]

OLD RED SANDSTONE PLANTS. – The plants from this, the oldest of the three formations, are placed on the right-hand side of the case.

The specimen which is illustrated, much reduced, in fig. 11, popularly known as the 'Corduroy Plant' *Haplocampium* sp., is doubtfully looked on as a calamite without nodes; but its true botanical position is unknown. It is from the sandstone quarries a little to the south of Lerwick in Shetland which is now considered to be of Upper Old [Red] Sandstone age.

Palaeopteris (*Cyclopteris*) *hibernica* Forbes. A specimen of one of the fronds of this fern, from the Upper Old Red Sandstone of Kiltorcan in Ireland, is the subject of Figure 2. Scottish and Irish specimens of this fern are exhibited in wall-case 51.

Figure 3 is that of the specimen of coniferous wood referred to by Miller as the 'veritable Adam of the forest' which is placed in case 120 illustrative of his *Foot-prints of the Creator*. It is of Middle Old Red Sandstone age.

Figure 13, considered by Miller to be that of a fern, is the supposed fruit of *Arthrostigma* Dawson, and is also from the Middle Old Red Sandstone.

Figure 12[0][158] is that of *Psilophyton dechenianum* Carruthers – 'Lycopodite' of Miller – from the Middle Old Red of Thurso, Caithness, presented by Robert Dick (Miller 1890, p. 391fn).

Figure 118, on page 388, is taken from a specimen of [a] dichotomous plant like *Psilophyton*, in circination[159] and looked upon by Miller as a 'fucoid'. The specimen is from the Middle Old Red Sandstone of Skail[l] in Orkney.

Figure 119, on page 388, is that of a specimen of *Psilophyton dechenianum* Carruthers – the '*Lycopodites Milleri*' of Salter – and also from Skail[l], Orkney.

CARBONIFEROUS PLANTS AND ANIMALS. – Figure 58 on p. 67 is that of '*Pleuracanthus laevissimus*' Agassiz, a median dorsal spine of a placoid fish from the Coal Measures of Dalkeith, Midlothian. For other specimens of this spine see wall-cases 54, 55.

Frontispiece. – *Telangium* (*Sphenopteris*) *affine* Lind. & Hutt., the '*Sphenopteris affinis*' of Miller's writings. Two specimens of this fern from the Burdiehouse Limestone, Midlothian, are shown in this case and several others in wall-case 52, which evidently afforded Miller the material for the restoration of the frond of this fern which forms the frontispiece to his work the *Testimony of the Rocks*.

Figure 129 on p. 423, *Sphenopteris bifida*, the specimen figured by Miller from Burdiehouse, Midlothian.

Figure 125 on p. 417 [of Miller (1890)] is that of a specimen of *Pecopteris* sp., from the Coal Measures of Lanarkshire.

Figure 126 on p. 461 [of Miller (1857)], *Stigmaria* sp., is that of a specimen from Portobello, Midlothian.

JURASSIC PLANTS. – Figure 131 is taken from a specimen, counterparts of which are shown, of *Taxites jeffreyi* Seward, described by Miller as 'coniferous twigs', from the Upper Jurassic rocks of Brora, in Sutherlandshire.

Figure 141, No.1 is that of *Sagenopteris phillipsi* Brongniart, described by Miller as 'fern leaves'. No.2 *Nilssonia orientalis* Heer, described by Miller as ‘fern

[154] Also figured by Anderson (2005).

[155] Note that the pagination of *Testimony* changed at some point when it was reset in type. Peach usually, but not always, cites the pagination of the later editions (e.g. Miller 1890), rather than of the earlier editions (e.g. Miller 1857), without being clear about this.

[156] In fact, one lecture developed into two chapters (Miller 1890, p. 383fn).

[157] The wording used usually leaves it unclear whether the figures in this desk-case were normally accompanied by the appropriate specimens. But this is what one would expect, and tends to be confirmed by several references to specimens being present, and to 'other specimens' on display elsewhere.

[158] Peach actually put Fig. 12, which is of the same or a similar fossil, but the footnote reference points to Fig. 120.

[159] Coiled, especially in the sense of a growing shoot of a young fern. Ben Peach would have known about this term from his father's interest in the apparently seasonally varying form of fossil plants (Anderson and Taylor 2008).

leaves like those of Hart's-tongue'. Both from the Upper Jurassic rocks of Helmsdale, Sutherlandshire.

Figure 150 (p. 448 [of Miller (1890)]). *Strobilites milleri* Seward. Specimen figured by Seward and Bancroft (1913, Pl. I, fig. 13) [Peach has ‘Seward 1912’].

Figure 149 (p. 446). *Brachyphyllum* sp., described by Miller as 'imbricated stem'.[160]

Figure 143 (p. 441). *Todea*? sp., described by Miller as *Pecopteris obtusifolia*.

Figure 147 (p. 444). Indeterminable plant which Miller compares to *Lycopodium*. From Upper Jurassic of Helmsdale, Sutherland. On same figure *Dichopteris* figured by Miller as a 'true fern'. Also from Helmsdale.

Figure 140 (2 specimens), 1. *Nilssonia orientalis* Heer, and 2. *Williamsonia pecten* Phill., both named '*Zamia*' by Miller, Upper Jurassic, Helmsdale.

Figure 139 (p. 437). Cone figured by Miller, from Eathie, Cromarty.

Figure 144 (p. 442). *Cladophlebis denticulata* Brongniart, figured as 'Fern' by Miller, Helmsdale.

Figure 135 (p. 433). *Pseudoctenis eathiensis* Rich. Figured by Miller as '*Zamia*', Eathie, Cromarty.

Figure 152 (p. 450). *Dicty*[*o*]*phyllum* sp. Figured by Miller as 'of a dicotyledonous character'.[161]

Figure 146 (p. 443). *Pterophyllum nathorsti* Seward. Figured by Miller as '*Phlebopteris*'. Figured also by Seward (1911, Pl. X, fig. 44).

Figure 134 (p. 433). *Nilssonia orientalis* Heer. Figured by Miller as '*Zamia*'. Figured by Seward (1911, Plate X, fig. 46).

Figure 136 (p. 434). *Zamia buchianus* Ett. Figured by Miller as '*Zamia*'. Figured by Seward (1911, Pl. X, fig. 23).

Figure 137 (p. 435). *Zamia carruthersi* Seward, figured by Miller as '*Zamia*'. Figured by Seward (1911, Pl. X, fig. 43).

Figure 133 (p. 432). *Pseudoctenis eathiensis* Rich., figured by Miller as '*Zamia*'. Figured by Seward (1911, Pl. X, fig. 4 and 5 [*recte* 45?]).

Figure 130, considered by Miller to represent 'sprigs of conifers', is taken from six different specimens from the Upper Jurassic rocks of Eathie in Cromarty, and Helmsdale in Sutherlandshire, which are arranged around the figure in the case.

Figure 130A (p. 430). *Sphenolepidium* sp., [*unclear but may be* cf.] *S. kurrianum* Dunk., figured by Miller as 'sprig of conifer'
Figure 130B *Elatides sternbergiana* Schenk.
Figure 130C *Elatides curvifolia* Dunk.
Figure 130D *Elatides curvifolia* Dunk.
[Figure 130E is not mentioned]
Figure 130F [blank]

Counterparts of some of these spec[imen]s are placed in the General Collection in wall-case 57.

Figure 132 [p. 430], *Masculostrobus woodwardi* Seward. Figured by Seward and Bancroft (1913, Pl. I, figs. 6, 8).

Figure 151, *Hausemannia buchii* And., figured by Miller as 'dicotyledonous leaves'.[162]

Desk-case 118

The right half of this case is specially arranged to show the use made by modern specialists of Hugh Miller's collection of the fossil plants from the narrow stripes of Jurassic rocks now left on the northern shores of the Moray Firth. Most of these are from the Kimmeridgian horizon exposed along the Helmsdale shore of Sutherland, while the others are from his older haunts of Eathie and Shandwick where the ammonites from the same beds denote an Oxfordian horizon. Fortunately, most of the plants have been fossilized in such a manner as to preserve their minute microscopic texture, and Professor Seward, by taking advantage of modern histological methods, has been enabled to make out their structures and affinities in a manner that was impossible, even to specialists in botany, in Miller's time.

Many of the Jurassic plants described by Professor Seward had already been figured and published by Miller in his *Foot-prints of the Creator*. These are to be seen in desk-case 119.

The remaining moiety of case 118 is devoted to special collections illustrative of structures, both organic and inorganic, shown by specimens from the Miller collection. These are continued in desk-case 117.

The space at the extreme right hand of case 118 is taken up with Professor Seward's investigation and description of the strobilus or cone of *Williamsonia scotica*, which is exhibited as cut by him both transversely and longitudinally for microscopic examination. Side by side with the sliced cone is a plaster cast showing its outward form before the slicing. Professor Seward has supplied a coloured diagram which is numbered and lettered so as to afford a scheme to the slices and to the seventeen microscopic slides used for his description published in the [*Philosophical*] *Transactions of the Royal Society* [*of London*] (Seward 1912).[163]

[160] Leaves overlapping like scales or roof-shingles.

[161] This appears to be in error; Peach seems to have muddled this with the fossil in Fig. 151 (Miller 1890, pp. 448-449, fig. 151). Miller seems to have regarded the one in Fig. 152 as a fern, but a missing parenthesis does not help the clarity of his statement.

[162] In fact Miller said 'decidedly marked by the dicotyledonous character' (Miller 1890, p. 448).

Plates IX, X, XI and XII [presumably of Seward (1912)] with their explanatory notes exhibit and explain the magnified structures shown by these sections.

The rest of the space is given over to Professor Seward's descriptions and figures of coniferous plants. Two specimens of *Conites juddi* are shown. One of them has been sliced by Professor Seward, the microscopic sections of which he made use for his description of the cone before the Royal Society of Edinburgh (Seward 1911, Pl. I and II). Copies of these plates are shown together with their explanatory notes.[164] Professor Seward shows that the plant appears under four separate forms which he distinguishes as alpha, beta, gamma and delta. The sliced cone falls under his *forma* gamma.

A fine cone of *Conites juddi, forma* beta, is shown in a separate specimen which affords the material for his text figure 2A (nat. size).

Other forms examined microscopically by him are *Strobilites milleri* figured by him in Plate I, fig. 13 (natural size), the original specimen of which is exhibited in case 119, as it had supplied Miller's fig. 150 of his *Testimony of the Rocks*. *Masculostrobus woodwardi*, Plate I, figs. 6-8, is placed here, the original specimen as cut by Seward is also placed in case 119 as it afforded the material for fig. 132 of *Testimony of the Rocks* and was described by Miller as 'sprig of a conifer with four apparently embryo cones'.

Taxites jeffreyi, Pl. I, Fig. 5. The original of this is in case 119 as it was figured in *Testimony of the Rocks* by Miller as 'coniferous twig'.

Brachyphyllum eathiense, in Seward (1911, Pl. IX, fig. 33), and in Seward and Bancroft (1913, text-fig. 5A and Pl. I, figs 2-4).[165] The original is in case 119 as it was figured by Miller in his *Testimony of the Rocks*, figure 149, and described as 'imbricated stem'.

The microscopic slides of *Taxites jeffreyi*, *Masculostrobus woodwardi, M.* sp., *Brachyphyllum* and *Pseudoctenis* are shown in case 118.

As an overflow from this case some of Professor Seward's plates accompanied by an interesting catalogue of the plants described from the same beds, owing to lack of room, are framed and fixed up on the wall space at the south-east end of the gallery.

STRUCTURES, ORGANIC AND INORGANIC. – The rest of case 118 is given over to the exhibition of structures both organic and inorganic shown in specimens collected by Miller.

Coprolites of fishes. – A small collection of coprolites, in this case, the dung of fishes, from the Old Red Sandstone and Carboniferous rocks of Scotland and the Chalk of England, is laid out, some of which reveal the nature of the prey in the form of scales and bones. Most of the coprolites are elongated and show a distinct spiral arrangement. The origin of these fossil 'screws', as they were often popularly called, seemed so mysterious that they were held somewhat in reverence like the belemnites. Their true nature was first demonstrated by a lady[166] who squeezed plaster of Paris through the gut of a dogfish with the result that she produced the exact counterparts of these fossils, having obtained her clue from the debris of fishes contained in the fossil coprolites.

In the nearest two boxes are set out a selection of the coprolites of fishes from the Middle Old Red Sandstone of Caithness. In four boxes are shown Lower Carboniferous coprolites. Those from the Burdiehouse Limestone, Midlothian, are attributable to the great predatory ganoid *Rhizodus hibberti* the great jaws and trenchant teeth of which are well displayed at the bottom of wall-cases 54 and 55. Even finer specimens are shown in wall-cases in the adjacent Fossil Fish Gallery. The rest of the collection shows a few coprolites from the Chalk of England, the spiral character of which is only displayed in two specimens. Accompanying the collection is a diagram showing the spiral valve in the gut of [the] skate (after Arthur Thomson[167]) to explain the spiral arrangement of the faecal matter of such fishes.

Crania of fishes. – The next row of tablets is devoted to the illustration of some of the structures shown by fossil fishes. On the nearest tablet is placed a specimen of *Thursius* (*Diplopterus* of Miller) showing [the] posterior part of the cranium and the arrangement of the ridge-scales of [the] back. The specimen was presented to Miller by Robert Dick, the 'Thurso Baker', together with a drawing by Dick of some of the headplates showing the position of the pores through which the mucus flowed which

163 See also Anderson (2005); and Taylor and Anderson (2015) for the problem of a cone in the Charles Peach collection figured by Miller, and its possible origin in the Miller collection.

164 This must have been as part of the wall display (Taylor and Anderson 2017). Peach's MS used actual lower case Greek letters.

165 Peach ascribes it to 'in Vol. 49 1902' but this does not make sense. Probably an error for vol. 48, the actual volume number of Seward and Bancroft (1913), and 1912, its date of oral presentation.

166 William Buckland (1784-1856) of Oxford University seems to have been the first person to do this, injecting the intestines 'of rays and dog-fishes […] with Roman cement' (Buckland 1829, p. 234fn; Duffin 2009). Peach probably confounded him with his long-suffering but also geologically competent wife Mary, who in any case probably joined in the messy experiments (Kölbl-Ebert 1997, 2002). Did Peach, one wonders, have access to Buckland family oral history through his father Charles, who was stationed for a while at Lyme just after this work was done, and who could have met Buckland at scientific meetings (Anderson and Taylor 2008)? But Ben might have muddled Mary Buckland with Mary Anning the younger (1799-1847) of Lyme Regis, whose field observations and collections were important contributions to Buckland's coprolitic work (Torrens 1995).

enabled these old armour-cased fishes to flip easily through the water in pursuit of their prey. The drawing is pasted to the back of the specimen.

On the next five tablets are shown the crania and mandibles of the ancient lungfish *Dipterus*, from the Middle Old Red of Caithness. The specimens have been cleared from their matrix by Miller and some of the plates named by him. Fine specimens showing the crania and mouth organs of this old fish are shown in desk-case 120 and in wall-case 49. For a further study of this old double-breathing fish see General Collection of Fossil Fishes in adjoining gallery, and, for comparison with it, see recent *Ceratodus* in Recent fish gallery and dissections in Type Hall on same floor.

A palatal or grinding tooth of *Petalodus*, an ancient shark from the Carboniferous Limestone of Fife, is shown on the furthest removed tablet.

The next row of tablets holds a miscellaneous collection of specimens of interest.

On the first tablet is placed a small fragment of dark coloured quartzite with casts of *Orthis calligramma* and other forms, from near Gorran Haven, Cornwall,[168] and is one of the first specimens, discovered by his friend Charles William Peach, which determined the Lower Silurian age of a ridge rising through the Devonian rocks of Cornwall. The specimen was presented to Miller by the discoverer about the year 1840.

Neuropterid wings? – On the next tablet are shewn what are probably the remains of wings of a neuropterid insect from the Upper Jurassic rocks of the Moray Firth Basin.

In [the] next box is placed the central spiral axis of an ancient 'sea-mat', *Archimedes wortheni* Hall, from the Subcarboniferous rocks of America (see Zittel 1900-1902, vol. I, p. 282).

Rolled trilobites. – The specimens of Silurian trilobites of the genera *Asaphus* and *Calymene* show the method of rolling up into a ball so as to protect their delicate organs which were all placed ventrally. This habit had not been acquired by the early Cambrian forms. It necessitated the production of a tail shield approximating [to] that of the head shield in form and the facetting of the pleura of the abdominal segments, structures absent from early forms. For analogous structures and habits shown by recent arthropods see *Glomeris* a vegetable-eating, air-breathing myriapod or gally-worm, or the more accessible 'woodlice' of our back gardens. The common *Oniscus*, Woodlouse or Slater, is only able to slightly curve its body while *Armadillium*, the Pill Slater, can roll itself into an almost complete sphere.

In his address 'On the Ancient Grauwacke Rocks of Scotland' Miller (1892c, p. 313) remarks about a large trilobite, *Illaenus maccallumi*, found by him in the Silurian rocks of Girvan, 'One of the most remarkable-looking fossils of the group is, however, a large trilobite, – an *Illaenus*, furnished with a caudal shield as large as that which covers its head'. *Illaenus* is nearly allied to *Asaphus*, one of the trilobites shown rolled up in [a] box [*i.e. display tray, presumably*], but in which the approach in form of the two shields is even more complete.

Archaeocidaris. – Next to the trilobites is placed a box with detached plates of *Archaeocidaris urei*, an ancient sea-urchin, from the Carboniferous Limestone of Charlesto[w]n, Fife. Each plate is furnished with a boss to which was articulated a characteristic toothed spine. Observe the pit in [the] centre of [the] boss for the insertion of a round ligament which held fast the spine, also the raised ring surrounding the boss for the attachment of the muscles which moved the spines.

Pteraspid plates. – Next to the old sea-urchin plates is shown a box containing fragments of *Pteraspis*, an ancient cuirass-armoured fish from the Devonian rocks of Llantivet Bay, Cornwall, and mounted on card by Miller himself. These were presented to Miller by the discoverer Charles William Peach in 1848, to compare with the Old Red Sandstone fishes of Scotland; but it was not till long afterwards that it was generally accepted that they belonged to *Pteraspis*. The bony structure of these fragments was mistaken by McCoy for the meshwork of a sponge and described as such; but in 1864 E. Ray Lankester made use of some of the specimens collected by C. W. Peach for his description of *Pteraspis* (*Scaphaspis*) [presumably in Lankester in Powrie and Lankester (1868-1870)].[169]

Fossil fruit. – In [the] next box is shown the 'nut' or seed protector with triradiate opening of ?*Cordaites*, a Carboniferous tree.

Shell-limestone. – One specimen of shell-limestone made up chiefly of one species of *Cardium* or cockle from the Tertiary Formation.

Echinoderm structure. – The next group of tablets is arranged to [show] the structure of the lime carbonate entering into the skeleton of Echinoderms.

167 John Arthur Thomson (1861-1933), Professor of Zoology at Aberdeen. The diagram is presumably from one of his many text-books (e.g. Thomson 1916, p. 543, fig. 285).

168 More family history: Gorran Haven was Ben's birthplace.

169 It is not clear what Ben Peach meant, especially the 1864 date. The work by Lankester (1868), confirming that the 'sponge' *Steganodictyum* was a fish, was not directly based on Charles Peach's finds - unless, of course, they lay in collections owned by others and credited to them. Ben Peach's citation of '*Monographs of the Palaeontographical Society* 1864, vol. XXI' implies the first part of Powrie and Lankester (1868-1870), issued in 1868, but Lankester therein only briefly mentioned Charles's material explicitly, on p. 61. Nor do Ben Peach's accounts here and in the section for desk-case 46 make it clear that his father was not the original discoverer of the locality. See Taylor and Anderson (2015).

The perfect rhombohedral cleavage of the calcite entering into the test of *Echinocorys*, an irregular sea-urchin from the Chalk of England, is shown on [a] tablet where cleavage faces are seen to cut all the plates indiscriminately thus indicating that the whole skeletal jacket is built up of one crystal.[170] On a second tablet are mounted the remains of *Cidaris*, a regular form of sea-urchin – also from the Chalk – with the articular tubercles on the test and spines cut by a similar set of cleavage planes. Plates of the cup of *Marsupites* – a Cretaceous stone-lily – are placed on a third tablet to show that they are similarly cleaved. In addition to the above macroscopic character, the skeleton of echinoderms when examined microscopically is thickly scattered with minute pores which help to reveal their character.

Cephalopod structure. – The rest of the case is taken up with a small collection of ancient Cephalopods - ranging from Silurian to Jurassic time - to illustrate various points in their structure.

The four-gilled or Tetrabranchiate forms are represented by both Nautiloids and Ammonoids. Both straight and coiled forms of Nautiloids are shown. The straight ones are represented by three specimens of *Actinoceras lyoni* Stokes from the Wenlock Limestone, Dudley. These have been sliced longitudinally and polished and show their outer wall, septa, and beaded siphuncle which is furnished with endosyphuncle and organic deposits. The coiled forms are represented by *Trigonoceras cariniferum* Sow. – a Lower Carboniferous nautilus. It is sliced and polished so as to show the comparatively deep outer chamber in which the animal lived. The rest of the whorl exhibits the simple septa with which it cut off the disused parts of its cone from time to time as it grew, and the subcentrally placed siphuncle by which the vacated rooms communicated with the living chamber. On a third tablet is placed the beak-like radula of an ancient nautiloid from the Ordovician rocks of Ayrshire. There is no means of telling whether this belongs to a straight or curved form. Such structures are rarely found in the older rocks. The ammonoids are represented by two specimens of *Perisphinctes* from the Jurassic rocks of Eathie, Cromarty, to represent the ammonites showing only their outer form. None of the ammonites in the Miller collection that have been sliced show their internal structure. Some fragmentary specimens in wall-case [*blank*] however show the intricate pattern of 'lobes and saddles' where their septa joined the outer walls.

The Dibranchiate or two-gilled group are represented by belemnites the skeletons of the ancestors of our modern squids or cuttlefishes. Unlike the nautiloids and ammonites, the whole of these structures were covered up by the flesh to which they acted as an internal skeleton and not as the home within which they dwelt. Two tablets show the relation of the guard to the chambered phragmacone. The guard shows concentric lines of growth showing that it kept pace with the enlargement of the phragmacone. The radiating prisms of lime carbonate of the guard are well exhibited by specimens split both transversely and longitudinally as described by Miller, and some of the phragmacones show their simple imperforate septa, illustrating in a remarkable manner the passage written by him in the first chapter of his *Old Red Sandstone* (1892a, p. 42). Speaking of a belemnite that he found at Eathie on his first visit, he says 'It was of a conical form and filamentary texture, the filaments radiating in straight lines from the centre to the circumference. Finely-marked veins like white threads ran transversely through these in its upper half to the point; while the space below was occupied by an internal cone, formed of plates that lay parallel to the base, and which, like watch-glasses, were concave on the under side and convex on the upper'. At the time of writing this chapter he had not known that the point of the belemnite was in reality its lower extremity which he must have afterwards known because one of the specimens shown in this special collection is that of a belemnite showing the position of the inkbag situated within the structures that extended beyond the phragmacone, and which shows that the animal was an ancient 'squid'. The homologue of the guard is still to be seen as a minute point projecting downwards from the so-called 'back bone' of the recent *Sepia*; but which is a much more prominent object in the embryonic stages through which our recent cuttlefishes pass.

Desk-case 117

Case 117 contains a miscellaneous assortment of special collections. Several small ones illustrating organic and inorganic structures are in continuance of those shown in case 118.

CONCRETIONS. – A small but interesting collection of concretionary nodules occupies the right hand portion of the case to illustrate the formation of the nodules from which Miller liberated the remains of so many long-imprisoned old-world fishes from the Carboniferous rocks of Wardie and from the Old Red Sandstone of Cromarty.

Recent and Post-Tertiary concretions. – On the side of the case, next the observer, is placed a tablet with a group of nodules popularly known as 'Fairy Stones'. These are formed in uncompacted silts by the passage of water carrying lime carbonate in solution along the more permeable layers and deposition of the lime salt around nuclei of calcite. The loose grains of the silt are thus cemented together into a hard rock. The form of the nodule thus produced depends chiefly on three factors, viz., (1) the shape of the nucleus, (2) the thickness of the permeable bed, and (3) the disposition and proximity of the nuclei. In thick permeable beds with a simple nucleus the nodule tends to be globular; but if the bed be thin the form becomes discoidal.

[170] The shell must have been recrystallised after burial, as a taphonomic naturofact. In life the individual elements of the echinoid stereom are single, but separate, calcite crystals.

Elongated nuclei give rise to ellipsoidal forms. Where there is a rapid alternation of thin layers of different permeability nodules simulating rouleaux[171] of larger and smaller coins are produced. Compound forms are chiefly brought about by the coalescing of concretions formed round closely adjacent nuclei, the irregularity being increased where more than one factor has come into play.

In Scotland these concretions or 'Fairy Stones' are mostly found in glacial silts interstratified [with] Boulder Clay. A locality where they have been long known to occur and whence they probably derive their popular name is 'Fairy Dean' near the junction of the Elwand or Allan Water with the Tweed, a little above Melrose, a scene made to be haunted by the 'White Lady of Avenel' by our great enchanter, Scott, in his 'Monastery' and 'Abbot'.[172]

Some very irregularly shaped nodules are – for lack of space – set back in the far right hand corner. These have obviously formed in deposits on the bed of the present sea just below the surface. The numerous included recent shells have evidently acted both as nuclei and supplied the lime for the cementation of the particles of the sediment. On one of the elongated concretions a *Serpula* or tubicolar worm has grown showing that the concretion had formed close to the surface and afterwards had been exposed directly to the sea water either by a change of current or direction of the wave action.

'Fairy Stones'[173] with nuclei of fish skeletons from the Glacial Clays of Canada. – Next to the tablet with the Scottish 'Fairy Stones' are placed portions of two elongated nodules with the skeletal remains of a fish *Mallotus villosus*[174] from the Glacial silts of Canada in which the remains have acted the role of nucleus as well as supplied the cementing material to bind together the grains of the uncompacted mud in which it became embedded after death.

'Fairy Stones' of Middle Old Red Sandstone Age. – A series of nodules containing the fossil fishes *Diplacanthus striatus* and *Cheirolepis trailli* is laid out next to those from the Canadian Glacial Beds, for it is obvious that both lots have formed under similar conditions notwithstanding the immense lapse of time between their entombment. In this latter case the bones, scales, and spines have acted both as nuclei and also supplied the cementing material to convert the uncompacted Old Red sediments into nodules soon after the burial of the fishes. From a study of the nodules, it becomes also obvious that their shape depends on the attitude the enclosed fish assumed at death and burial. Where the fish is extended the nodule is oval or ellipsoid. Where the fish is bent round into a bow or ring, the nodule more nearly approaches a disc or lens. This latter point is even more wonderfully exhibited in the nodules laid out in the present case to illustrate Miller's idea that wholesale violent death overtook shoals of these Old Red Fishes, owing to periodical desiccation.

'Fairy Stones' of Lower Carboniferous Age. – Next to the Old Red Sandstone concretions is shown a small collection of Clay Ironstone nodules from the dark carbonaceous shales exposed on the foreshore at Wardie near Edinburgh. In these, remains of the fish *Nematoptychius greenocki* and another Palaeoniscid fish were embedded in dark sour muds and have acted as nuclei round which iron salts dissolved in the water have acted as the cementing material to form the hard nodules while the outside mud has been compressed into shales by the weight of the accumulating sediment, which, before the end of Carboniferous time, must have reached several thousands of feet in depth; while the more resistant hard nodules have preserved the enclosed fossils in the round.

Two ellipsoid nodules of clay-ironstone are shown in which elongated coprolites or fish excrements have acted as nuclei round which both the carbonate and sulphide of iron have agglutinated the dark mud.

Belemnites. – Succeeding to the concretions is set out a small collection of belemnites. Two tablets of fine specimens closely allied to *Belemnites acutus* from the Oxfordian rocks of Eathie, near Cromarty, next to which is a card with several specimens of graceful forms of the subgenus *Megateuthis* from the same source, just as they were stuck on by Miller's own hands. This is followed by a tablet with several belemnites that have been distorted and faulted by crust movement since the compacting of the sediments in which they were embedded.[175]

Vertebrae of Fossil Fishes and Reptiles. – A few specimens are placed in this case to show ring vertebrae and amphicoelous - double hollowed - vertebrae. Next to the observer is a tablet to show that in some of the old fishes the bony part of the centrum only formed a peripheral ring as exemplified by the centrum of a vertebra of *Megalichthys* from the Coal Measures of Dalkeith, Midlothian. Next to it is shown two of the amphicoelous vertebrae of a Cretaceous fish beside which two of the vertebrae of the recent Fishing Frog *Lophius piscatorius*[176] from Miller's collection are placed for comparison.

On the next tablet are shown two of the amphicoelous vertebrae of *Ichthyosaurus* – a Jurassic marine reptile – from Eathie, Cromarty. These are specimens mentioned by Miller as having been dug up in an unsuccessful sinking for coal (Miller 1892f, p. 371).[177]

[171] Like stacks of coins.

[172] Books in the Waverley Cycle of Walter Scott's novels. The story of *The Monastery* concerns the fictional Borders abbey of Kennaquhair during the Scottish Reformation, and the various wooers of the orphan heiress Mary Avenel. The White Lady is a supernatural guardian spirit of the destinies of the House of Avenel. *The Abbot* is the sequel. On these fairy stones, see Thomson (1835), Brewster (1866), and Duffin and Davidson (2011, pp. 11-12).

[173] This use of the term 'fairy stones' for localities other than the Elwand Water risks giving the impression, perhaps wrongly, that these other occurrences all gave rise to actual folklore legends.

[174] The Capelin is a small fish found in the Arctic and Atlantic Oceans.

Following upon the Eathie reptilian vertebrae are shown several vertebrae of higher reptilian forms probably crocodilian,[178] from the Jurassic 'Bone Bed' of Eigg the finding of which is described by Miller in his *Cruise of the Betsey* (1858a).

Bog iron-ore tubes. – Next to the vertebrae there is exhibited a small collection of tubes of limonite (Bog iron-ore) deposited round the roots of trees by bacteria from percolating chalybeate waters and left hollow after the decay of the roots.[179]

Jurassic fossil wood showing structure. – A small collection of specimens of jet and fossil wood showing its structure to the naked eye, from the Jurassic rocks of Eathie, Cromarty, and Brora in Sutherlandshire, is placed next to the limonite tubes. The specimens of jet (lignite) from Eathie are of special interest as being in all probability part of the specimens found in an unsuccessful sinking for coal mentioned by Miller (1892f, p. 371).

Fossils bored by organisms. – Next to the above is set out a small collection of fossils that have been bored by organisms, (1) prior to, and (2) after fossilization.

(1) On a tablet is shown a polished specimen of wood bored by an ancient species of *Teredo* or 'Ship Worm', and now found fossil in the Eocene strata of Sheppey, at [the] mouth of the Thames. Next to this specimen is set out in [a] glass covered box an assortment of shells of *Tellina balthica* bored by *Natica*, a small spoutless gastropod which attacks shells of burrowing habit. For this purpose it also burrows by means of a specially constructed foot and when a victim is found it uses a drill with which it is supplied, which acts both by solution and rasping, and makes such round holes as those seen on these shells through which it extracts the soft tissues of the unfortunate animal. The shells are from the Interglacial, or perhaps Pliocene, beds of King Edwards, Banffshire. Next to the bored shells are shown two specimens of Jurassic belemnite from Eathie bored by [the] sponge ?*Cliona*. One of the specimens is further bored, the large circular hole suggesting that it has been made by an unknown gastropod.

(2) Following on the belemnites two specimens of ammonite from Eathie shore are shown which have been bored by some animal probably a crustacean or marine worm which forms a dumb-bell shaped opening to its burrow which is narrowed by a mesial constriction. This has been done since the specimen became a pebble or boulder on the present shore. A third specimen of ammonite which has also been a loose block on the same shore shows that it has been bored by the recent bivalve *Saxicava rugosa* as well as by the organism that leaves the track with the mesial constriction. The mesial constriction would secure the inward and outward current necessary to aerate the blood of the creature working deep in so narrow a tunnel.

Attitude of Fossil Fishes as evidence of 'Violent Death.' – A collection of Fossil Fish from the Middle Old Red Sandstone from Cromarty, Moray, and Caithness, is laid out in this case to illustrate what Miller has written on this subject in his *Old Red Sandstone* (1892a, p. 77). Nearest the observer are shown two specimens of *Pterichthys* with their spike like lateral appendages set out as described by him, their cuirass encased bodies precluding their being bent. Three specimens of *Diplacanthus striatus* show their moveable spines ranked out from the body in the attitude of defence. Most of the other fishes are bent either into bows or complete hoops, in attitudes assumed by animals poisoned by strychnine, as if they had died in extreme agony. Perhaps the most complete examples of the ring or hoop are shown in the case of two small specimens of *Acanthodes* from Cromarty. Many specimens of *Cheiracanthus* suggest both by their bent bodies and ranked out spines that they had died struggling. Except *Pterichthys* all the above fishes are Selachians; but the rest of the collection consists of Osteolepids. Although these were not supplied with spines to set they show by their bent bodies that they had died writhing like their neighbours. They comprise two species of *Osteolepis*, *O. microlepidotus* and *O. macrolepidotus*, from Cromarty and Morayshire, and the nearly allied *Thursius* from Caithness.

The absence of the lungfish, *Dipterus*, from the collection may be only accidental, but it may be that if asphyxiation were the cause of such wholesale death, through the periodical drying up of arms of the inland enclosed basins in which the Old Red Sandstone sediments accumulated, *Dipterus* may have possibly escaped by encasing itself in dried mud and trusted to its lungs for breath, like its living congeners, till the waters returned.

Illustrative of the *Cruise of the Betsey*. – At the extreme end of the case is laid out a small collection of specimens mentioned by Miller in his *Cruise of the Betsey*.

Polished serpentine from Portsoy. – A small collection of polished specimens of the serpentine and associated rocks from Portsoy acquired by Miller as mentioned in the *Cruise of the Betsey* (Miller 1858a, p. 271).

Fossil Shark's teeth like 'scupper nails'. – A large specimen of the Jurassic 'Bone bed' from the Rhu Stoir, Eigg, studded with the tricuspid teeth of *Hybodus* (an ancient shark) likened by Miller to 'scupper nails' (1858a, p. 77). Another small specimen showing the same teeth associated with the estuarine shell *Cyrena* also from Eigg (ibid., p. 77 [p. 75 perhaps intended]).

175 One of us has collected such distorted belemnites from Eathie where strata in the vicinity of the Great Glen Fault show brittle fracturing and recementation.

176 More commonly referred to as the Angler fish or Monkfish.

177 See Anon. (1852a), Judd (1874) and Torrens (2003).

178 More likely to be plesiosaurian, as noted earlier.

179 Interestingly, Charles Peach described apparently similar tubes from the Burn of Milton near Wick (Peach 1867b).

The Eigg Pine. – At the further side of cases are shown two large blocks of semi-fossilized pine wood ('*Pinites eiggiensis*' of Miller) found by Miller below the pitchstone of the Scuir of Eigg,[180] and probably of Eocene age. For the account of the finding of the old tree-trunks of which these are specimens, see Miller (1858a, pp. 36-40).

Desk-case 114

Relics from Francis's Cave (Uamh Fhraing), Eigg – In this case are placed the relics brought back by Miller from the cave situated on the south shore of Eigg where a punitive party of Macleods smothered the whole population of the Island (Macdonalds) by setting fire to brushwood piled across the mouth of [the] cave.

The collection consists of some unglazed pottery and the handle stave of a 'luggie' called by Miller a 'child's porringer'.[181] An accompanying label written on a piece of blue notepaper by Miller mentions a pellet of grey human hair; but this pathetic relic has evidently been lost. It also mentions a 'horse-grinder'. The tooth now shown is that of an ox. The heart-rending story of the exploration of the cave is told in *Cruise of the Betsey* (Miller 1858a, pp. 36-40 [*recte* 22-29]).

Recent fish fragments used by Miller in his study of Fossil Fishes. – At the extreme end of the case are exhibited the fragments of recent fishes which Miller studied for the interpretation of analogous and homologous structures of the ancient fish remains he unearthed from the Palaeozoic rocks of Scotland.

With rare instinct he seems to have particularly studied the rays and sharks, especially the Common Skate, *Raia batis* Linn., as shown by the cranial cartilages, the mouth cartilages, [and] the gill arches. The Thornback, *R. clavata* Rondeletius, is represented by its mouth armature. Of the sharks are shown the armature of teeth of the Tope, *Galeus vulgaris* Cuvier, the mouth cartilages and teeth of the Porbeagle, *Lamna cornubica* Cuvier, and the Blue Shark, *Carcharius glaucus* Cuvier.

Of the Ganoids are shown three of the ridge scales of the Sturgeon, *Accipenser sturio* Linnaeus.

The Teleosteans or true bony fish are represented by the heads of [the] Gurnard, *Trigla gurnardus* Linnaeus, and the Ballan Wrasse, *Labrus maculatus* Bloch. The Fishing Frog, *Lophius piscatorius* Linnaeus, is represented by cranial bones and vertebrae and by jaws set with its formidable hooked teeth, whose mode of anchylosis with the jaw bone is well displayed.

The Wolf- or Cat-fish, *Anarrhichas lupus*[182] Linnaeus, is represented by head bones and jaws with their wolflike teeth. The pavement-like arrangement of the powerful rounded teeth with which this, the largest of the Blennies, crushes the bivalve shells on which it feeds, is well displayed.

[Peach's script ends here]

Acknowledgements

The *Guide* is published courtesy and copyright of the Trustees of National Museums Scotland. We especially thank Geoff Swinney for drawing our attention to the manuscript and typescript, and Rachel Russell for assistance. Tracey Gallagher, Gill Nixon and Emma Gallagher assisted with BGS photographs. We are grateful to David Alston, Mike Benton, Yves Candela, Vicen Carrió, Christopher Duffin, Andrew Kitchener, Stefanie Klug, Ralph O'Connor, Suzie Stevenson, Sarah Stewart, Geoff Swinney, Hugh Torrens and Nigel Trewin for discussion and advice. The British Geological Survey photographs are reproduced by permission. MAT thanks the staff of the Libraries of National Museums Scotland, the Universities of Edinburgh and Leicester, and Inverness (Highland Council).

References

We have used accessible editions of Miller's work for convenience, while noting original dates of publication. Some society *Proceedings* and *Transactions* cited here were characteristically published every few years, leading to a variable but potentially substantial time lag between delivery of the spoken paper and actual publication, let alone the year carried by the bound volume. We have not tried to deal with this issue here, especially as the written form of the paper might have been revised before publication, except for *Transactions of the Edinburgh Geological Society*, for which we have used the listing of parts and dates given in their volume 13, p. 271.

ABSALOM, R.G. 1933. Two unpublished letters of Hugh Miller. *North Western Naturalist* March 1933, 20-27.

AGASSIZ, J.L.R. 1833-1843. *Recherches sur les poissons fossiles*. 10 volumes. Petitpierre, Neuchâtel.

AGASSIZ, J.L.R. 1844-1845. *Monographie des poissons fossiles du Vieux Grès Rouge ou Système*

[180] An Sgùrr, the famous columnar pitchstone hill, now considered remnant of a Palaeogene lava, or pyroclastic, flow over a pre-existing trap basalt landscape. The wood was from the conglomerate underlying the pitchstone and above the basalt.

[181] Scots. Luggie, a hooped dish rather like a small half barrel, but with one stave longer than the others to do duty as a handle. Porringer, small dish for porridge, etc.

[182] Not an African or American catfish, but the peculiarly ugly marine littoral-benthic fish of, amongst other waters, the Scottish coast.

Dévonien (Old Red Sandstone) des Îles Britanniques et de Russie. 2 volumes. Soleure, Neuchâtel.

ALSTON, D. 2006. *My little town of Cromarty. The history of a northern Scottish town*. Birlinn, Edinburgh, xxvi + 372pp.

ANDERSON, L.I. 2005. Hugh Miller: introducing palaeobotany to a wider audience. *In*: Bowden, A.J., Burek, C.V. and Wilding, R. (eds). *History of Palaeobotany: Selected Essays. Geological Society, London, Special Publications* **241**, 63-90.

ANDERSON, L.I. and LOWE, M. 2010. Charles W. Peach and Darwin's barnacles. *Journal of the History of Collections* **22**, 257-270.

ANDERSON, L.I. and TAYLOR, M.A. 2008. Charles W. Peach, palaeobotany and Scotland. *The Geological Curator* **8**, 393-425.

ANDREWS, S.M. 1982. *The discovery of fossil fishes in Scotland up to 1845, with checklists of Agassiz's figured specimens*. Royal Scottish Museum, Edinburgh, 87pp.

ANON. 1852a. Are coals to be found in the Black Isle? *Inverness Advertiser* 4 May, 4.

ANON. 1852b. Royal Physical Society. *Caledonian Mercury* 18 Nov., 4.

ANON. 1858. *Directory of the Industrial Museum of Scotland, and of the Natural History Museum, Edinburgh*. Chapman and Hall, London, 15pp.

ANON. 1872. *Edinburgh Museum of Science and Art. Catalogue of Natural History Department.* Edinburgh Museum of Science and Art, Edinburgh, 52pp.

ANON. 1903. Edinburgh Geological Society. *Scotsman* 17 April, 4.

ANON. 1912a. Death of a distinguished Scottish palæontologist. *Scotsman* 23 Nov., 8.

ANON. 1912b. Eminent living geologists. William Carruthers [...]. *Geological Magazine*, (5) **9**, 193-199.

ANON. 1916. *The Royal Scottish Museum, Edinburgh. A guide to the collections*. His Majesty's Stationery Office, Glasgow, 71pp.

ANON. 1924. *The Royal Scottish Museum, Edinburgh. A guide to the collections*. His Majesty's Stationery Office, Edinburgh, 63pp.

ANON. 1929. *The Royal Scottish Museum, Edinburgh. A general guide to the collections*. His Majesty's Stationery Office, Edinburgh, 56pp.

BAILEY, E.B. 1926. Obituary. Benjamin Neeve Peach [...]. *Geological Magazine* **63**, 187-190.

BARROW, G. 1908. The High-Level platforms of Bodmin Moor and their relation to the deposits of stream-tin and wolfram. *Quarterly Journal of the Geological Society of London* **64**, 384-400.

BAYNE, P. 1871. *The life and letters of Hugh Miller.* 2 volumes. Strahan, London.

BENNIE, J. 1894. Arctic plants in the old lake deposits of Scotland. *Annals of Scottish Natural History* **3**(9), 46-52.

BENNIE, J. 1896. Arctic plant beds in Scotland. *Annals of Scottish Natural History* **5**(17), 53-56.

BENNIE, J. and SCOTT, T. 1891. The ancient lakes of Edinburgh. *Proceedings of the Royal Physical Society of Edinburgh* **10**, 126-154.

BENTON, M.J. 1979. *H. A. Nicholson (1844-1899), invertebrate palaeontologist: bibliography and catalogue of his type and figured material. Royal Scottish Museum Information Series, Geology 7*. Royal Scottish Museum, Edinburgh, vii + 94 pp.

BORLEY, L. (ed.) 2003. *Celebrating the life and times of Hugh Miller. Scotland in the early 19th Century. Ethnography and folklore, geology and natural history, church and society*. Cromarty Arts Trust etc., Cromarty, 352pp.

BREWSTER, D. 1866. On the fairy stones found in the Elwand Water near Melrose. *Proceedings of the Royal Society of Edinburgh* **5**, 567-571.

BROWN, C. 1900. Über das Genus *Hybodus* und seine systematische Stellung. *Palaeontographica* **46**, 149-174.

BUCKLAND, W. 1829. On the discovery of coprolites, or fossil fæces, in the Lias at Lyme Regis, and in other formations. *Transactions of the Geological Society of London* (2) **3**, 223-236.

CAMPBELL, R. 1930. John Horne and his contributions to geological science. *Transactions of the Edinburgh Geological Society* **12**, 267-279.

CARRICK MOORE, J. 1849. On some fossiliferous beds in the Silurian rocks of Wigtownshire and Ayrshire. *Quarterly Journal of the Geological Society of London* **5**, 7-12.

CARRUTHERS, W. 1863. Notes on the geology of Swellendam, South Africa. *Proceedings of the Royal Physical Society of Edinburgh* **2**, 108-109.

CLEEVELY, R.J. and COOPER, J. 1981. Edward Charlesworth and the British Natural History Society 3. Material in the British Museum (Natural History). *The Geological Curator* **3**, 99-119.

CLEEVELY, R.J., TRIPP, R.P. and HOWELLS, Y. 1989. Mrs Elizabeth Gray (1831-1924): a passion for fossils. *Bulletin of the British Museum (Natural History) Historical Series* **17**, 167-258.

CROSSKEY, H.W. and ROBERTSON, D. 1867. The Post-Tertiary fossiliferous beds of Scotland. *Transactions of the Geological Society of Glasgow* **2**, 267-282.

CROSSKEY, H.W. and ROBERTSON, D. 1868. The Post-Tertiary fossiliferous beds of Scotland. *Transactions of the Geological Society of*

Glasgow **3**, 113-129.
CURLE, A.O. 1920. *Report for the year 1919-20 by the Director on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, Edinburgh, 16pp.
CURLE, A.O. 1921. *Report for the year 1920-21 by the Director on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, Edinburgh, 23pp.
CURLE, A.O. 1923. *Report for the year 1922-23 on the Royal Scottish Museum*. Cyclostyled type-script, copies in NMS Library, 19pp.
DAVIDSON, R.G. and NEWMAN, M.J. 2003. James Powrie, chronicler of the Scottish Lower Devonian. *Proceedings of the Geologists' Association* **114**, 243-246.
DONOVAN, S.K. 2007. Collectors, curators and the fossil record: a reply to Hope (2004). *Scottish Journal of Geology* **43**, 75-77.
DUFFIN, C.J. 2009. 'Records of warfare … embalmed in the everlasting hills': a history of early coprolite research. *Mercian Geologist* **17**, 101-111.
DUFFIN, C.J. and DAVIDSON, J.P. 2011. Geology and the dark side. *Proceedings of the Geologists' Association* **122**, 7-15.
EGERTON, P.M. de G. 1848. Palichthyologic notes, supplemental to the works of Prof. Agassiz. *Quarterly Journal of the Geological Society of London* **4**, 302-314.
EGERTON, P.M. de G. 1860. Palichthyologic notes. No. 12. Remarks on the nomenclature of the Devonian fishes. *Quarterly Journal of the Geological Society of London* **16**, 119-136.
ETHERIDGE, R. 1878. Notes on a few Silurian fossils from Ayrshire, in the collection of Mrs Robert Gray, Edinburgh. *Proceedings of the Royal Physical Society of Edinburgh* **4**, 164-176.
FORTEY, R.A., HARPER, D.A.T., INGHAM, J.K., OWEN, A.W., PARKES, M.A., RUSHTON, A.W.A. and WOODCOCK, N.H. 2000. A revised correlation of Ordovician rocks in the British Isles. *Geological Society, London, Special Report* **24**, 1-94.
FRASER, H.E. and CLEAL, C.J. 2007. The contributions of British women to Carboniferous palaeobotany during the first half of the 20th Century. *In*: BUREK, C.V. and HIGGS, B. (eds). *The role of women in the history of geology*. *Geological Society, London, Special Publications* **281**, 51-82.
GORDON, J.E. and SUTHERLAND, D.G. 2003. *Quaternary of Scotland*. (Geological Conservation Review Series). Joint Nature Conservation Committee and Chapman and Hall, London, xxi + 695pp.
GREENLY, E. 1928. Benjamin Neeve Peach: a study. *Transactions of the Edinburgh Geological Society* **12**, 1-11.
HALL, A.M. and CONNELL, E.R. 1982. Recent excavations at the Greensand locality of Moreseat, Grampian Region. *Scottish Journal of Geology* **18**, 291-296.
HARRIS, T.M. 1941. Obituary. Sir Albert Charles Seward, F.R.S. 1863-1941. *New Phytologist* **40**, 161-164.
H[EPBURN], D. 1901. Memorial notice of the late James Simpson. *Transactions of the Edinburgh Geological Society* **8**, 32 only.
HORNE, J. 1897. Obituary notice of Hugh Miller. *Transactions of the Edinburgh Geological Society* **7**, 132-138.
HORNE, J. 1903. Obituary notice of the late Mr Bennie. *Transactions of the Edinburgh Geological Society* **8**, 187-193.
H[ORNE], J. 1926. B.N. Peach, F.R.S. 1842-1926. *Proceedings of the Royal Society of London* **B100**, xi-xiii.
HUDSON, J.D. 2003. Hugh Miller's geological discoveries and observations on the Isle of Eigg, as recorded in *The Cruise of the Betsey*, and in the light of modern knowledge. *In:* Borley (2003), 197-214.
HYDROGRAPHIC OFFICE 1868. *North Sea Pilot. Part 2. North and east coasts of Scotland*. 2nd edition. Hydrographic Office, Admiralty, London, x + 248pp.
JAMIESON, T.F., JUKES–BROWNE, A.J., and MILNE, J. 1898. Cretaceous fossils in Aberdeenshire. - Report of the Committee […] to ascertain the age and relation of the rocks in which Secondary fossils have been found near Moreseat, Aberdeenshire. Appendix - on the fossils collected at Moreseat [...]. *Annual Report of the British Association for the Advancement of Science* **for 1897**, 333-342.
JONES, J. 1984. The geological collection of James Hutton. *Annals of Science* **41**, 223-244.
JUDD, J.W. 1874. The Secondary rocks of Scotland. *Quarterly Journal of the Geological Society of London* **29**, 97-197.
KENNEDY, W.Q. 1946. The Great Glen Fault. *Quarterly Journal of the Geological Society of London* **102**, 41-76.
KNELL, S.J. and TAYLOR, M.A. 2006. Hugh Miller: fossils, landscape and literary geology. *Proceedings of the Geologists' Association* **117**, 85-98.
KÖLBL-EBERT, M. 1997. Mary Buckland (née Morland) 1797-1857. *Earth Science History* **16**, 33-38.
KÖLBL-EBERT, M. 2002. British geology in the

early nineteenth century: a conglomerate with a female matrix. *Earth Science History* **21**, 3-25.

LANKESTER, E.R. 1868. On the discovery of the remains of cephalaspidian fishes in Devonshire and Cornwall; and on the identity of *Steganodictyum*, McCoy, with genera of those fishes. *Quarterly Journal of the Geological Society of London* **24**, 546-547.

McCANCE, M. 2002. Hugh Miller, 1802-1856, geologist and writer: his links with 19th Century Girvan. *Ayrshire Notes* **23**, 20-23.

McCOY, F. 1848. On some new ichthyolites from the Scotch Old Red Sandstone. *Annals and Magazine of Natural History* (2)**2**, 297-312.

MacCULLOCH, J. 1814. Remarks on several parts of Scotland which exhibit Quartz-rock, and on the nature and connexions of this rock in general. *Transactions of the Geological Society of London* (1) **2**, 450-486.

MACGREGOR, M. 1916. A Jurassic shore line. *Transactions of the Geological Society of Glasgow* **16**, 75-85.

MARTIN, T.C. 1912. *Report for the year 1911-12 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, Edinburgh, 31pp.

MARTIN, T.C. 1914. *Report for the year 1913-14 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 28pp.

MARTIN, T.C. 1915. *Report for the year 1914-15 by the Director* [...] *on the Royal Scottish Museum, Edinburgh*. His Majesty's Stationery Office, London, 26pp.

[MILLER, H.] 1840. The late earthquakes. *Witness* 22 Jan., [3].

MILLER, H. 1841. *The Old Red Sandstone, or, New walks in an old field*. John Johnstone, Edinburgh.

MILLER, H. 1857. *The testimony of the rocks, or geology in its bearings on the two theologies, natural and revealed*. [First edition], 16th thousand. Constable, Edinburgh, xi + 500pp.

MILLER, H. 1858a. *The Cruise of the* Betsey, *or, a summer ramble among the fossiliferous deposits of the Hebrides*. Constable, Edinburgh, ii + 486pp [first edition, also reissued in facsimile, ed. by Taylor, M.A., NMS Publishing, Edinburgh].

MILLER, H. 1858b. The fossiliferous deposits of Scotland [title only]. *Proceedings of the Royal Physical Society of Edinburgh* **1**, 1 only.

MILLER, H. [the younger] 1884. On fluxion-structure in till. *Geological Magazine* (3)**1**, 472-473.

MILLER, H. [the younger] 1885a. On boulder-glaciation. *Proceedings of the Royal Physical Society of Edinburgh* **8**, 156-189.

MILLER, H. [the younger] 1885b. On fluxion-structure in till. *Annual Report of the British Association for the Advancement of Science* **for 1884**, Reports of the Sections, 720-721.

MILLER, H. 1889a. *First impressions of England and its people*. [First published 1847.] Nimmo, Hay and Mitchell, Edinburgh, xx + 368pp.

MILLER, H. 1889b. *Sketch-book of popular geology*. [First published 1859.] Nimmo, Hay and Mitchell, Edinburgh, xxxvi + 358pp.

MILLER, H. 1890. *The testimony of the rocks, or geology in its bearings on the two theologies, natural and revealed*. [First published 1857.] Nimmo, Hay and Mitchell, Edinburgh, xv + 454pp.

MILLER, H. 1891. *Edinburgh and its neighbourhood, geological and historical; with The geology of the Bass Rock*. [First published 1863.] Nimmo, Hay and Mitchell, Edinburgh, vi + 344pp.

MILLER, H. 1892a. *The Old Red Sandstone, or, New walks in an old field*. [Essentially the 7th and first posthumous edition, published 1857.] Nimmo, Hay and Mitchell, Edinburgh, xxxi+ 385pp.

MILLER, H. 1892b. Geological evidences in favour of revealed religion. *In*: Miller (1892a), 285-296.

MILLER, H. 1892c. On the ancient Grauwacke rocks of Scotland. *In*: Miller (1892a), 297-324.

MILLER, H. 1892d. On the red sandstone, marble and quartz deposits of Assynt; with their supposed organisms and probable analogues. *In*: Miller (1892a), 325-344.

MILLER, H. 1892e. On the corals of the Oolitic system of Scotland. *In*: Miller (1892a), 345-355.

MILLER, H. 1892f. The fossiliferous deposits of Scotland. *In*: Miller (1892a), 356-385.

MILLER, H. 1893. *My schools and schoolmasters*. Nimmo, Hay and Mitchell, Edinburgh, xi + 562pp.

MILLER, H. 1896. *Footprints of the Creator, or the Asterolepis of Stromness*. [First published 1849, as *Foot-prints*...] Nimmo, Hay and Mitchell, Edinburgh, lxxii + 352pp.

MILLER, J. 1859. On the succession of the rocks on the north coast of Scotland. *Quarterly Journal of the Geological Society of London* **15**, 578-584.

MORRISON-LOW, A.D. 1992. William Nicol, FRSE, *c*. 1771-1851, lecturer, scientist and collector. *Book of the Old Edinburgh Club*, new series **2**, 123-131.

MURCHISON, R.I. 1827. On the coal-field of Brora in Sutherlandshire, and some other stratified deposits in the North of Scotland. *Transactions of the Geological Society of London* (2)**2**, 293-326.

MURCHISON, R.I. 1859. On the succession of the older rocks in the northernmost counties of Scotland; with some observations on the Orkney and Shetland Islands. *Quarterly Journal of the*

Geological Society of London **15**, 353-421.

NICHOLSON, H.A. and ETHERIDGE jnr, R. 1878-1880. *A monograph of the Silurian fossils of the Girvan district in Ayrshire, with special reference to those contained in the 'Gray Collection*'. 3 volumes. Blackwood, Edinburgh.

NICOL, J. 1841. On the geology of Peeblesshire. *Transactions of the Highland and Agricultural Society of Scotland*, new series **8**, 149-206.

NICOL, J. 1848. On the geology of the Silurian rocks in the valley of the Tweed. *Quarterly Journal of the Geological Society of London* **4**, 195-209.

NICOL, J. 1857. On the red sandstone and conglomerate, and the superposed quartz-rocks, limestones and gneiss of the north-west coast of Scotland. *Quarterly Journal of the Geological Society of London* **13**, 17-39.

OLDROYD, D.R. 1990. *The Highlands Controversy: constructing geological knowledge through fieldwork in nineteenth-century Britain*. University of Chicago Press, Chicago, ix + 438pp.

OLDROYD, D.R. 1996. The geologist from Cromarty. *In*: Shortland, M. (ed.) *Hugh Miller and the controversies of Victorian science*. Clarendon Press, Oxford, 76-121.

PATON, R.L. 2004. Traquair, Ramsay Heatley (1840-1912). *Oxford Dictionary of National Biography*, online edn [http://www.oxforddnb.com/view/article/48896, accessed 7 Sept. 2010].

PEACH, B.N. 1883a. On some fossil myriapods from the Lower Old Red Sandstone of Forfarshire. *Proceedings of the Royal Physical Society of Edinburgh* **7**, 177-188.

PEACH, B.N. 1883b. On the occurrence of *Pterygotus* and a limuloid in the Caithness Flagstones, and on the nature and mode of formation of 'Adam's Plates'. *Proceedings of the Royal Physical Society of Edinburgh* **7**, 343-350.

PEACH, B.N. 1908. *Monograph on the higher Crustacea of the Carboniferous rocks of Scotland.* Memoirs of the Geological Survey of Great Britain, 82pp.

PEACH, B.N. and HORNE, J., 1881. The glaciation of Caithness. *Proceedings of the Royal Physical Society of Edinburgh* **6**, 316-352.

PEACH, B.N. and HORNE, J. 1908. B. N. Peach, A.R.S.M., LL.D., F.R.S., President 1905-1908. *In*: Macnair, P. and Mort, F. (eds.). *History of the Geological Society of Glasgow, 1858-1908, with biographical notices of prominent members*. Geological Society of Glasgow, Glasgow, 259-264.

PEACH, B.N. and HORNE, J. 1913. *Guide to the geological model of the Assynt mountains*. His Majesty's Stationery Office, Edinburgh, 32pp.

PEACH, C.W. 1858. Notice of the discovery of fossils in the limestones of Durness, in the county of Sutherland. *Proceedings of the Royal Physical Society of Edinburgh* **1**, 23-24.

PEACH, C.W. 1867a. On the fossils of the Boulder Clay of Caithness, N.B. *Proceedings of the Royal Physical Society of Edinburgh* **3**, 38-42.

PEACH, C.W. 1867b. Further observations on the Boulder Clay of Caithness, with an additional list of fossils. *Proceedings of the Royal Physical Society of Edinburgh* **3**, 396-403.

POWRIE, J. and LANKESTER, E.R. 1868-1870. A monograph of the fishes of the Old Red Sandstone of Britain. Part 1. The Cephalaspidae. *Monographs of the Palaeontographical Society*.

RICHARDS, J.T. 1885. On Scottish fossil cycadaceous leaves contained in the Hugh Miller collection. *Proceedings of the Royal Physical Society of Edinburgh* **8**, 116-123.

SECORD, J.A. 1985. John W. Salter; the rise and fall of a Victorian palaeontological career. *In*: Wheeler, A. and Price, J.H. (eds). *From Linnaeus to Darwin: commentaries on the history of biology and geology*. Society for the History of Natural History, London, 61-75.

SECORD, J.A. 2000. *Victorian sensation. The extraordinary publication, reception, and secret authorship of* Vestiges of the Natural History of Creation. University of Chicago Press, Chicago, xix + 624pp.

SEDGWICK, A. and MURCHISON, R.I. 1829. On the geological relations of the Secondary strata in the Isle of Arran. *Transactions of the Geological Society of London* (2)**3**, 21-36.

SEWARD, A.C. 1911. The Jurassic flora of Sutherland. *Transactions of the Royal Society of Edinburgh* **47**, 643-709.

SEWARD, A.C. 1912. A petrified *Williamsonia* from Scotland. *Philosophical Transactions of the Royal Society, London* **B203**, 101-126.

SEWARD, A.C. and BANCROFT, N. 1913. Jurassic plants from Cromarty and Sutherland, Scotland. *Transactions of the Royal Society of Edinburgh* **48**, 867-888.

SHORTLAND, M. 1996. Appendix: a bibliography of Hugh Miller. *In*: Shortland, M. (ed.) *Hugh Miller and the controversies of Victorian science*. Clarendon Press, Oxford, 301-384.

SIMPSON. J. 1887. On reindeer and other mammalian remains discovered by Mr Macfie of Dreghorn in a rock-fissure at Green Craig, Pentland Hills. *Transactions of the Edinburgh Geological Society* **5**, 294-300.

SMILES, S. 1878. *Robert Dick baker of Thurso geologist and botanist*. Murray, London, xx + 436pp.

SMITH, G. 1878. *The life of John Wilson, D.D. F.R.S. for fifty years philanthropist and scholar in the east*. Murray, London, xiii + 652pp.

STEVENSON, S. 2002. *Facing the light. The photography of Hill and Adamson*. National Galleries of Scotland, Edinburgh, 128pp.

STEVENSON, S. 2017. Hugh Miller and the gravestone, 1843-4. *The Geological Curator* **10** (7), 455-461.

TAIT, D. 1912. On a large glacially transported mass of Lower Cretaceous rock at Leavad in the county of Caithness. *Transactions of the Geological Society of Edinburgh* **10**, 1-9.

TAYLOR, M.A. 2002. Man of *Vestiges* – Robert Chambers 200 years on. *Edinburgh Geologist* **39**, 32-35.

TAYLOR, M.A. 2007. *Hugh Miller. Stonemason, geologist, writer*. NMS Publishing, Edinburgh, 176pp.

TAYLOR, M.A. and ANDERSON, L.I. 2015. Additional information on Charles W. Peach (1800-1886). *The Geological Curator* **10**, 159-182.

TAYLOR, M.A. and ANDERSON, L.I. 2017. The museology of a local, national and supranational hero: Hugh Miller's collections and museums over the decades. *The Geological Curator* **10**, 285-367.

THACKRAY, J.C. 1976. The Murchison-Sedgwick controversy. *Journal of the Geological Society of London* **132**, 367-372.

THOMAS, H.T. and BOWER, F.A. 1941. Albert Charles Seward 1863-1941. *Obituary notices of Fellows of the Royal Society* **3**, 867-880.

THOMSON, C.A. and WILKINSON, I.P. 2009. Robert Kidston (1852-1924): biography of a Scottish palaeobotanist. *Scottish Journal of Geology* **45**, 161-168.

THOMSON, J.A. 1916. *Outlines of Zoology*. 5th (US) edition. Appleton, New York, xxi + 855pp.

THOMSON, R.D. 1835. Fairy stones. *Records of General Science* **2**, 1-2.

TORRENS, H.S. 1995. Mary Anning (1799-1847) of Lyme; 'the greatest fossilist the world ever knew'. *British Journal for the History of Science* **28**, 257-284.

TORRENS, H.S. 2003. William Smith (1769-1839) and the search for English raw materials: some parallels with Hugh Miller and with Scotland. *In*: Borley (2003), 137-155.

TRAQUAIR, R.H. 1871. Notes on the genus *Phaneropleuron* (Huxley), with a description of a new species from the Carboniferous formation. *Geological Magazine* (1)**8**, 529-535.

TRAQUAIR, R.H. 1877. On new and little-known fossil fishes from the Edinburgh district. No. III. *Proceedings of the Royal Society of Edinburgh* **9**, 427-444.

TRAQUAIR, R.H. 1877-1914. The ganoid fish of the British Carboniferous formations. Part 1. Palaeoniscidae. *Monographs of the Palaeontographical Society*.

TRAQUAIR, R.H. 1878. On the genera *Dipterus*, Sedgw. and Murch., *Palaedaphus*, Van Beneden and De Koninck, *Holodus*, Pander and *Cheirodus*, McCoy. *Annals and Magazine of Natural History* (5)**2**, 1-17.

TRAQUAIR, R.H. 1880. [Presidential address, on the history of research on Scottish Palaeozoic fossil fishes.] *Proceedings of the Royal Physical Society of Edinburgh* **5**, 137-161.

TRAQUAIR, R.H. 1884. Remarks on the genus *Megalichthys*, Agassiz, with description of a new species. *Geological Magazine* (3)**1**, 115-121.

TRAQUAIR, R.H. 1893a. [Presidential address on natural history museums.] *Proceedings of the Royal Physical Society of Edinburgh* **11**, 173-191.

TRAQUAIR, R.H. 1893b. On the British species of Asterolepidae. *Proceedings of the Royal Physical Society of Edinburgh* **11**, 283-286.

TRAQUAIR, R.H. 1894. On a new species of *Diplacanthus* with remarks on the acanthodian shoulder girdle. *Geological Magazine* (4)**1**, 254-257.

TRAQUAIR, R.H. 1894-1914. A monograph of the fishes of the Old Red Sandstone of Britain. Part 2. The Asterolepidae. *Monographs of the Palaeontographical Society*.

TRAQUAIR, R.H. 1905. Hugh Miller and his palaeichthyological work [abstract]. *Transactions of the Geological Society of Glasgow* **12**, 257-258.

TREWIN, N.H. (ed.) 2002. *The geology of Scotland*. 4th edition. Geological Society, Bath, 576pp.

TREWIN, N.H. 2003. Hugh Miller's fish; 'the winged *Pterichthys*'. *In*: Borley (2003), 168-176.

TURNER, R. 1927. *Descriptive catalogue of the geological collection in the Chambers Institution, Peebles*. Thin, Edinburgh, ix + 206pp.

WILD, R.P. 1920. Notes on the rock specimens in the Museum. *Museum Publication of Cheltenham Art Gallery and Museum* **1**, 1-49.

WILDING, R. 2005. D.H. Scott and A.C. Seward: modern pioneers in the structure and architecture of fossil plants. *In*: Bowden, A.J., Burek, C.V. and Wilding, R. (eds). *History of Palaeobotany: Selected Essays. Geological Society, London, Special Publications* **241**, 153-160.

WILLIAMS, A. 1962. The Barr and Lower Ardmillan Series (Caradoc) of the Girvan District, south-west Ayrshire, with descriptions of the Brachiopoda. *Memoir of the Geological Society of London* **3**, 1-255.

YOUNG, J. 1866. On the affinities of *Platysomus* and allied genera. *Quarterly Journal of the Geological Society of London* **22**, 301-317.

ZITTEL, K.A. von (ed. and tr. EASTMAN, C.R.) 1900-1902. *Text-book of paleontology* [...]. 2 volumes. Macmillan, London.

THE FIRST KNOWN STEREOPHOTOGRAPHS OF HUGH MILLER'S COTTAGE AND THE BUILDING OF THE HUGH MILLER MONUMENT, CROMARTY, 1859

by M. A. Taylor and A. D. Morrison-Low

Taylor, M. A. and Morrison-Low, A. D. 2017. The first known stereophotographs of Hugh Miller's Cottage and the building of the Hugh Miller Monument, Cromarty, 1859. *The Geological Curator* 10(7): 429 - 445.

Two early stereophotographs of Hugh Miller's birthplace cottage at Cromarty have separate provenances and their original photographer is unknown, but they were apparently taken at the same session and from almost the same location. One shows the Hugh Miller Monument under construction. The monument's planning, funding and building are outlined. It was completed in June/July 1859, with a statue of Miller by Alexander Handyside Ritchie. Combined with the state of foliage in the trees, this dates the photographs to about April/May 1859. The photographs provide useful evidence for the generally deteriorating condition of the cottage when combined with other images of the 1850s and 1860s. The production of stereophotographs for the commercial market complements contemporary accounts which confirm that Miller's birthplace was on the tourist trail even at this early date, well before the family renovated the cottage and opened a museum there in the mid-1880s. The monument played a significant part in encouraging this early tourism. It remains the only statue of Hugh Miller in an outdoors location.

M. A. Taylor, Research Associate, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh EH1 1JF, Scotland, and Honorary Research Fellow, Department of Museum Studies, University of Leicester. Email mat22@le.ac.uk; disambiguator: http://orcid.org/0000-0002-1495-8215; and A. D. Morrison-Low, Research Associate, Department of Science and Technology, National Museums Scotland, Chambers Street, Edinburgh EH1 1JF, Scotland. Email a.morrison-low@nms.ac.uk. *Received 25 November 2016. Accepted 31 July 2017.* **All correspondence to M. A. Taylor.*

1. Introduction

One way in which Hugh Miller (1802-1856), geologist, editor and writer, has been commemorated is by the preservation of his birthplace cottage at Cromarty, now held by the National Trust for Scotland as part of the Hugh Miller Birthplace Cottage and Museum (Gostwick 2005; Alston 2006; Taylor 2007; Taylor and Anderson 2017). Another memorial to Miller is the Hugh Miller Monument, a statue atop a column built on top of the Kirk Brae, the old fossil sea-cliff behind the birthplace cottage (also Kirkie Brae; Scots *brae* = steep hill or slope, *kirk* = church, diminutive *kirkie*, referring to the churches at the brae's head and foot).

In this paper we report the finding, in separate collections held by National Museums Scotland, of two stereophotographs of the cottage, apparently taken at the same session by the same photographer, as a result of the kindness of Mrs Alma Howarth-Loomes and Dr Bruce Elliott, Carleton University, Ottawa. One stereophotograph includes a distant view of the Hugh Miller Monument, still under construction. Little has been published about the monument and we here outline its history in some detail for the first time, showing how its fundraising clashed with that for the purchase of the Miller collection for the Natural History Museum in Edinburgh (now part of National Museums Scotland; Taylor and Anderson 2017). We date the monument's completion accurately. We can therefore identify these images as the earliest surviving photographs and earliest known stereophotographs of the cottage. We assess who might have taken the photographs and their role in the local tourist industry, and what the photographs show as evidence for the evolution of the cottage and the heritage industry that developed around Cromarty's most famous son.

Sources and abbreviations. Newspapers tended to copy each other extensively at this time, often explicitly, and we give only a selection of reports, giving the likely original reports where possible. The

Inverness Courier, owned and edited by Miller's friend Robert Carruthers (1799-1878), is particularly useful as it had good coverage of the monument story and is searchable online. Online newspaper archives used include: *British Library British Newspapers 1600-1900; British Newspaper Archive*, www.britishnewspaperarchive.co.uk; and index in *Am Baile*, the High Life Highland website for local history and culture, www.ambaile.org.uk. *The Witness*, which Miller edited and which was still partly owned by his family till 1864, is not yet online; print copies exist in, for example, NLS and the University of Edinburgh's New College Library. Abbreviations: NLS, National Library of Scotland, Edinburgh, www.nls.uk; NMS, National Museums Scotland, Edinburgh; NRS, National Records of Scotland, Edinburgh (some data accessed via www.scotlandspeople.gov.uk); OS, Ordnance Survey maps accessed through www.nls.uk; SNPG, Scottish National Portrait Gallery, National Galleries of Scotland, Edinburgh.

2. Provenance and origin of the photographs

The two stereophotographs which form the subject of this paper arrived independently in the collections of NMS during the 2000s. There is no reason to doubt that they had been separately owned since their original and almost certainly commercial production. The first (Figure 1) came in as a part of the enormous collection of around 18,000 stereophotographs formed over many years by the late B.E.C. Howarth-Loomes, currently on loan to NMS, but generously promised as a future bequest by his widow (loan number NMS IL.2003.44.6.2.244). The provenance of this collection, put together from the early 1960s until his death in 2002, is essentially unknown as the Howarth-Loomeses acquired material from assorted dealers, markets, antique shops and other places, but without noting which items came from where (Morrison-Low 2015). The second item (Figures 2, 3) was found by Dr Bruce Elliott at an antiques fair in Canada in late 2008, and given to one of the authors who presented it to NMS, as it was easier to deal with the accession paperwork this way (accession number NMS T.2009.192).

Each pair of images was made using a pair of wet collodion negatives exposed in a stereoscopic camera and then fixed; positive pairs were produced from these on albumenised paper, developed, and then pasted on to slightly larger cards. In both examples, a handwritten explanation has been written on the back of the cards. The card in Figure 1 reads: 'House in which / the late Hugh / Miller, the cele - / brated geologist, / was born, Cromarty.' The text on the back of the card in Figure 2, with the view of the monument, is almost exactly the same, with an additional sentence: 'The monument, in / course of erection, to his / memory is seen in the / distance' (Figure 3). The writing appears to be the same hand in both exam-

Figure 1. Hugh Miller's Cottage, Cromarty. Stereo albumen prints from wet collodion nagatives, NMS.IL.2003.44.6.2.244. The photographer was standing in what was probably then a herring curing yard. The cottage is on the other side of Church Street, which runs from right to left but is concealed by a low wall on this side. The cottage's nearer gable end, only partly visible here behind the tree, abuts onto the roadway so that the long axis of the building is at right angles to the street. Just visible on the left edge of the images is the corner of what is today called Paye House. Compare the modern view in Taylor and Anderson (2017, Figure 5). Courtesy and copyright Howarth-Loomes Collection at National Museums Scotland.

Figure 2. Hugh Miller's Cottage, Cromarty. Single image from stereo albumen prints from wet collodion nagatives, NMS.T.2009.192. The viewpoint is slightly different from that of Figure 1, opening up a view of Hugh Miller's Monument on Kirk Brae which can be seen in the distance, over the crow-steps of the further gable end of the cottage. Courtesy and copyright National Museums Scotland.

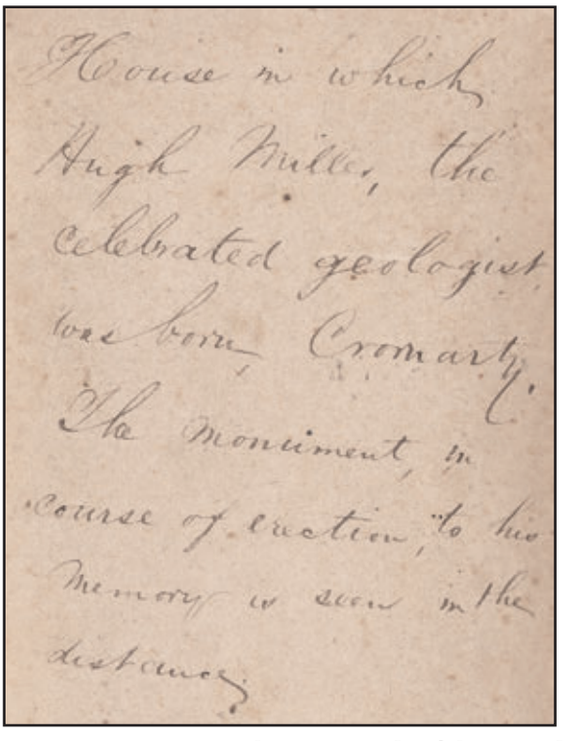


Figure 3. Inscription on the reverse side of the second stereophotograph, NMS.T.2009.192. Courtesy and copyright National Museums Scotland.

ples, surely by the original photographer or one of his staff. This implies production by a small commercial concern, as larger operations would have used ready-printed cards. Admittedly, amateurs could produce stereo images from the mid-1850s, if with difficulty, but the annotations here are not personal enough for us to consider that these examples came from anyone other than a commercial photographer.

Stereophotography was still a new technique when these photographs were taken (Stevenson and Morrison-Low 2016). It was devised for use with the daguerreotype process and was first publicly shown at the Great Exhibition of 1851. This allowed two slightly-differing photographs taken side by side to be seen in a viewer, in which the brain merged the two images into a three-dimensional scene. The Victorians were enthralled. But the daguerreotype process was too expensive and slow to keep up with the enormous demand; and the nature of the calotype gave the image a fibrous and blurred result. Fortunately, there was a new form of positive/negative photography, the wet collodion process, which used a glass carrier for the negative and sensitised albumen paper for the positive. This was developed by Frederick Scott Archer who published his method in early 1851. This allowed both amateur and professional photographers to use his process without paying a licence fee, as had been mandatory for both the preceding daguerreotype and calotype processes. Additionally, the wet collodion process was both faster and cheaper than either, producing a sharp negative on glass; it was more robust than the paper calotype negative which could tear while wet; and the daguerreotype was a single, reversed positive process, so that if one wanted further copies, one had to take new photographs. However, photography still remained a messy, smelly and awkward business. Nevertheless, this was the point at which photography became an industry. With the new free process, the numbers of professional studios mushroomed: in 1851 there were about a dozen studios in London; by 1866 there were over 280. One of the forms of photography supplied to a seemingly insatiable market was the stereophotograph in the form of a double albumen print on a card, that could be viewed in the comfort of the aspiring middle-class owner's drawing-room. Hundreds of thousands of stereo images were produced and bought by a seemingly insatiable public during the 1850s and 1860s. In 1854, George Swan Nottage set up the London Stereoscopic Company, the first of a number of entrepreneurs happy to help supply this demand. 'No home without a stereoscope' was the company slogan, and in due course it became the largest photographic publishing company in the world. Others would jump on this particular bandwagon and act as wholesalers for many individual photographers: Francis Bedford, Francis Frith, and, in Scotland, the Aberdonian

George Washington Wilson (Taylor 1981; Nickel 2004; Spencer 2011).

Much of the output of these companies related to what became known as 'armchair tourism'. Bedford's views of rural England and Wales helped the growth of visitor numbers to beauty spots. The 1850s saw the growth of Thomas Cook's travel business initiated in 1841. Frith abandoned grocery to travel up the river Nile with his stereo camera. George Washington Wilson, originally an artist, was given his big break into photography by Royal patronage, when he was invited to go to Balmoral in 1854 and take photographs of the new castle which Prince Albert and Queen Victoria were building there.

3. The appeal for the Hugh Miller Monument

An early suggestion of a stone monument to Miller, some two weeks after his death, came in a pseudonymous letter to the *Scotsman* by 'Beatus Martinus' (1857). This was perhaps Sir Theodore Martin (1816-1909), man of letters, translator, and biographer of Prince Albert (Sara Stevenson, pers. comm. 2016). Referring to the famous calotype photographs of Miller by D.O. Hill and R. Adamson (Stevenson 2017, and see below), 'Martinus' wrote:

> Have you seen Mr Hill's calotype of Hugh Miller? - standing in his mason's dress, with his brawny arms bare, his left hand holding the chisel, and resting on a gravestone, his right grasping the 'mell' - I don't know a grander embodiment of genius and power. The whole of him is there [...] Now, if we are going to raise a monument to him, let us get a huge block of his own 'old red sandstone', and let his figure, as in the calotype, be cut out of it, leaving a background of the rock, and let it be hewn broad, forcible, and grand, like the man himself [...]

To build a monument must have been an obvious idea. So it is not known whether the *Scotsman* letter actually influenced events in Cromarty, where a public meeting was soon held on 23 February, called by Provost Robert Ross (c. 1792-1878), Cromarty merchant and bank agent, and Miller's old employer at the Commercial Bank (Anon. 1857a; Provost: Scots, mayor). The meeting decided to raise funds for a monument to show the regard in which Miller was held in the area. Local donations soon started coming in (Anon. 1857d). The appeal was extended to Edinburgh with a launch at a lecture about Miller. It encouraged small donations from working men of a shilling (in United Kingdom pre-decimal currency, one pound (£1) = 20 shillings (20s)). Advertisements were placed in newspapers with the formation of an Edinburgh committee to complement the Cromarty one (Anon. 1857e, 1857f, 1857g, 1857h). The Cromarty committee called in the collected donations in May, keen to develop specific proposals once they had some idea of the budget with which they could work (Anon. 1857i, 1857j, 1857m; R. Ross 1857a). The results from outside Cromarty were disappointing, as 'One of the Committee' stated in a (presumably unofficial) letter to several newspapers (Anon. 1857n, 1857o, 1857p). He also identified a lack of response from Free Church ministers, as already noted for the parallel public appeal to purchase Miller's fossil collection for an Edinburgh institution (Taylor and Gostwick 2003; Taylor and Anderson 2017). This perhaps reflected persistent ill-feeling from Miller's clashes with the ruling clique in the Free Kirk. But perhaps Miller's work on behalf of the Kirk had already been forgotten. Free Kirk ministers were, in any case, dispersed over Scotland, and often poorly paid, so they might have been slow to respond at the best of times.

The unfortunate story of Cromarty's last monument-to-be, in memory of James Thomson (1823-1854), another native, was unhelpfully raked up again (Anon. 1857k). Assistant Surgeon Thomson of the 44th (East Essex) Regiment had died of overwork and cholera while tending Russian prisoners of war after the Battle of the Alma in the Crimea. The principal fundraiser chose a site on the hill above Cromarty without bothering to consult the landowner, Colonel George Ross of Cromarty. Colonel Ross pointed out that this would force the felling of some of his trees, while his existing plantings would soon grow as to obscure the monument. He offered alternative sites. One was on the Kirk Brae, just yards from that later occupied by the Miller Monument, and was well supported locally. It had been suggested by Miller himself who 'took a spade and turned over a turf, saying, that was the spot' (Anon. 1858p; [Miller] 1856; G.W.H. Ross 1858b). But the fundraiser took such umbrage at being denied his first choice that he refused the moneys collected at Cromarty, replaced them out of his own pocket, and built the monument at Forres on the other side of the Moray Firth. This greatly embarrassed his Cromarty supporters, leading to an unedifying correspondence in the newspapers, and forcing the unfortunate Provost and Colonel into public defences of their actions, partly to head off any risk that the Thomson affair should discourage donations to the Miller project (Anon. 1857y, 1858a, 1858c; G.W.H. Ross 1858a, 1858b; R. Ross 1857b).

The Thomson affair was a local problem, but the Cromarty committee did also face a more general

problem of competition from the proposal to buy the Miller collection for the museum in Edinburgh, and an abortive proposal to endow a professorship in natural science at the Free Church of Scotland College (Taylor and Anderson 2017). One correspondent suggested that some people conflated these other proposals with the Cromarty project or assumed that they had superseded it (Anon. 1857q). But Provost Ross had already noted it 'probable that many of the higher classes may reserve the greater part of their subscriptions' for the Edinburgh proposals and stressed the importance of focussing on less wealthy donors by encouraging donations even as small as a shilling (R. Ross 1857b).

The Cromarty committee issued a revised donor list at the end of August (Anon 1857r). It included Miller's fellow geologists the Duke of Argyll (£3) and Charles W. Peach, whose 10s was a much greater proportion of his income (Anderson and Taylor 2008). Another was Robert Fairly, Miller's printer-partner in *The Witness* (£5). *The Inverness Courier*, edited by Miller's old friend Robert Carruthers, thought the cumulative total of some £122 'quite unworthy' and far too little for a decent monument. Little had come from Inverness, Edinburgh, Glasgow, and the 'wealthy towns of the south' (Anon. 1857s). Carruthers made a 'call on our brethren of the press' to publicise the project and a number of other newspapers responded (e.g. Anon. 1857t), though the *Fife Herald* thought part of the problem was the lack of a network of active local organisers (Anon. 1857u). The results were still disappointing, one donor expressing his 'deep sense of humiliation' that Miller's services should attract such a paltry response (Burns 1857). And a London newspaper, the *Morning Advertiser*, commented that 'the thing must be considered a failure' and would 'be a deep and lasting reproach to Scotland' (Anon. 1857x).

Provost Ross made a fresh start in February 1858 with a letter to *The Inverness Courier* (R. Ross 1858), appealing for more funds to bring the project to a decent completion. He explained that recently the committee had not felt it prudent to push their fundraising as much as would have been desirable. This was because of 'losses and anxieties in mercantile affairs' (presumably the financial crisis and bank crash which took place in the United States in mid-1857 and spread to the U.K.), and the 'state of India' (the Indian Rising of 1857, presumably because of the ensuing economic uncertainty and competing demands for charitable giving, for humanitarian relief). Nevertheless, they had now raised £183. His list of new donations included gifts from Miller's Elgin friends Patrick Duff and Isaac Forsyth, and more than £20 evidently collected by expatriates and sent through Miller's brother-in-law, the Rev. T.M. Fraser, Free Church minister in Singapore (Anon. 1858b). Ross now solicited further donations to bring them up to the £300 quotation they had received from a sculptor. But, despite further collecting, especially in Glasgow where subscription lists were opened in the Royal Exchange and other places (Anon. 1858d), matters still went slowly, perhaps because of competition from the Edinburgh collection appeal. By the end of April, only another £20 had been added, including ten guineas from Roderick Murchison, and the committee had to put off for the moment whether to go ahead with a contract or even to choose the 'style of monument' (Anon. 1858e, 1858f). Further donations, including more than £62 collected in Glasgow (Anon. 1858g), finally enabled the committee to issue a formal invitation on 28 July for designs and estimates. Their notice specified a maximum budget of £300 for a monument on the 'Kirky Brae', to include £10 contingency allowance and an iron railing around the whole (Anon. 1858h).

4. The building of the Monument

Figure 4. Detail from Figure 2, with enhanced contrast, showing Hugh Miller's Monument under construction, surrounded by scaffolding. The column shaft is well on the way to completion, but appears to lack the capital and the statue. Courtesy and copyright National Museums Scotland.

The design chosen was of a 'Grecian Doric column and statue', the column to be executed by the contractor, one Thos. Watson of Edinburgh, and the statue by 'Handyside Ritchie', that is, Alexander Handyside Ritchie (1804-1870) (Anon. 1858i, Anon. 1858j; University of Glasgow History of Art and HATII 2011a).The *Inverness Advertiser* helpfully explained that Ritchie had 'executed the sculptured figures on the Caledonian Bank here [in Inverness], and is well known for his various artistic labours throughout the country' (Anon. 1858k).

The Hugh Miller Monument's foundation stone was formally laid with due ceremony on the cold and clear afternoon of 24 November 1858 (Anon. 1858p, 1858q). The ceremony was watched by five or six hundred local people - 'a more sympathetic and intelligent-looking body of spectators could not be found in any town in the kingdom' (Anon. 1858p). The principals were the Cromarty freemasons, Provost Ross leading Miller's young son Hugh (1850-1896) by the hand, the burgh magistrates and council, and the Rev. McEachran, Free Church minister of Cromarty. The formal laying of the stone was supervised by one Alexander Williamson, Miller's cousin (and son of his first master).

The British Association for the Advancement of Science had just held its annual meeting in Leeds that September of 1858. Roderick Murchison commented in passing, during a paper on geology, that he had visited the site of the monument, due to be completed the next year, and that 'at his […] urgent request the statue of the historian of the old red sandstone will be constructed of that material' (Anon. 1858l, 1858m). However, at least one report specified 'column' rather than 'statue' (Anon. 1858o, p. 469), and Murchison was unhelpfully reported as saying 'monument' when he returned to the theme at a soirée of the local mechanics' institute (Anon. 1858n). Most of the monument, though perhaps not the statue, was indeed built with local Old Red Sandstone, though probably for economy as much as sentiment; the committee had already notified potential tenderers that a 'good Yellow Sandstone can be had, with carriage to the site, for about 6d per foot' (Anon. 1858h).

The base of the monument was said to be of Old Red Sandstone from 'the shore quarry, the first scene of Mr Miller's labours and of his geological researches' (Anon. 1858p). This 'first scene', where Miller famously observed fossil ripple-marks, was a quarry on the west coast of the Black Isle, on the Bay of Cromarty in the old fossil coastline. It was evidently somewhere near where the side road from Rosefarm meets the coast road from Cromarty. However, it has often been confused with a site at Navity on the east coast of the Black Isle, to which Miller's gang had soon moved (Taylor 2007; Gostwick 2013). But the Cromarty organisers do seem to have made a point of using the true first quarry, or at least one near it and effectively part of the same outcrop in the same fossil sea-cliff. An Admiralty chart of about this time marks a 'Quarry of Red Sand Stone' at the likely location of the first quarry, or possibly a little further west along the coast (*Scotland N. E. Coast. The Firth of Cromarty*, revised to March 1853; NLS Admiralty Chart 2167, http://maps.nls.uk/coasts/admiralty/3235). Plainly the quarry was conspicuous enough in the 1850s to be a useful sea-mark, at least within the narrow Firth of Cromarty, so perhaps it was active. The locals certainly claimed to remember the site. At a public meeting at Aberdeen to discuss Government proposals for university reform, one William Lindsay, a bookseller, noted the need to remember the education of the less well off. He cited the respect in which Miller was held at Cromarty: 'you will find (if you mix with the working folks [...]) that young and old will manifest the greatest delight in taking you to the quarry where Hugh Miller used to work. They will show you what were his favourite walks - nay, [...] how he used to carry his hammer in his pocket' (Anon. 1859a). This is consistent with the conventional 'first quarry' being the correct one, easily accessed by a gentle amble along the flat shore road, than at Navity, which needs a hill climb and walk down a steep slope to the shore. One account of the monument also specified this first quarry as being 'about a mile to the west', which is in the right direction, though a mile or two short on distance (Anon. 1859g, 1859h).

Apart from the base, the 'rest of the work' was to be built of a more durable 'yellowish' sandstone from the quarry at Davidston (Anon. 1858p), some distance further south-west from Cromarty than the first quarry. There seems no reason to doubt that this was carried out, though later reports usually just refer to 'old red sandstone'. One even suggested that this yellow stone was inappropriate, perhaps confusing non-geologists expecting the Old *Red* Sandstone (Anon. 1860).

The more-than-life-size statue of Miller was evidently carved in Handyside Ritchie's workshop in Edinburgh in two parts, apparently meeting horizontally at the waist, and together weighing three tons (Anon. 1859b, 1859c, 1859d; Figure 5). It is, unsurprisingly, hard to identify this stone from ground level, especially as the seagulls which habitually use Miller's head as a convenient perch have stained the statue with guano, resulting in algal growth to add to the lichens. However, some remarks may be made (Lyall Anderson, Bob Davidson, Andrew McMillan and Nigel Trewin, pers. comms. 2016). The colour and weathering of the statue differ perceptibly from those of the Davidston stone of the column (which includes probably the capital or pedestal on which Miller stands). Perhaps a stone obtained in Edinburgh was used for the statue. This would save the cost of transporting large unhewn blocks from Cromarty to Edinburgh, even if Davidston yielded stone of the right size and sculptural quality. This immediately suggests one of the massive sandstones of Carboniferous age then routinely used in Edinburgh (McMillan *et al.* 1999). Handyside

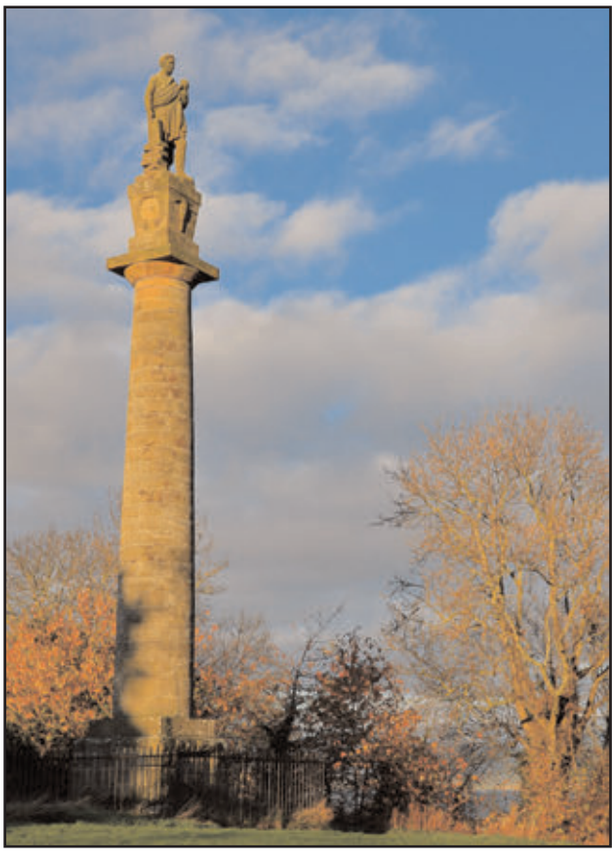


Figure 5. Modern photograph of Hugh Miller's Monument, Cromarty, in the warm sunlight of late afternoon. Courtesy and copyright R. G. Davidson.

Ritchie is known to have worked with several such stones, for instance, those from Binny around 1851 (a large statue of Queen Victoria; McMillan *et al.* 1999, p. 138), Redhall about the same time (Anon. 1851, vol. 1, p. 135), Bishopbriggs/Kenmure near Glasgow some years later (Anon. 1857z), and even Swinton in Berwickshire (Anon. 1861). Using one of those would certainly be consistent with the apparent lack of any press report of what stone was used for the statue - surely something to highlight if Miller had been carved in Old Red Sandstone, and raising a suspicion that the matter was being tacitly ignored by the committee. Having Miller carved, not in his own Old Red Sandstone, but something from the Midland Valley Carboniferous, was still appropriate, for Miller had been just as happy hunting for fossils in the Lothian rocks and writing about them, as on his native Old Red. But it would not have been the same to his Cromarty compatriots.

5. The completion - but not inauguration? - of the Monument

In late June 1859, the column was completed and the statue was delivered to Cromarty by steamer for installation, arriving by 28 June (Anon. 1859b, 1859c, 1859d). A description in *The Witness* for 9 July, and an account of a visit to Cromarty, confirm that the 'monument now erected' was complete by mid-July, including the inscription on the base (Figure 6), except possibly for details such as the iron railing (Anon. 1859g, 1859h, 1859r).

We have found no report of any formal inauguration, despite the committee's apparent aspirations. This seems unlikely to be a failure of press coverage or online searches, so probably there never was an inauguration. Further scrutiny suggests how this might have come about. It had been announced in 1857 that the British Association for the Advancement of Science was meeting in Aberdeen in that September of 1859, within striking distance of Cromarty. Even then, in 1857, this gave rise to suggestions of a possible excursion to Cromarty because of its links with Miller in general (Anon. 1857w, 1857aa). As the Hugh Miller Monument grew towards completion in the summer of 1859, those notions evolved into a suggestion that Sir Roderick Murchison should inaugurate it that September. The *Inverness Advertiser* stated in late June 1859 (Anon. 1859d) that '[i]t is rumoured that the committee will avail themselves of [Murchison's] presence [...] to offer him the honour of presiding at the inauguration', and this was picked up by other newspapers (e.g., Anon. 1859e). *The Witness* made similar remarks on 2 July when it reported the arrival of the statue at Cromarty (Anon. 1859f), but a week later it acknowledged that Murchison's involvement was still up in the air

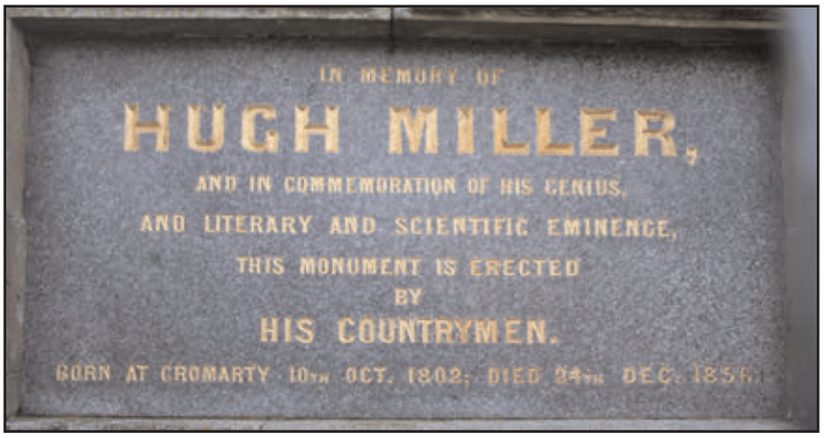


Figure 6. Inscription at the base of Hugh Miller's Monument, Cromarty.

(Anon. 1859g). *The Witness* was, of course, Miller's newspaper, and was still jointly owned by his former partner Robert Fairly and by Lydia Miller, Hugh's widow (partly in trust for her children). It is not known whether Lydia Miller approached Murchison directly, but interestingly one delegate spotted Lydia at the 1859 British Association meeting - or at least she was present in Aberdeen at the same time, although she is not known to have been an attendee at Association meetings (Pengelly 1897, p. 87, whose mention of family friends Charles Peach and the Rev. William Symonds pretty much clinches her identification). One wonders if she was still hoping for something to happen with the monument. Murchison made a point, in a session of the Geological Section, of showing round a photograph of Miller by J.G. Tunny as a 'striking likeness' (Anon. 1859i); perhaps Lydia had just given it to him.

It is not clear whether the Cromarty committee had assumed that the inauguration of the monument would take place during an official 'Brit Ass' outing to Cromarty, or be completely separate. Be that as it may, the Association's sole organised geological excursion was to Elgin, 'district of the fossil reptiles' (Anon. 1859m). This is not surprising. Elgin was closer to Aberdeen and easily accessible on a new railway, as well as being highly topical. The reptiles themselves were (and remain) of considerable scientific interest. Moreover, there was a long-standing controversy over the dating of the parent sandstone and, therefore, of the reptiles, directly feeding into a major theoretical debate on the existence and nature of progress in the fossil record (Benton 1983). In any case, Murchison, in particular, and some of his most eminent geological colleagues did not go on this outing. As important members of the Association, they were routinely invited by each year's President to his local country seat; that year, it was Prince Albert at Balmoral - and a royal invitation was never easily refused (Anon. 1859n, 1859o).

It seems unlikely that Murchison had inaugurated the Hugh Miller Monument on his way from Highlands fieldwork to the British Association meeting. *The Witness* does not appear to carry any such story from 9 July onwards to the reports of the British Association. And Murchison himself mentioned no such event when he 'warmly eulogized the labours of his lamented friend, Hugh Miller; and expressed his satisfaction at having seen, in a recent excursion to Cromarty, the monument erected to the memory of that truly eminent man' (Anon. 1859l; also Anon. 1859j, 1859k). But 'excursion' need not mean an organised field trip, and it is even possible that Murchison only viewed the monument from, for example, the deck of a passing steamboat. Murchison was under pressure that summer, for his interpretation of the geology of the Highlands had been challenged, with serious implications for his academic and political credibility as director of the Geological Survey, and its spending of public funds (Oldroyd 1990). He must therefore have been preoccupied with fieldwork in the North-West Highlands, and with preparing and delivering a keynote paper on their structure at the British Association meeting. Cromarty was a natural waypoint from his field area to Aberdeen, but he might well have been too busy or uncontactable, or his travels too unpredictable, for anything to be arranged with the Cromarty committee. Of course, once the committee's first choice of Murchison had become public knowledge, accurately or not, they would have found it embarrassing to invite anyone else as so obviously second best. Perhaps they simply let the matter drop, especially as months had passed since completion. At least they had a fine foundation ceremony.

Reaction to the completed monument seems to have been generally positive (Figures 5, 6). One report judged that the sculptor had 'on the whole, been very successful in transferring to the stone the stalwart form and highly intellectual lineaments of the late editor of *The Witness*. A graceful effect has been obtained by the fall of the plaid, which, crossing the shoulders, descends from the back in ample folds, and imparts somewhat of a classical aspect [...]. The figure is full of quiet dignity, and will be recognised as a very faithful transcript of the form and features of one whose memory his countrymen will long cherish. […] Great pains have been taken by Mr Ritchie to secure a correct representation of the deceased, and every means available were placed within his reach' (Anon. 1859b). Those 'means' must have included the famous calotype photographs of Miller by Hill and Adamson, for whom Ritchie had himself also sat (Stevenson 1981, pp. 91, 101, 157, 163-164, 170; Stevenson 2017; Sara Stevenson, pers. comm. 2016). *The Witness* found the statue's 'likeness [of Miller] exceedingly good. It combines the calm force and intensity of Mr Brodie's bust, with the tenderness and subdued melancholy expressed in that by Mr Gall' (Anon. 1859c). The Brodie bust is now in SNPG. The Gall sculpture is, we assume, the 1851 work by James Gall Junior (1808-1895), publisher who was active in the Free Church, but we do not know its current location (University of Glasgow History of Art and HATII 2011b).

The Cromarty folk and their visitors also seem to have been pleased with the statue and monument. A Royal Navy sailor from the visiting gunboat H.M.S. *Lizard* was decidedly unimpressed with Cromarty in 1861, and awarded the monument the rather back-

handed compliment of being the 'only object of interest' (Anon. 1904). There is a fascinating account of a whirlwind tour of Miller country in July 1859 by one 'J.R.' (Anon. 1859r). 'J.R.' is a very common pair of initials in Scotland, but we have attempted to identify him in view of the suggestion by Sara Stevenson (pers. comm. 2016) that he was the 'John Robertson' featuring beside Miller in the calotype photographs of journalists covering the Disruption of the Church of Scotland taken by D.O. Hill and R. Adamson (Stevenson 1981, p. 170). Our J.R.'s return to work on the train through Kinloss places his final destination anywhere from Lossiemouth through Fraserburgh and Aberdeen to Penzance, in the then incomplete state of the Highlands rail network. However, his reference to living on granite points to Aberdeen or Peterhead, or one of the nearby inland granitic tracts, consistent with hearing Murchison speak of the monument at the British Association meeting (or at an extramural event) in Aberdeen that summer. In fact, one John Robertson (1811-1875), journalist and native of Aberdeen, had indeed reported on the Disruption in 1843 (Robertson 1842, 1843; Miller 1844; Anon. 1875; A. Lohrli, entry for John Robertson, Dickens Journals Online, http://www.djo.org.uk/indexes/authors/john-robertson.html accessed 25 November 2016; Wellesley Index Online). Still more promisingly, he was also said to be interested in the sea, and to have written about fisherfolk (as Miller did) and on marine life, including a study of the boring mechanism of the mollusc *Pholas*, if we believe his 1875 obituarist. A book on Clyde marine life by a man of the same name includes, amongst other things, an account of *Pholas* and quotes from Miller (Robertson n.d., pp. 135-136). But it also shows that the author was probably born and certainly brought up beside the Firth of Clyde, and was still very much alive in 1893, when he perhaps wrote it and certainly dedicated a copy (now in the Smithsonian Institution, Washington D.C.; endpapers, https://archive.org/stream/animallifeonshor00robe#page/n5/mode/2up, accessed 25 November 2016; Moore and Gibson 2006; Overstreet 2013). Plainly two different John Robertsons those are, while the question of the identity of ‘J.R.’ remains open.

At any rate, the J.R. who visited Cromarty evidently had little geological experience, but he still borrowed a hammer and chisel, and went nodule-cracking at Miller's classic sites at Eathie and then Cromarty. He noted ample evidence of past collecting by previous visitors including Miller himself. 'J.R.' called on Miller's mother, Mrs Williamson, in the birthplace cottage and had a chat with her. No doubt it helped that the guide he had engaged happened to be a relative of her husband, Miller's stepfather. In a suitably Victorian sentimental excursus, 'J.R.' reported Mrs Williamson's story (also appearing in other reports such as Anon. 1859g) that when Miller was

> yet an infant, he was in the practice of accompanying her to the top of the hillock behind the house, to the identical spot on which his own monument now stands, to watch his father's vessel as it entered the firth; and when his father had departed to return no more [i.e., lost in shipwreck], he proceeded alone to the same place, looking earnestly on every vessel as it entered for the well known marks. When he came down, and found his mother crying, the fatherless little fellow would creep close to her and say - 'Dinna greet [Scots: don't cry], mother, he'll be back next week.' (Anon. 1859r)

'J.R.' observed that

> [a]lthough the pillar has anything but an elegant appearance, [...] the statue on the summit is considered by all, and among others his own mother, to bear a striking resemblance to Miller. There he stands, with his bushy whiskers, dressed in his long frock coat, with ample pockets, leaning with his right arm on a pile of volumes, and apparently in the act of examining half of a nodule, newly broken open, which he holds in his left hand.

Accounts of the monument often omit the fossil fish carved on the front of the figure's pedestal above the Doric capital (visible in Figure 5); one exception was, naturally, his own newspaper, doubtless informed by his widow (Anon. 1859g). This fish is, of course, Miller's eponymous *Pterichthys milleri* which he first discovered on the shore close by. The statue is undoubtedly in one tradition of Miller portraiture, showing him as the Lowland Scots countryman in his maud (Scots: grey plaid). This is also seen (this time with a hammer in the other hand) in the charming 1860s statue by Hill's wife Amelia Paton Hill (1821-1904) (now NMS.A.1887.735; Taylor and Anderson 2017, figure 18).

That visit inside the birthplace was more than the Duke of Argyll had managed in 1857, being too early in the morning for the frail old lady to be 'At Home' even to him (Anon. 1857v). Another visitor, evidently inspired by Miller's books, visited Cromarty in 1857, and went fossil-hunting despite little or no previous experience. He described his stay at great length, larded with excerpts from Miller's books (Dickson 1858). However, although he inspected the cottage from the street, he made no mention of going inside.

6. Dating and production of the stereophotographs

The stereophotographs were taken at a time when the trees bore only a little foliage and substantial upstanding work had evidently been done on the monument, which, however, remained incomplete; so far as can be seen, the monument lacked the capital and the statue atop (Figures 2, 4). Late autumn 1858 seems most unlikely. The contractor had only been appointed in September, and the foundation stone laid at the end of November, so little if any upstanding work would have been completed before winter stopped mortar work. The pause would start a little after 'Hallowday' (All Saint's Day, 1 November) and extend into February or March, if Miller's own memoirs are any guide (Miller 1893, p. 113). The other possible date is spring 1859, perhaps April or May in those boreal latitudes, and this is far more consistent with the known June/July completion. A further check on dating is that the photographs plainly predate the addition, probably in 1864-1865 (Anon. 1864a, 1864b), of a railing to the low wall fronting the open yard on which the cottage faces, doubtless to exclude intrusive sightseers. This railing, or replacement, is absent from an 1851 sketch (Taylor and Anderson 2017 Figure 34), but is seen in most other pictures, such as the painting by Miller's daughter Harriet Davidson (Figure 7).

We have been unable to identify the photographer of the stereophotographs or find any photographers' advertisements which mention stereophotographs of the cottage amongst the goods on offer. One obvious possibility is, however, William John Smith (1824-1906), who moved to Tain around 1850, where he was a newsagent, bookseller and photographer (Torrance 2011, vol. 2, pp 263-264). He had, in 1857, been commissioned by Shepherd & Elliot, the Edinburgh publishers of Miller's *Testimony of the Rocks*, to photograph the cottage and other Cromarty scenes associated with Miller's life, supposedly for use in that book (Anon. 1857b, 1857c). In fact, so far as is known, these Cromarty photos were not used in early editions of *Testimony*, and in any case they seem an odd choice, given the book's subject matter. It would make far more sense if the reporter had got muddled and Shepherd & Elliot were actually planning a new edition of Miller's autobiography, *My Schools and Schoolmasters*, for which such photos would be far more appropriate (as they would for several other books of his, such as *Scenes and Legends of the North of Scotland*). However, if it was planned, no such edition of *Schools* is known to have

Figure 7. 'My Father's Birthplace', a painting of the cottage by Miller's daughter Harriet Davidson, probably 1864-1868 (see text for discussion). Note the fish drying on the house to the side, and the woman with a creel (Scots: carrying basket), who might well have been a fishwife carrying her husband's catch for sale. Courtesy and copyright John Gordon, Rosefarm.

appeared, almost certainly because Shepherd & Elliott were seemingly unable to cope with the demand for *Testimony*, and had to share *Testimony* with Thomas Constable & Co., who then supplanted them for later printings and for other Miller editions. This is reflected by title pages of successive printings of *Testimony*, first showing Shepherd & Elliot alone, then Shepherd & Elliot alongside Constable, and finally Constable alone (Anon. 1857l; Trewin 2015; Nigel Trewin, pers. comm. 2015). Shepherd & Elliot did issue a few copies of *Testimony* with a photograph of Hugh Miller as an extra frontispiece, apparently the first time an author had been commemorated in this way (Trewin 2015). Nevertheless, whatever happened with Shepherd & Elliott, Smith was selling stereophotographs of Cromarty scenes directly to the public by 1862. Those included images of the completed Miller Monument, Prince Alfred playing cricket with his Royal Naval shipmates, and their First Rate ship of the line H.M.S. *St. George* in the Firth of Cromarty (Anon. 1862). In any case, there were other photographers in the area, particularly in Inverness, of whom at least one, a Mr Stuart, was said to produce stereophotographs, evidently for the tourist trade (Anon. 1859p, 1859q). This might be the 'Stuart' identified as John *Stewart* by Torrance (2011, vol. 2, pp. 279-280).

7. Stereophotographs, tourists, Miller, and Cromarty

These photographs are the oldest known *extant* images of the birthplace cottage and the Hugh Miller Monument, and are valuable records of the cottage's history (Taylor and Anderson 2017). However, they were not made for that purpose, but for the tourist market. The stereophotographs give us a sense of the cottage which visitors saw in 1859. Hugh Miller's mother, Harriet Williamson, was still resident, as we saw above from the visit by 'J.R.' later in 1859. She had, however, moved in next door with a daughter in Miller House by the 1861 census, and the cottage was rented out (valuation rolls; 1861 census; death certificate, NRS). Sometime in or around June 1864, another visitor came to the cottage on a miserably drizzly day (Anon. 1864c), when

> […] the state of the atmosphere was such as to give the wretched looking house a still more melancholy aspect than usual. Judging entirely from the appearance of the cottage in which he was born, poor Hugh must have had hard enough times of it in his youth. Thatched on the roof, its walls bearing traces of having been 'harled' [i.e., rendered] at some indefinite period, and its small windows begrimed with dust, the little house [...] looks, of all places in the world, the most unlikely to have been the birthplace of one destined to shine in the firmament of literature. Opposite the door, and above two mouldy water barrels, planted among thick rank weeds, hung the bleached remains of a huge codfish. And, to complete the sorrowful surroundings, in the gutter sat a poor 'natural', chattering unintelligibly, and looking with a vacant stare into our faces. It was truly a heartfelt relief to us when we learned that arrangements were in course of being carried out to have the place made neat and tidy, and worthy of being visited by the numerous tourists who go out of their way to see the native town of the eminent geologist and man of letters.

The 'natural' was almost certainly Angus Mackay or MacKay (d. 1883), more usually called Foolish Angie or Captain Mackay, presumably in ironic reference to his soldier father, and an 'imbecile from youth' (Bayne 1871, vol. 1, pp. 304; L. Miller 1902, p. 463; Sutherland and McKenzie Johnston 2002, pp. 50, 167-168; Alston 2006, p. 266; death certificate, NRS; 1871 census). The visitor had evidently not realised that Mackay was, as Alston (2006, p. 266) noted, one of the real-life characters described in Miller's books whom visitors might still encounter. Mackay was fond of Miller and visited his kitchen in Miller House next door, evidently to be fed, and doubtless also the cottage kitchen when Miller's mother lived there. Indeed, in the 1851 census, he was evidently being boarded out by the local authorities with Miller's Aunt Jenny in her own little cottage at the end of the birthplace cottage's garden (Taylor and Anderson 2017; census book Cromarty 061/1/25, recorded out of sequence at the end of the book as on the 'Pey'). No doubt he was returning to scenes of past happy memory.

The 'huge codfish' must have been forgotten after being hung up to be wind-dried. Wind-drying fish was a common practice and Harriet Davidson's painting a few years later shows more fish festooning a house opposite the cottage (Figure 7). This reminds us that photographs do not convey smells. The sightlines in the two stereophotographs fix the camera locations to precise spots within what is now the front garden of Lydia Cottage, a National Trust for Scotland property on the other side of Church Street from Miller's birthplace. Lydia Cottage was not built till the twentieth century, and its site is believed to have been a fish curing station (this was certainly the case around 1910, as shown by the Inland Revenue Field Books and associated annotated map in NRS; David Alston, pers. comm. 2011).

A reviewer of Miller's autobiography in 1855 was so scathing about the dirtiness of the burgh, and espe-

cially the fishertown (Scots: fishermen's quarter), on which the birthplace cottage bordered, that he was quoted in a local newspaper. The visitor would

> be met by such a stench of cod viscera, and decomposed haddocks, and rotten mussels, flavoured with sundry other waste matter, sodden into dungheaps, and steaming, festering beneath the sun [...]. Hugh Miller loves his birth-place [...], but we have never heard him praise it for its cleanliness [...]

And, although the writer had visited the slums of Edinburgh and London,

> […] neither our eyes, nor our noses, have ever been assailed with such a concentration of intensely abominable filth as that which almost knocked us down, twelve years ago [1843], each time we ventured to pass the doors, or enter the dwellings of the fishers of Cromarty [...] (Anon. 1855a, p. 321, 1855b).

The savagery of this account might be to do with its being published in a temperance journal. Temperance campaigners were apt to have strong views on the fecklessness of working folk, though one might think the blame in this case surely lay with the burgh council's failure to provide proper sanitation. Alston (2006, pp. 247-248) provisionally identifies the author as Alexander O. Brodie, employed by the Stevensons building the Cromarty lighthouse in 1843-1844, and his views evidently stem from that period. Nevertheless, hygiene, sewerage and waste disposal continued to be serious problems for many years as Cromarty tried to adapt itself to serving the tourist industry (Alston 2006). In July 1869, Roderick Murchison was not impressed to find, at the foot of the brae below the monument and not in the fishertown, 'an assemblage of dunghills […] which it did not need Sir Roderick to tell us […] are a disgrace to be seen in such close proximity' - though one hopes that they were farmyard manure rather than anything worse (Anon. 1869b).

The intended works of 1864 included also a new iron railing in front of the building (Anon. 1864a, 1864b). Assuming that the railing was indeed installed at this time, it provides a useful guide to dating pictures of the cottage. A painting of the cottage, with the completed monument on the hill behind, is so similar to the stereophotographs right down to the creeper or rose bush by the door that it might as well also be 1859 (original in the private collection of a member of the family; a cropped version was published by Gostwick 2005, p. 7). A further aid to dating is the insertion of a shop doorway in the street gable end, probably around 1868 when a grocer rented the cottage (Taylor and Anderson 2017). The painting reproduced here by Harriet Davidson, Miller's daughter, should therefore date to 1864-1868 or so, safely before she emigrated to Australia in March 1870 with a return visit to the UK in 1877 (Allen 1999; Sutherland and McKenzie Johnston 2002). However, the railing is noticeably different from other images which show the one present today. Perhaps it was a temporary one, soon replaced, or more probably she added the railing by memory at home later with a pen and Indian ink (or was it an advance design study?). Her painting also shows a noticeable slumping of the thatch, which was probably not artistic licence, as it completes the sequence of images showing growing deterioration. An 1871 visitor reported the cottage as 'unoccupied and in a most lamentable state of decay, the roof fallen in', and in 1880 it was 'rapidly falling into decay' (Alston 2006, p. 266). Repairs in the mid-1880s halted this decline, and recreated the cottage as a museum open to the public, as described elsewhere (Taylor and Anderson 2017). From now on, surviving photographs of the cottage often seem to have been taken for publication as postcards. Perhaps this was the case for the 1889 image by George Washington Wilson (HMBCM collection; Gostwick 2016).

8. Discussion

This study has provided evidence for a wider history of the birthplace cottage as discussed by Taylor and Anderson (2017), who note that Miller is one of very few geologists with a museum of his own - but also that his fame rests partly in other realms of endeavour. Much the same can be said about his monument. Few geologists have a full-length statue of their own, let alone of them so obviously engaged in geology. Most are commemorated in stone or metal, if at all, as busts - more practical, being easier to carry and easier to arrange in scholarly halls and museum galleries. However, consider the 1901 statue by Onslow Ford (1852-1901) of Adam Sedgwick (1785-1873) in his eponymous museum at the University of Cambridge (McNamara 2014). One wonders if Miller's statues, whether by Handyside Ritchie or Amelia Paton Hill, were in part an inspiration for Sedgwick's. He, like Miller, has hammer and fossil in hand, although swapping the fish for the appropriately named trilobite *Angelina sedgwickii*. It might seem illogical that Sedgwick is in his academic gown; in reality, this would have been as characteristic a dress on field classes around Cambridge as Miller's wrap was on the Cromarty beaches. But Sedgwick does not have a column to stand on - though his museum is a lot bigger than the Cromarty cottage.

On the other hand, Miller was not just a geologist,

and still less were all the donors of the appeal. The building of the monument surely reflected local pride and a wish to honour a famous local son, and someone who evidently symbolised for many people then and since what it meant to be a Scot: for instance, in self-help, hard work, and education (Taylor 2007). But the Cromarty folk must also have had an eye on the monument's role in promoting tourism and in generally elevating the status of their burgh, in an era of what has been called statue-mania, whereby the lack of such public ornament was a matter of shame for a town's inhabitants. In those respects, and in at least some of the possible ambiguities involved (not least the concept of Scotland as a stateless nation within the United Kingdom), Miller's monument is reminiscent of the many statues being erected to the poet Robert Burns at the same time and since (Whatley 2016, 2017).

It is a good question whether the social and political tensions evident around the various Burns memorial projects had their equivalents in the Cromarty project, and it is possible that further research into local archives would throw light on this. This also raises the question of just what the various donors, especially those furth of Cromarty, were seeking to commemorate about Hugh Miller, whether as local or national hero. We have not attempted to answer this here in detail, as this relates to the much wider question of what he meant to the Scots of his day (Taylor 2007). Probably the appeal to local patriotism, and the obvious boost to Cromarty, overrode all else, at least publicly. It would have helped that, on the whole, and some Free Church politicians aside, Miller was a more middle-of-the-road and, in this respect, a less conflicted figure than Burns, whose radicalism and views on the Union with England the great and the good found hard to suppress, and whose anticlericalism, drunkenness and promiscuity put off a great many other folk more generally (Whatley 2016). There was, inevitably, competition for funds, and confusion with the Edinburgh appeal to buy the geological collection, in a practical sense. However, this kind of competition is different from the head-on competition between towns to have a Burns statue. The Edinburgh appeal was also explicitly 'national', in the sense of Scotland, probably because the Edinburgh Museum was so obviously a national museum to be housed in the capital (Taylor and Anderson 2017). There is little if any emphasis on regional Edinensian pride, and one does not get much of a sense, if any, that Edinburgh was specifically claiming Miller to herself, as opposed to the capital of Scotland. The Edinburgh appeal thus complemented the local patriotism of the Cromarty one in that sense, and also in the very different nature of the memorials which they sought to establish.

Miller, unlike Burns, seemingly did not merit competing statues across Scotland, and the Cromarty statue is the only full-length statue of Miller in an open air location. Nothing came of the odd suggestions that were mooted, such as one for Edinburgh in 1859 (for a duplicate of the Cromarty statue) and another for Glasgow in 1866 (Anon. 1859c, 1866). However, this raises the question of whether Hill had made her original maquette or sketch model of Miller in the hope of gaining a commission to create a life-size public statue; it was around the same time that she made the maquette for her bronze statue of the missionary Dr. David Livingstone (1813-1873) in Princes Street Gardens (Anon. 1869a). Indeed, her own later statue of Burns erected in Dumfries in 1882 was produced from a maquette sent to Italy for carving (Anon. 1881; Whatley 2016, esp. pp. 95, 98). It so happens that when John Hugh Miller Davidson (1864-1921), Miller's Australian grandson, gave to the Public Library and Art Gallery of South Australia what must be the maquette of the Hill statue, or perhaps a plaster cast of it, he stated that it was 'about two feet high' and 'the original plaster model, by Mrs D.O. Hill, from which the Bronze statue, now in Princes Street Gardens Edinburgh was made' (Davidson, letter of 15 March 1886, Public Library and Art Gallery of South Australia correspondence, State Record Office, Adelaide, South Australia; Taylor and Anderson 2017). We have come across no record of a Miller statue project at this time and originally assumed that Davidson simply muddled it with the Livingstone statue. But it is possible that he was actually correct about the original *intent*. Perhaps Hill's marble statue of Miller was made to recoup some of the effort she had put into a larger project. It was possibly commissioned and presumably sold privately, to Catherine Bradbury (maiden surname Laird) (d. 1886), laird of Strathmartine, who bequeathed it to the Edinburgh Museum of Science and Art (now NMS) in 1887 (Taylor and Anderson 2017).

In the end, Cromarty ended up with a fine monument. What is striking about the Hugh Miller Monument is how successful it seems in hindsight. Its existence as a statue of the author was perhaps remarkable in itself; there seem to have been very few public statues to writers in the early decades of statue-mania, as opposed to the royal, political, military and/or naval great and good. Robert Burns had a statue in Edinburgh in 1831, inside the Burns Monument on Calton Hill. Walter Scott (d. 1832) took 5 years to get his own statue on monumental column in Glasgow in 1837, and it was not till 1847 that Edinburgh's Gothic Scott Monument, with statues of Scott, his favourite hound Maida, and characters from his novels, was finished. By comparison,

Miller's Cromarty monument was built in less than three years from his 1856 demise and the almost immediate initiation of fundraising, with relatively little in the way of public dissent: excellent going even by the standards of Burns' statues in much bigger and wealthier Lowlands burghs (Whatley 2017). The design was well received in its time, and continues to intrigue visitors today. Finally, the monument was an economic success, so far as we can judge in the absence of marketing surveys. Fishy odours, bracing or otherwise, had not prevented Miller from being a celebrity, and even before he died, Miller was contributing to the local economy by attracting visitors, then as now a badly needed asset (Alston 2006, 2007). But the monument, and later the cottage, were plainly important focal points for visitors, giving them something immediately identifiable as Millerian to see within the wider Cromarty scene, even in an hour off the steamer. Indeed, it is very likely that the monument helped develop a level of Miller-related tourism which sustained Miller's family in their decision to preserve the cottage, and gave the Miller brothers the confidence to open the cottage as a museum in the 1880s (Taylor and Anderson 2017). But long before that, the monument and cottage became tourist spots replicated in stereophotographs and, later, postcards, which were doubtless sold as souvenirs in Cromarty itself, as well as nearby towns. The stereophotographs described here were undoubtedly a response to the visitor market, and, so to speak, they illustrate the success, in that respect, of Miller's unusual monument and anticipate that of his equally unusual cottage museum.

9. Acknowledgements

We thank Martin Gostwick for assistance on site with the Hugh Miller Birthplace Cottage and Lydia Cottage (both National Trust for Scotland). We also thank Margaret Allen, David Alston, Lyall Anderson, David Bertie, Bob Davidson, John Diemer, Antonia Gordon, John Gordon, Henry McKenzie Johnston CB, Andrew McMillan, Paul Monk, Geoff Moore, Alix Powers-Jones, Garve Scott-Lodge, Sara Stevenson, Roger Taylor and Nigel Trewin for information and discussion. We thank Caroline Lam (Geological Society of London) and the State Record Office, Adelaide, via Margaret Allen, for archival information, and Highland Council Libraries for copies of *Inverness Advertiser* reports through Am Baile. We are grateful to Steve Donovan for his careful refereeing. We thank the Howarth-Loomes Collection, National Museums Scotland, Bob Davidson and John Gordon for permission to use photographs, and Margaret Wilson, NMS Enterprises, for assistance. We acknowledge the support of the libraries of National Museums Scotland and the Universities of Edinburgh and Leicester.

10. References

ALLEN, M. 1999. 'The Author's Daughter, the Professor's Wife' - Harriet Miller Davidson. *Journal of the Historical Society of South Australia* **27**, 103-124.

ALSTON, D. 2006. *My little town of Cromarty. The history of a northern Scottish town*. Birlinn, Edinburgh, xxvi + 372pp.

ALSTON, D. 2007. Preface. *In*: M.A. Taylor, *Hugh Miller. Stonemason, geologist, writer.* NMS Publishing, Edinburgh, 13-15.

ANDERSON, L.I. and TAYLOR, M.A. 2008. Charles W. Peach, palaeobotany and Scotland. *The Geological Curator* **8**, 393-425.

ANON. 1851. *Great Exhibition of the works of art of all nations, 1851. Official descriptive and illustrated catalogue. By authority of the Royal Commission*. 3 volumes. Spicer, London.

ANON. 1855a. Hugh Miller. *Scottish Review* **for 1855**, 319-334.

ANON. 1855b. The Burgh of Cromarty. *Inverness Advertiser* 23 Oct., 5.

ANON. 1856. The surgeon of the Alma. *Elgin Courant, and Morayshire Advertiser* 29 Feb., 7.

ANON. 1857a. Cromarty - Hugh Miller. *Inverness Courier* 26 Feb., 5.

ANON. 1857b. Cromarty. - House of the late Hugh Miller. *Inverness Advertiser* 3 Mar., 5.

ANON. 1857c. Reminiscences of the late Hugh Miller. *Caledonian Mercury* 7 Mar., [2].

ANON. 1857d. Subscription list for the erection of a monument at Cromarty in honour of the late Hugh Miller. *Inverness Courier* 19 Mar., 1.

ANON. 1857e. Half-holiday lectures. *Inverness Courier* 9 Apr., 3.

ANON. 1857f. Monument to Hugh Miller at Cromarty [advertisement]. *Edinburgh Evening Courant* 16 Apr., 1.

ANON. 1857g. Monument to Hugh Miller at Cromarty. *Caledonian Mercury* 23 Apr., [1].

ANON. 1857h. Monument to Hugh Miller at Cromarty. *Caledonian Mercury* 23 Apr., [2].

ANON. 1857i. Monument to Hugh Miller. *Inverness Courier* 7 May, 5.

ANON. 1857j. Monument to Hugh Miller. *Caledonian Mercury* 11 May, 2nd edition, [3].

ANON. (as 'F.') 1857k. To the Editor of The Inverness Courier. *Inverness Courier* 14 May, 6.

ANON. 1857l. The late Hugh Miller's new work. *Examiner* 30 May, 351.

ANON. 1857m. Monument at Cromarty in honour of Hugh Miller. *Inverness Courier* 18 June, 1.

ANON. (as 'One of the Committee') 1857n. Monument to Hugh Miller. *Inverness Courier* 23

July, 6.
ANON. (as 'One of the Committee') 1857o. Monument to Hugh Miller. *John o' Groat Journal* 24 July, 3.
ANON. (as 'One of the Committee') 1857p. Monument to Hugh Miller. *Scotsman* 25 July, 3.
ANON. (as 'R.') 1857q. The Miller Monument at Cromarty. *Inverness Courier* 30 July, 6.
ANON. 1857r. List of subscribers for the erection of a monument at Cromarty, in honour of the late Hugh Miller. *Inverness Courier* 27 Aug., 1.
ANON. 1857s. Hugh Miller's Monument. *Inverness Courier* 27 Aug., 5.
ANON. 1857t. Hugh Miller's Monument. *Caledonian Mercury* 31 Aug., [2].
ANON. 1857u. Hugh Miller's monument. *Fife Herald* 3 Sep., [2].
ANON. 1857v. Cromarty. *Inverness Courier* 17 Sep., 5.
ANON. 1857w. Meeting of the British Association in 1859. *Aberdeen Journal* 7 Oct., 5.
ANON. 1857x. The late Mr Hugh Miller. *Morning Advertiser* 28 Oct., 4.
ANON. 1857y. Memorial to the late Assistant-Surgeon Thomson. *Inverness Courier* 12 Nov., 6.
ANON. 1857z. Statue to the memory of the Rev. James Guthrie. *Stirling Observer* 26 Nov., 3.
ANON. 1857aa. The late Hugh Miller. - British Association. *John O'Groat Journal* 11 Dec., 2.
ANON. (as 'A Contributor'). 1858a. The Thomson Monument. *Inverness Courier* 28 Jan., 6.
ANON. 1858b. Monument to the late Hugh Miller. List of subscriptions. *Inverness Courier* 4 Feb., 1.
ANON. (as 'A Contributor'). 1858c. The Thomson Monument. *Inverness Courier* 4 Feb., 6.
ANON. 1858d. Monument to the late Hugh Miller. *Glasgow Herald* 12 Mar., 4.
ANON. 1858e. Monument to Hugh Miller. Additional subscription list. *Inverness Courier* 22 Apr., 1.
ANON. 1858f. The Miller Monument. *Inverness Courier* 22 Apr., 5.
ANON. 1858g. The Hugh Miller Monument. *Inverness Courier* 24 June, 5.
ANON. 1858h. Miller Monument. *Inverness Courier* 5 Aug., 1.
ANON. 1858i. Monument to Hugh Miller at Cromarty. *The Witness* 22 Sep., [3] [see also *Inverness Courier* 23 Sep., 5].
ANON. 1858j. Monument to Hugh Miller at Cromarty. *Scotsman* 25 Sep., 2.
ANON. 1858k. Monument to Hugh Miller at Cromarty. *Inverness Advertiser* 28 Sep., 5.
ANON. 1858l. British Association for the Advancement of Science. *Daily News* 29 Sep., 3.
ANON. 1858m. Sir R. Murchison's tour in the Highlands. *Edinburgh Evening Courant* 30 Sep., 3.
ANON. 1858n. Soiree of the Leeds Mechanics' Institution and Literary Society. *Leeds Mercury* 2 Oct., 7.
ANON. 1858o. British Association for the Advancement of Science. Section C. Geology. *Literary Gazette*, new series **15**, 9 Oct., 468-470.
ANON. 1858p. Hugh Miller's Monument. *Inverness Courier* 25 Nov., 5.
ANON. 1858q. Hugh Miller's Monument at Cromarty. *Inverness Advertiser* 30 Nov., 6.
ANON. 1859a. Head Court. Universities and colleges of Aberdeen. *Aberdeen Journal* 2 Mar., 6.
ANON. 1859b. Statue of Mr Hugh Miller. *Inverness Advertiser* 14 June, 5.
ANON. 1859c. Statue of Mr Hugh Miller. *The Witness* 11 June, [3] [also *Inverness Courier* 16 June, 3].
ANON. 1859d. Cromarty. - Hugh Miller's monument. *Inverness Advertiser* 28 June, 5.
ANON. 1859e. Hugh Miller's monument at Cromarty. *Caledonian Mercury* 1 July, 2.
ANON. 1859f. Hugh Miller's Monument. *The Witness* 2 July, [2].
ANON. 1859g. Mr Hugh Miller's Monument. *The Witness* 9 July, [3].
ANON. 1859h. Mr Hugh Miller's Monument. *John o' Groat Journal* 21 July, 3.
ANON. 1859i. British Association's meeting at Aberdeen. *The Witness* 17 Sep., [3].
ANON. 1859j. Sir Roderick Murchison on the geology of the Highlands. *Caledonian Mercury* 19 Sep., 4.
ANON. 1859k. On the geological structure and order of the older rocks in the northernmost counties of Scotland. *Aberdeen Journal* 21 Sep., 11.
ANON. 1859l. British Association's meeting at Aberdeen. *The Witness* 21 Sep., [3].
ANON. 1859m. Thursday - excursions. *Aberdeen Journal* 21 Sep., 5.
ANON. 1859n. The British Association. *The Standard* 23 Sep., 6.
ANON. 1859o. The British Association. Meeting in Aberdeen. *Aberdeen Journal* 28 Sep., 6.
ANON. 1859p. Charles Keith, bookseller. *Inverness Courier* 20 Oct., 1.
ANON. 1859q. 'Stuart's Photographic Studio [...]'; 'Fraser's Photographic Rooms [...]'; 'Photography. Hay's Portrait Rooms [...]'. *Inverness Courier* 27 Oct., 2.
ANON. (as 'J.R.') 1859r. Twenty-four hours at Cromarty. Reminiscences of Hugh Miller. *Banffshire Journal and General Advertiser* 1 Nov., 6.
ANON. 1860. Cromarty. *Inverness Courier* 3 May, 5.
ANON. 1861. Summary. *Caledonian Mercury* 31 May, 2.

ANON. 1862. Prince Alfred at Cromarty. *Inverness Courier* 22 May, 4.

ANON. 1864a. 'The family of Hugh Miller [...]'. *Geological Magazine* **1**, 96.

ANON. 1864b. Hugh Miller's birthplace. *Aberdeen People's Journal* 18 June, 4.

ANON. 1864c. Notes of a tour in the north. II. *Aberdeen People's Journal* 30 July, 2.

ANON. 1866. Proposed statue to Hugh Miller. *John O'Groat Journal* 1 Nov., 3.

ANON. 1869a. Royal Scottish Academy's Exhibition. Closing notice. *Scotsman* 24 Apr., 7.

ANON. 1869b. Visit of Sir Roderick Murchison to Hugh Miller's Monument at Cromarty. *Edinburgh Evening Courant* 10 Jul., 6.

ANON. 1875. Death of a veteran journalist. *Manchester Times* 12 June, 5.

ANON. 1881. Burns statue for Dumfries. *Scotsman* 18 Jan., 4.

ANON. 1904. 'Many in Berwick there are who can remember well the day […]'. *Berwickshire News and General Advertiser* 31 May, 5.

BAYNE, P. 1871. *The life and letters of Hugh Miller*. 2 volumes. Strahan, London.

'BEATUS MARTINUS' 1857. Hugh Miller's monument. *Scotsman* 7 Jan., 4.

BENTON, M.J. 1983. Progressionism in the 1850s: Lyell, Owen, Mantell and the Elgin reptile *Leptopleuron* (*Telerpeton*). *Archives of Natural History* **11**, 123-136.

BURNS, W. 1857. Hugh Miller's monument. *Inverness Courier* 8 Oct., 5.

DICKSON, N. 1858. *Cromarty; being a tourist's visit to the birth-place of Hugh Miller*. Murray, Glasgow, 107pp.

GEIKIE, A. 1902. Address by Sir Archibald Geikie, D.C.L., F.R.S. *In*: Anon. *The centenary of Hugh Miller being an account of the celebration held at Cromarty on 22nd August, 1902*. Glasgow University Press, Glasgow, 40-69; also published as GEIKIE, A. 1902. Hugh Miller: his work and influence. *Nature* **66**, 426-430.

GOSTWICK, M. 2005. *Hugh Miller Museum and Birthplace Cottage Cromarty*. National Trust for Scotland, Edinburgh, 48pp.

GOSTWICK, M. 2013. Cromarty Bay - stories in stone and lore. *Hugh's News. Newsletter of The Friends of Hugh Miller* **19**, 4-6, http://s3.spanglefish.com/s/27844/documents/newsletters/newsletterautumn13.pdf.

GOSTWICK, M. 2016. A dark place with some probably insoluble mysteries. *Hugh's News. Newsletter of The Friends of Hugh Miller* **27**, 5-8, http://s3.spanglefish.com/s/27844/documents/newsletters/newsletterwinter16.pdf.

McMILLAN, A.A., GILLANDERS, R.J., and FAIRHURST, J.A. 1999. *Building stones of Edinburgh*. 2nd edition. Edinburgh Geological Society, Edinburgh, xx + 235pp.

McNAMARA, K. 2014. Sedgwick and his trilobite. *Geology Today* **30**, 142-146.

[MILLER, H.] 1844. [Review of] *Report by the Commissioners for the British Fisheries of their Proceedings, 1842*. […]. *North British Review* **1**, 326-365.

[MILLER, H.] 1856. The late Dr James Thomson. *The Witness* 20 Feb., [2] [authorship from Anon. (1856), corroborated by it being a *Witness* editorial on a Cromarty subject].

MILLER, H. 1893. *My schools and schoolmasters, or, The story of my education*. Nimmo, Hay and Mitchell, Edinburgh, xi + 562pp.

MOORE, P.G. and GIBSON, J.A. 2006. On the date of publication of John Robertson's *Animal life on the shores of the Clyde and Firth* and potential confusion caused by three contemporary John Robertsons. *Archives of Natural History* **33**, 348-353.

MORRISON-LOW, A.D. 2015. *Photography: a Victorian sensation*. NMS Publishing, Edinburgh, x + 86pp.

NICKEL, D.R. 2004. *Francis Frith in Egypt and Palestine: a Victorian photographer abroad*. Princeton University Press, Princeton, 240pp.

OLDROYD, D.R. 1990. *The Highlands Controversy. Constructing geological knowledge through fieldwork in nineteenth-century Britain*. University of Chicago Press, Chicago, ix + 438pp.

OVERSTREET, L.K. 2013. Inscribed copy of *Animal life on the shores of the Clyde and Firth*. *Archives of Natural History* **40**, 351.

PENGELLY, H. 1897. *A memoir of William Pengelly, of Torquay, F.R.S., geologist, with a selection from his correspondence*. Murray, London, x + 341pp.

ROBERTSON, J. 1842. Notes on the fishers of the Scotch east coast. *Blackwood's Edinburgh Magazine* **51** (March), 296-305.

[ROBERTSON, J.] 1843. [Review of] *The People and the Church of Scotland* […] *Westminster Review* **40** (August), 189-215.

ROBERTSON, J. n.d. [?1893]. *Animal life on the shores of the Clyde and Firth*. Privately published, Gourock [?].

ROSS, G.W.H. 1858a. To the Editor of The Inverness Courier. *Inverness Courier* 28 Jan., 6.

ROSS, G.W.H. 1858b. The Thomson Monument. *Inverness Courier* 11 Feb., 6.

ROSS, R. 1857a. Monument to Hugh Miller. *Inverness Courier* 7 May, 7.

ROSS, R. 1857b. To the Editor of The Inverness Courier. *Inverness Courier* 21 May, 6.

ROSS, R. 1858. The Miller Monument. *Inverness Courier* 4 Feb., 6.

SPENCER, S. 2011. *Francis Bedford, landscape*

photography and nineteenth-century British culture: the artist as entrepreneur. Ashgate, Farnham, 212pp.

STEVENSON, S. 1981. *David Octavius Hill and Robert Adamson. Catalogue of their calotypes taken between 1843 and 1847 in the collection of the Scottish National Portrait Gallery*. Her Majesty's Stationery Office for National Galleries of Scotland, Edinburgh, 220pp.

STEVENSON, S. 2017. Hugh Miller and the Gravestone, 1843-4. *The Geological Curator* **10** (7), 455-461.

STEVENSON, S. and MORRISON-LOW, A.D. 2015. *Scottish photography. The first thirty years*. NMS Enterprises, Edinburgh, xii + 383pp.

SUTHERLAND, E. and McKENZIE JOHNSTON, M.A. 2002. *Lydia, wife of Hugh Miller of Cromarty*. Tuckwell, East Linton, xvii + 188pp.

TAYLOR, M.A. 2007. *Hugh Miller. Stonemason, geologist, writer*. NMS Publishing, Edinburgh, 176pp.

TAYLOR, M.A. and ANDERSON, L.I. 2017. The museums of a local, national and supranational hero: Hugh Miller's collections over the decades. *The Geological Curator* **10** (7), 285-368.

TAYLOR, M.A. and GOSTWICK, M. 2003. Hugh Miller's collection - a memorial to a great geological Scot. *Edinburgh Geologist* **40**, 24-29.

TAYLOR, R. 1981. *George Washington Wilson, artist and photographer, 1823-93*. Aberdeen University Press, Aberdeen, 204pp.

TORRANCE, D.R. 2011. *Scottish studio photographers to 1914 and workers in the Scottish photographic industry*. 2 volumes. Scottish Record Society, Edinburgh.

TREWIN, N.H. 2015. Collecting the works of Hugh Miller. *Hugh's news. Newsletter of the Friends of Hugh Miller* **26**, 5-8, http://s3.spanglefish.com/s/27844/documents/newsletters/newsletterautumn15.pdf.

UNIVERSITY OF GLASGOW HISTORY OF ART and HATII, 2011a. Alexander Handyside Ritchie. In *Mapping the Practice and Profession of Sculpture in Britain and Ireland 1851-1951*, online database: http://sculpture.gla.ac.uk/view/person.php?id=msib6_1213624942 (accessed 18 August 2016).

UNIVERSITY OF GLASGOW HISTORY OF ART and HATII, 2011b. James Gall Junior. In *Mapping the Practice and Profession of Sculpture in Britain and Ireland 1851-1951*, online database: http://sculpture.gla.ac.uk/view/person.php?id=msib6_1210070517 (accessed 5 September 2016).

WHATLEY, C. 2016. *Immortal memory. Burns and the Scottish people*. John Donald, Edinburgh, xii + 244pp.

WHATLEY, C. 2017. Local history and the nation: commemorating Robert Burns 1859-1914. *Scottish Local History* **96**, 3-9.

J.G. GOODCHILD'S GUIDE TO THE GEOLOGICAL COLLECTIONS IN THE HUGH MILLER COTTAGE, CROMARTY OF 1902

by J.G. Goodchild, M.A. Taylor and L.I. Anderson

Goodchild, J.G., Taylor, M.A. and Anderson, L.I. 2017. J.G. Goodchild's Guide to the Geological Collections in the Hugh Miller Cottage, Cromarty of 1902. *The Geological Curator* 10 (7): 447-454.

This reproduces, in facsimile, the *Guide to the Geological Collections in the Hugh Miller Cottage, Cromarty of 1902* by J. G. Goodchild.

†Goodchild, J.G., Curator of the Scottish Geological Survey Collection, Edinburgh Museum of Science and Art, Chambers Street, Edinburgh 1, N.B.
**Michael A. Taylor, Research Associate, Department of Natural Sciences, National Museums Scotland, Chambers St., Edinburgh EH1 1JF, Scotland, and Honorary Research Fellow, Department of Museum Studies, University of Leicester. Email mat22@le.ac.uk; disambiguator: http://orcid.org/0000-0002-1495-8215; and Lyall I. Anderson, Honorary Research Fellow, School of Museum Studies, University of Leicester,(formerly Department of Natural Sciences, National Museums Scotland). Email lia3@le.ac.uk.* *Received 15 Feb 2016. Accepted 15 Feb 2016*
† Deceased.
**All correspondence to M. A. Taylor.*

Introduction

James George Goodchild (1844-1906) was the curator of the Geological Survey collections and displays housed in the Edinburgh Museum of Science and Art (later Royal Scottish Museum and now part of National Museums Scotland, though the Survey long ago removed its collections to new accommodation). He wrote a guide to the newly revised geological displays in the Hugh Miller Cottage at Cromarty. It was almost certainly intended as a contribution to the commemoration of Miller's centenary in 1902, with ceremonies at Cromarty (Anon. 1902). It is reproduced here in facsimile, as an important and unique record of the contents of the displays. The background to its publication, and the information contained in it, are analysed in a complementary paper by Taylor and Anderson (2017).

The only known copies of this Guide booklet are in the British Geological Survey library at Keyworth, Nottinghamshire (it is, rather surprisingly, missing from the bound set of Goodchild's publications in the National Museums Scotland library).

As well as the material reproduced here [blank pages have been ommitted for space reasons], there is a paper cover to the booklet included in the pagination (which is why the text proper begins on page 5). However, it contains no further information apart from a briefer version of the title, thus: *Hugh Miller Cottage Cromarty … Guide to the Geological Collections. By J. G. Goodchild, H. M. Geological Survey, Edinburgh Museum*.

Acknowledgements

Reproduced by permission of the British Geological Survey (BGS). IPR/129-83CT. No part of this work may be reproduced without permission of BGS. This would not have been possible without Dr Michael Howe's (BGS) finding of the only known copies and kind response to an appeal circular sent out by MAT. Mrs Tracey Gallagher and Ms Gill Nixon are (BGS) are thanked for their kind assistance.

References

ANON. 1902. *The centenary of Hugh Miller being an account of the celebration held at Cromarty on 22nd August, 1902*. Glasgow University Press, Glasgow.

TAYLOR, M.A and ANDERSON, L.I. 2017a. The museology of a local, national and supranational hero: Hugh Miller's collections and museums over the decades. *The Geological Curator* **10** (7), 285 - 368.

A GUIDE

TO THE

GEOLOGICAL COLLECTIONS

IN THE

HUGH MILLER COTTAGE,

CROMARTY.

BY

J. G. GOODCHILD,

H.M. GEOLOGICAL SURVEY, EDINBURGH MUSEUM.

DINGWALL:
Printed by the Ross-shire Printing and Publishing Coy., Ltd.

1902.

A GUIDE TO THE GEOLOGICAL COLLECTIONS IN THE HUGH MILLER COTTAGE, CROMARTY.

Of the geological collections formed by Hugh Miller, the major parts were acquired for the Nation several years ago, and are now safely stored in the Natural History Department of the Museum of Science and Art, Edinburgh. But when the transfer was contemplated the Hugh Miller Trustees considered that it would be well to retain some part of his Collection, in order that it might be kept as one of the mementoes of his life and work in his native town Cromarty. Accordingly, this was done, and the part of the Collection thus referred to has been for some years past placed on view in one of the rooms of the Cottage where the illustrious writer was born.

There are three upstairs rooms in the Cottage, in the easternmost of which Hugh Miller first saw the light. This has fittingly been set apart for things personal to himself. The walls are hung with pictures relating to him, various articles of furniture with which his name is now associated —such as the low chair upon which his mother nursed him as an infant—part of his library, and a set of the "Witness" newspaper, which he edited for so long, and which contains so many articles from his pen, are placed in the Birth Room.

The geological collections are exhibited in the two rooms adjoining : those made by Hugh Miller himself being placed in the middle room. This contains four cases, lettered respectively A, B, C, and D. Case A, the upright case placed edgeways to the skylight, is reserved for the exhibition of various manuscripts. On one side of the Case the visitor will find specimen of numerous works in Hugh

Miller's handwriting at various periods, from his boyhood days onward, including the manuscripts of some of his better-known works. Along with these are placed some of the original drawings for the plates that illustrated "The Old Red Sandstone," and some other of his works. On the other side of Case A, are placed selections from the autograph letters sent to Hugh Miller by some of his numerous distinguished correspondents. Here, those who are interested in Church matters will find letters from noted Scottish Divines such as Dr Guthrie, Dr Chalmers, and others. Amongst letters from well known statesmen are those from Lord Palmerston, the Marquis of Breadalbane, &c. Men of Science are represented by autograph letters from Louis Agassiz, the celebrated authority in past times on the fossil fishes of the Old Red Sandstone, Professor Owen, Charles Darwin, Thomas Davidson, and many others. Literature is also represented by autograph letters from Thomas Carlyle, Sir Thomas Dick Lauder, and other writers hardly less well known. It is probable that this feature of the collection will prove one of the most interesting to the general public. Unfortunately, the manuscripts have suffered, to some extent, of course, from age; but more from exposure to light. The damp air has affected others. But they are now better protected against these sources of danger. Covers opaque to the light hang in front of the cases, and visitors who inspect the manuscripts are furthermore asked to see these covers properly replaced as soon as they have ended their visit.

To geologists the exhibit which will prove of greatest interest will doubtless be that of the Fossil Fishes from the Old Red Sandstones, shewn in the table case placed below the sky-light in this room and lettered (B). This contains a fairly-good selection of the specimens referred to in his works, and especially in "The Old Red Sandstone."* Copies of the illustrations for that work are placed alongside of the specimens, so that the visitor may be able to see what the fossils themselves are like, and, at the same time, obtain a more exact knowledge of what the illustrations in the book are intended to convey. Full descriptions of the specimens are given on the tickets accompanying them.

* The references to the pages where descriptions are given of these objects, refer to the 3rd Edition of "The Old Red Sandstone."

It should be mentioned here that the Collection was arranged, in the first instance, by the late Mr Hugh Miller of the Geological Survey, son of the author. Quite recently such of the specimens of fossil fishes whose names required to be revised were taken to Edinburgh by the writer of this note, where the eminent specialist in everything relating to the fossil fishes of the older rock, Dr Traquair, F.R.S., kindly undertook the work.† The nomenclature of these interesting forms of ancient life has therefore now been brought quite up to date (see also Appendix 2).

The third case (C), that on the east side of the room (next the stair case) contains part of Hugh Miller's general collection of fossils (amongst which a foremost place has been given to his specimens of the "Seraphim"), so well known to readers of his works.

The fourth case (D), holds the remainder of his collection so far as it is represented in the Cottage.

A short description of the contents of each case may prove of interest to visitors: – Beginning with case B, on the left-hand side, we find a very interesting set of examples of the fish remains obtained from the Lower Old Red Sandstone of Forfarshire. Two chief fossiliferous horizons occur in that rock, one of these (see Appendix 1) lies beneath the great pile of andesite lavas out of which the Ochils and the Sidlaws have been shaped. These strata are therefore of older date than the volcanic eruptions to which those lavas are

† Amongst the numerous papers by Dr Traquair dealing with the subject of fossil fishes, the one of most importance in the present connection is undoubtedly his "Extinct Vertebrate Fauna of the Moray Firth Area," published in Harve Browne and Buckley's "Vertebrate Fauna of the Moray Firth." It contains some most valuable restorations of many of the species.

due. Amongst the localities where fossils occur in this horizon may be mentioned Tealling, Farnell, Pitroddie, and Turin Hill, in Forfarshire. The fossils found at these localities are chiefly fishes of an ancient type, which have some affinities with the Sharks and Rays of the present day. They are all armed with more or less conspicuous spines which are well seen upon both the upper and the lower fins, as well as upon other parts of the body in the specimens exhibited. On account of these thorny spines the group that they belong to is usually referred to in the Acanthodians. The collection includes a fairly-good set of these early forms of fish life.

Above the volcanic rocks of the Ochils and Sidlaws, and therefore of later date than the volcanic eruptions, occur other bands, one of which not uncommonly yields the curious buckler-headed fishes which Hugh Miller described so eloquently in his Old Red Sandstone, p. 182. Amongst these in the collection are examples of both *Cephalaspis* and *Pteraspis*. Hugh Miller's figure of *Cephalaspis* has been placed alongside of one of the specimens. The chief locality for these buckler-headed fishes is at Auchtertyre, Newtyle.

The Old Red Sandstone (or Devonian) Period was one of immense length, and it would appear as if, over large areas, the conditions suitable for the welfare of organic beings were for a long time wanting. Now and then, and often at localities far apart, such conditions did occur. Some of the rocks which were formed during one of these episodes, favourable for both the development of fishes and their subsequent preservation as fossils occur at Cromarty, and others at Edderton, Lethen Bar, near Nairn, and Tynet Burn, near Fochabers. It was chiefly from these that Hugh Miller obtained most of the specimens of fossil fish with which his name has been so long associated. The Cromarty locality is near the foot of Eathie Burn, which comes down to the coast about three miles due south of the town of Cromarty.

Regarding these fish remains, it is well to remember that they lived at a period long after the fossils, noticed a few lines above, had ceased to exist. In regarding them we must remember that they lived at a much later period of the Earth's history, and nearer our own times by a period of almost inconceivable length. The reader who wishes to obtain a trustworthy account of the zoological position of these Cromarty Fishes will have to turn to the numerous works on the subject by Dr Traquair. It is true that they were described by Hugh Miller, as well as by Louis Agassiz, the celebrated Swiss naturalist, and that both these writers vastly increased our knowledge of these fossil forms. All honour to them both. But Science has advanced greatly in many directions during the last half century, and we must study modern views if we are to duly appreciate the value of the work done by the founder of this Collection. An outline of the modern classification of the Fishes of the Old Red Sandstones, as far as the specimens in the Museum are concerned, is given as an APPENDIX to this.

There are so many specimens of great scientific value in this part of the Collection that they can hardly be passed over without some kind of notice. Foremost amongst the Acanthodian fishes here is the original specimen described and figured by Louis Agassiz, and also by Hugh Miller, under the name of *Diplacanthus striatus*. Hugh Miller's figure, from the "Old Red Sandstone," is placed alongside of the original. One might describe these fishes as small spiny fishes allied to the Sharks; but they are widely different in structure from any sharks now living, and they may have been also different in their habits.

Another one of these spiny sharks is the *Rhadinichthys longispinus* of Dr Traquair, which is also in the Collection.

Two others are represented: one of these is *Cheiracanthus murchisoni*, named after Sir Roderick Murchison (see "The Old Red Sandstone," pp. 122-125). The original specimen figured by Agassiz, and reproduced in the Old Red Sandstone, is in the Collection. Dr Traquair's fine restoration of

it on fig. 2, Pl. II., of the "Extinct Vertebrata of the Moray Firth" is well worth close examination The other species is *Cheiracanthus latus*, which does not call for any special remark.

Following these come examples of the extraordinary armour-plated creature known as the *Pterichthys milleri*, in honour of the writer who did so much to make this organism known to the world (see "The Old Red Sandstone," pp. 78 to 85). Hugh Miller's figures from the "Old Red Sandstone" are placed alongside the specimens. Figures embodying the latest knowledge regarding *Pterichthys* are given by Dr Traquair on Plate I. of the work mentioned. Regarding its affinities there has been considerable difference of opinion; but most writers take the view that it is a true fish, though of a very exceptional—and, of course, quite extinct—type. Its structure seems to have been specially adapted for life at the bottom of a river, where it may well have lived in much the same manner as the modern sturgeon.

Coming next after the strange and totally extinct type just mentioned, is another fish with quite a different structure and history. To understand this we must bear in mind the fact that the modern creatures we call fish comprise a great group of animals which include very diverse types of structure. Without entering into anatomical details, it may be mentioned that there are at least four different plans of structure amongst the fishes now living, and many persons would say there were six. In addition to these there have been in the past, as we have just seen, fishes constructed on other plans, which now find no representative at all.

One group living at the present day can breathe by either lungs or gills, according to its surrounding circumstances. The fishes that do this, moreover, shew many points of relationship with the Amphibia—the group that include the Newts, Frogs, and Toads, &c. On account of this double mode of breathing they are called the Dipnoi.

The *Ceratodus* or Barramunda of some of the Australian rivers is one of the modern representatives of this type.

Now, fishes constructed, so far as one can see, on almost exactly this same type, lived around what is now the Moray Firth (which then, of course, had no existence) in the period when the Old Red Sandstone of Cromarty was laid down. The species known as *Dipterus valenciennesii* is of fairly common occurrence in the Caithness Flags, which are of the same age; and it is occasionally met with at Cromarty, Tynet Burn, and Lethen Bar. There are examples of it in the Collection, and Hugh Miller's figure of the species is placed alongside for comparison (see "The Old Red Sandstone," p. 113). I am fain to refer also to Dr Traquair's beautiful restoration on Plate II., fig. 3, of the work above mentioned.

Another remarkable fish represented in the Collection belongs to the same great group of modern fishes as that which includes the salmon, the cod, the eel, the flounder, and all our ordinary common fishes, exclusive of the sharks, and rays, and their allies. This group, or sub-class, is now called the Teleostomi. Amongst these now living there are some few examples of fish that, in former periods of the Earth's history, played a much more important part than they do now. One of these is represented by a curious fish that yet lives in the Nile, and is called *Polypterus*. Omitting any reference here to other points of structure, we may notice its front or pectoral fins, which shew a clearly-marked lobe, like a short arm, at the base, around which the fin itself forms a well-marked fringe. This character, which runs through all the group of fishes to which the Nile species belongs, has given rise to one of the names for the group, which is that of the Fringe-Finned Fishes. Now, when the Old Red Sandstone was being formed, there lived many different kinds of fishes constructed upon the same plan as is the Nile *Polypterus*. One of these, whose remains are by no means rare at Eathie, Tynet Burn, Edderton, and other places in the Moray Firth area, is called *Glyptolepis*

leptopterus (see "The Old Red Sandstone," pp. 114-115). Examples of it, and of its curiously-sculptured scales, are in the Collection, and Hugh Miller's figures are placed near them for comparison.

One of the very commonest of the Old Red Sandstone fishes from the Orcadian area, as well as from the area of the Moray Firth, also belongs to this same Order of Fringe-Finned Fishes. This referred to is called *Osteolepis macrolepidota* (see "The Old Red Sandstone," pp. 105-112), of which Hugh Miller gave a restoration, a most excellent one in its day. The figure referred to is placed in the case as usual (see also Dr Traquair's figure in the work above referred to).

Another curious form of fish belonging to the same Order is called *Diplopterus agassizii*. It is only occasionally found. There are specimens in the Collection.

A still more remarkable extinct group of fishes, which are constructed on the same general plan as the Teleostomi, is the one that attracted so much of Hugh Miller's attention, and which were named by Agassiz *Coccosteus decipiens*. There are only fragments of this fish in the Collection; but Hugh Miller's figure from the "Old Red Sandstone" will convey a sufficiently good general idea of what the creature was supposed at that time to be like (see "The Old Red Sandstone," p. 85).

Lastly, so far as the Orcadian or Middle Old Red Sandstone is concerned, we have yet one more fish to notice. This is really a very distant ally of the modern Sturgeon; though its appearance would hardly lead an untrained observer to suspect any relationship at all. The fish referred to is called *Cheirolepis trailli* (see "The Old Red Sandstone," p. 116-118). Under a slightly different name a figure of the same species was given in the "Old Red Sandstone," and this figure is put out as usual. See also Dr Traquair's Pl. III., fig. 4, op. cit.

Of very much later origin than either of the two Old Red Sandstones above referred to is the Upper Old Red

Sandstone, which lies, in different parts of the Kingdom, quite discordantly (or unconformably) upon any rock older than itself (see APPENDIX I.). As long an interval of time may well have elapsed between the period when this Upper Old Red Sandstone was formed and the close of the next geological formation of older date, as separated the time when *Cephalaspis* lived from the time when *Pterichthys* appeared. It is necessary to mention this, otherwise the reader will not perceive the full meaning of the great change in the character of the fishes from the Upper Old Red Sandstone, as compared with even those of the Old Red Sandstone of Cromarty, and still more, that of Forfarshire.

Unfortunately, as it happens, very few examples of Hugh Miller's Upper Old Red Sandstone Fishes were retained when the main part of the Collection went to Edinburgh. Only two or three scales of *Holoptychius* (see "The Old Red Sandstone," pp. 203-216) and a fragment of *Bothriolepis* are all that remain. Possibly this loss may be made good before long, to an extent at least sufficient to illustrate the fine description he gives of the fishes from this interesting horizon.

The remainder of Case B is occupied with some of his Lower Carboniferous Fishes, amongst which the fine specimen of the teeth of *Rhizodus hibberti* from Burdiehouse can hardly fail to attract attention.

Passing now to Case C, on the east side of the room, the visitor will find in that, as already noticed above, another portion of his collection containing some of the specimens referred to in the "Old Red Sandstone," Chapter XII. Some of it may be said to possess only a general interest for the visitor. At the same time, however, the specimens of the remarkable "Water Scorpions," or Eurypterids, represented by *Pterygotus anglicus*, the "Seraphim" of the Forfarshire quarrymen (see the "Old Red Sandstone," pp. 179-183), cannot fail to attract attention. These are placed at the end of the case near the door. With these will be found examples of the curious *Parka decipiens* described in the "Old Red Sandstone," p. 189. At the right hand side of the case

is placed a selection of the fossil plant remains collected by Hugh Miller in the sixties while he was within reach of both the Burdiehouse Limestone Quarries and the coalpits of the Dalkeith Coalfield.

Hugh Miller had at one time a fairly good collection of fossils from the Jurassic Rocks of the Moray Firth area, as well as of those of Brora in Sutherlandshire; and he had also collected fossils of the same age from Skye and Eigg. Only a very few examples of these remain here. The visitor will find them in Case D, along with some interesting fossils from various geological horizons and localities equally various. As specimens that formerly belonged to the great writer, they are, however, as much to be treasured as the specimens which are more highly thought of by the geological specialists who visit the Collection.

Hugh Miller's sons, as is well known, followed much in their father's footsteps. Hugh passed through the Royal School of Mines with distinction, and then joined the Staff of the Geological Survey, on which he worked with much advantage to geological Science for a lengthy period of years. His loss is much regretted by his old colleagues.

In the course of his long career as a field geologist on the Staff of the Survey, he made many collections of interest and value, and it has been deemed fitting that these should find a resting-place in the room adjoining that devoted to the collection left by his father.

Accordingly, this has been done, and the visitor who is interested in geology can spend many hours with profit in studying the collections referred to.

Colonel Miller, Hugh's brother, also mad some valuable geological collections, and these too are set forth in the same room.

Some specimens of fossil plants from the Old Red Sandstone of Eathie Burn, presented by Sir Thomas Hanbury, have also been placed in this room.

The two appendices which are given below may be of use to the visitor interested in the scientific aspects of the collection.

APPENDIX I.

Scheme of Classification of the Old Red Sandstones of Scotland, with Especial Reference to their Fossils in the Hugh Miller Museum at Cromarty.

Upper Old Red Sandstone.	Thickness in Feet.
11. Upper sub-division or NAIRN BEDS.	
10. Lower ,, ELGIN ,,	
Unconformable to every rock older than itself.	
Orcadian Old Red Sandstone.	
9. John O'Groat's Flags, or Eday Beds.	
8. Thurso, or Rousay Beds.	
7. Beds of Achanarras, Stromness, Cromarty, and the fossiliferous Beds of this age in the Moray Firth Area.	? 18,000
Lower Old Red Sandstone.	
6. Strathmore Sandstones.	
5. Cephalaspis Beds of Auchtertyre.	
4. Volcanic Series of the Ochils and Sidlaws.	
3. Acanthodian Beds of Turin Hill, Farnell, &c.	
2. Pterygotus Beds of Forfarshire:—	
1. Base not seen.	? 20,000

An Extensive Unconformity occurs here in most of the Lower Old Red Sandstone areas in Scotland.

Downtonian Beds.

Uppermost Silurian strata containing some of the oldest known fish.

APPENDIX II.

Classification of the Fish remains from Old Red Sandstones, exhibited in this Museum.

Sub-Class *ELASMOBRANCHII* (Sharks, Rays, and their Allies).
- Order, *Acanthodii.*
  - Family, Acanthodidæ
    - Genera, *Acanthodes*, *Cheiracanthus.*
  - Family, Ischnacanthidæ.
    - Genera, *Ischnacanthus.*
  - Family, Diplacanthidæ.
    - Genera, *Diplacanthus*, *Climatius*, and *Parexus.*

Sub-Class *OSTRACODERMI* (Extinct groups of Armour-plated fishes.)
- Order, *Heterostraci*
  - Family, Pteraspidæ.
    - Genus, *Pteraspis.*
- Order, *Osteostraci.*
  - Family, Cephalaspidæ.
    - Genus, *Cephalaspis.*
- Order, *Antiarcha.*
  - Family, Asterolepidæ.
    - Genera, *Asterolepis*, *Pterichthys*, *Bothriolepis.*

Sub-Class, *TELEOSTOMI* (The ordinary types of fish exclusive of the Sharks and Rays).
- Order, *Crossopterygii* (Fringe-finned Fishes).
  - Family, Holoptychiidæ.
    - Genera, *Holoptychius*, *Glyptolepis.*
  - Family, Osteolepidæ.
    - Genera, *Osteolepis*, *Diplopterus.*
- Order, *Actinopterygii.*
  - Family, Palæoniscidæ.
    - Genus, *Cheirolepis.*

Sub-Class—*DIPNOI.*
- Order, *Sirenoidei.*
  - Family, Dipteridæ.
    - Genus, *Dipterus.*
- Order, *Arthrodira.*
  - Family, Coccosteidæ.
    - Genera, *Coccosteus*, *Homosteus.*

HUGH MILLER AND THE GRAVESTONE, 1843-4

by Sara Stevenson

Stevenson, S. 2017. Hugh Miller and the Gravestone, 1843-4. *The Geological Curator* 10 (7): 455 - 461.

The photographs of David Octavius Hill and Robert Adamson, taken in Edinburgh between 1843 and 1847, were arguably the first to explore the truthful and aesthetic properties of photography, beyond its powers as an accurate form of reproduction. The largely undocumented friendship between D. O. Hill, the landscape painter and photographer, and Hugh Miller, was based on an evident mutual admiration. This appears initially in the photographs of him taken by Hill and Adamson in 1843 and 1844, and in one of the very earliest critical articles on photography, written by Miller in 1843 from this direct experience as a sitter and from discussion with the photographers.

This article is intended to offer a cross-cultural approach to images generally examined for their artistry. The original intention behind the photographs was sophisticated beyond the concern to make an attractive picture, and was meant to address the individual, his nature and his concerns. The portraits show us one of the most significant geologists of his day, and should be seen within the historic context of that time. They are museum objects, which can be read for their visual and intellectual impact.

Sara Stevenson, Honorary Senior Research Fellow, School of Culture and Creative Arts, University of Glasgow, 8 University Gardens, Glasgow G12 8QH, Scotland. Email sara.stevenson11@btinternet.com. *Received 24 January 2016. Accepted 11 August 2017.*

Introduction

At some point between the end of May and the beginning of June 1843, Hugh Miller, the geologist, stonemason and editor of the evangelical newspaper, *The Witness*, was to be found leaning on a tombstone in the Old Calton cemetery in Edinburgh (Figure 1). Miller was co-operating in an experiment, which had started over the road in the garden of the highest private house on Calton Hill. This house was currently leased by the newly-established photographer, Robert Adamson (1821-1848). Calton Hill itself was one of the volcanic eminences of the city, at the eastern end of Princes Street, giving a magnificent panoramic view, sweeping across the Old and New Towns of the city and round to the Forth estuary. Adamson's choice of location had the great advantage that it was elevated well above the streets and much of the city's pollution, and faced south into the sun. He worked with the 'calotype' process, invented by William Henry Fox Talbot in 1840. This comparatively insensitive process used opaque drawing paper both for

Figure 1. David Octavius Hill and Robert Adamson, Hugh Miller, calotype photograph, 1843. Courtesy and copyright National Galleries of Scotland, PGPHA 281.

the negative and the positive and required the maximum natural light - preferably sunlight - to take the picture. Robert Adamson's 'studio' was out of doors. The paper generally used by Robert Adamson was Whatman Turkey Mill, the same paper used by J. M. W. Turner for his watercolour painting. For an extended view of the careers of Robert Adamson and his collaborator David Octavius Hill (1802-1870), see Stevenson (2002), and for Miller, Taylor (2007).

The time was one of high enthusiasm in Edinburgh. In May, more than 400 of the ministers of the established Church of Scotland had issued a protest against the interference of landowners in selecting ministers, the so-called patronage, and walked out, to form the Free Church of Scotland. This extraordinary act has been described as the equivalent of the political revolutions in other countries at the time (Brown and Fry 1993, p. ix):

> It was an age of revolution in Scotland, more far-reaching in its impact than that surrounding the Union of 1707, and the Disruption crystallised and symbolised the transformations being unleashed on the nation.

The Disruption was a focus of international attention. Miller himself (1843a) described it as: 'One of the most pregnant events in modern history […] an event for which Evangelism all over the world feels a deep concern.' The Rev Dr Thomas Guthrie, one of the leading figures of the Free Church, later recounted that the noted German chemist, the Chevalier Bunsen, was impressed with the idea:

> that God had, in His providence, raised us up in this country, and placed us in circumstances favourable for its solution, to try the problem, whether a Church, without aid or countenance from the State, could by the resources of its own members and nothing else, fulfil the two grand objects of every living being - sustain and extend itself. (Guthrie and Guthrie 1875, vol. 2, p. 67)

At home, the Disruption filled the genre and landscape painter, David Octavius Hill (1802-1870), with the urge to paint a grand historical picture. The painting, which took more than 20 years to complete, is generally known as the Disruption Painting, but was formally titled *The First General Assembly of the Free Church of Scotland. Signing the Act of Separation and Deed of Demission at Tanfield, Edinburgh, May, 1843*. It is in the collection of the Free Church of Scotland. Hugh Miller is prominently placed in the foreground. Miller, one of the key figures in the fight, may have first met Hill while he was making his preliminary sketches at the formal meetings of the Free Church. Miller wrote an article on the subject, comparing David Allan's painting of the General Assembly of the Church of Scotland in 1783, with D. O. Hill's approach (Miller 1843a):

> If Allan, with his quick perception of the ludicrous, his homely truth of character in all cases in which the character was not of an exalted cast, his enjoyment of the low, and his unideal plainness of conception […] was one of the best fitted in the world for taking the portrait of Moderatism when in its palmiest condition, - Evangelism in the present instance has been not less fortunate in its artist. The one principle required a caricaturist who could confine his love of the ludicrous within the limits of the just and the natural; and such a caricaturist it got. The other demands an artist of nice sensibilities, not unaffected by the moral sublime, and a master of character in its higher departments; and such an artist has it found in Mr Hill, - a gentleman of exquisite taste and fine genius.

The physicist Sir David Brewster (1781-1868), himself a Free Churchman, also encountered Hill at work sketching. He recommended Hill to meet Robert Adamson to consider using photography to capture the portraits of so many ministers before they dispersed to their homes throughout Scotland. The studio was rapidly set up to take portraits and groups as sketches for the painting, and Hugh Miller was photographed.

In connection with these first encounters and the discussion that evidently took place, Miller became interested in the process. He decided to write a further article, 'The Calotype,' which was published in July (Miller 1843b). In the course of discussion, the three men may well have devised the second portrait session, which took them over the road to the Calton graveyard. In these photographs, the gravestone Miller leans on is just by the gate, but by a curious conjuring trick it is surprisingly difficult to find, because the side we see in the photograph is the reverse of a far more interesting piece of carving (Figures 2, 3). It would appear that the family inscription filled the front and then moved, economically, round the back, where it is dated 1756. The back was given the carved symbol of the mason's dividers and setsquare in reference to a later member of the family, which was also appropriate for Hugh Miller. The calotype was staged to give the best, raking, light to bring out the carving at the top of the stone, and was presumably taken in the morning. (The stone is currently facing west and east but it has been raised and reset, so it may not be in the original

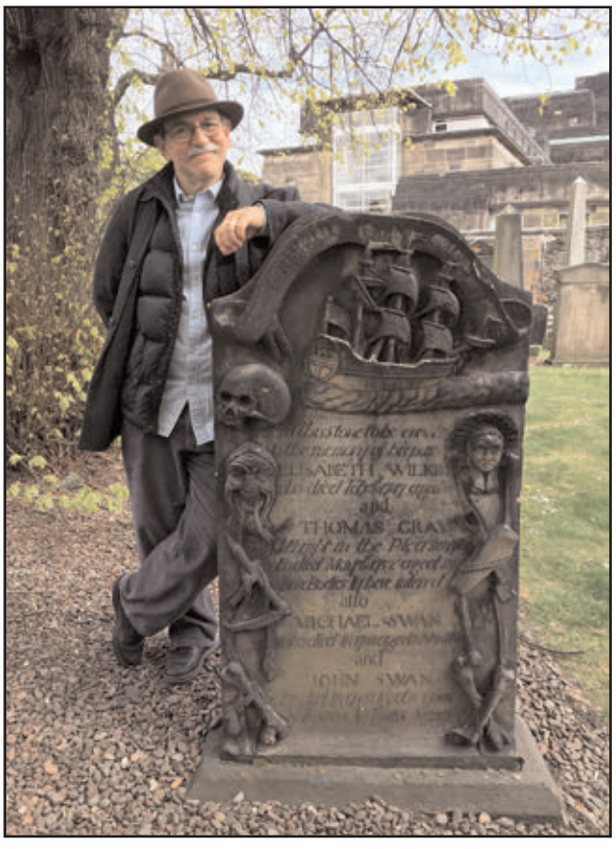


Figure 2. Alison Morrison-Low, Kenneth J. Launie leaning on the gravestone erected by Captain John Gray in memory of his parents, (i-phone digital photograph, 2017). Photograph courtesy and copyright Alison Morrison-Low.

Figure 3. Robin Gillanders, Michael Taylor leaning on the gravestone erected by Captain John Gray, reverse (camera digital image, 2017). Photograph courtesy and copyright Robin Gillanders.

orientation.) The curious coincidence, that Miller's own father had been a sea captain, would have struck both Miller and Hill as pleasing - the ship was not to be seen in the photograph, but it was there behind Miller, an appropriate piece of history.

There are two issues raised in the taking of these calotypes, which are worth exploring before analysing the actual intention behind them. Firstly, according to Miller's son, recounting an event taking place some seven years before his own birth, Miller and the photographers found by chance a mason at work in the graveyard; the coincidence suggested that Miller should 'assume his old garb and be taken[,] mallet in hand' (Hugh Miller the younger in Taylor 2017, p. 105). Miller had begun his working life as a stonemason - work, which had opened out the world of geology in the discoveries he made while breaking stone for building and exploring the rocks more widely from that start. He had then turned to the more skilful work of carving stone, generally for graves. This account proposes a casual character for the session. It belongs within the persistent conception of photography itself as an accidental art, which has dogged photographers from the beginning. But the pose and the location were consciously chosen and constructed.

Secondly, an analysis of the photographs, made by Michael Shortland, argues (briefly speaking) that Miller was assuming a physical, 'masculine' role, because he was uncertain of his male identity. Shortland (1996, p. 15) saw the images as unreal:

> Here was a man earning £400 per annum adopting the pose of a stonemason lucky to earn £40, a man on terms of easy acquaintance with the leading intellectual, political and religious figures of his day presenting himself as a humble mechanic. The photographs thus reveal a man engaged in a complicated process of self-modelling, in which truth somehow emerged - or was intended to emerge - from deceit and duplicity.

The practical flaw of this argument lies in the assumption that Miller alone determined the design of the photograph and his appearance. But neither Hill's work on the painting nor his work with photography was commissioned; and in contemporary terms, it is very hard to imagine a conversation between the men on this subject, even in cloaked terms.

Shortland's view of the humility in the pose may well be correct in different terms. It would have seemed absurd both to Hill and to Miller and, indeed, contrary to nature and truth to propose that Miller should

keep his coat on to signal to the world that he was now an intellectual earning £400 a year.

There is a near-contemporary anecdote, which may well relate to these photographs, which was told after Miller's death (Anon. 1858):

> The late Hugh Miller, on being asked by a lady why he did not destroy some photograph portraits of himself lying on his writing table, replied, "Because when I look at them they keep me humble."[1]

Assuming the story is true, it is likely that the photographs in question were Hill and Adamson's, but, if they were, an idea of *Christian* humility lay behind the photographs in Miller's mind. At the time, some still saw social humility as a proper part of Christian humility; rising in the world could carry a burden of doubt. Dr Thomas Guthrie quoted a letter from Miller in 1853, refusing an invitation from the Duke of Argyll (Guthrie and Guthrie 1875, vol. II, pp. 325-326):

> I could easily reason on this point, and have oftener than once done so:- I have said that our nobles have *their* place… and that I have *mine*, with its own humble responsibilities, and duties; and further that men in my position, but vastly my superiors - poor Burns, for instance - have usually lost greatly more than they have gained by their approaches to the great. But I am not to reason the matter, seeing that it exists in my mind mainly as a feeling which I cannot overcome. You will think all this very foolish; but it is fixed, and I really can't help it […].

Truth, in both Miller's and Hill's minds, arose from nature, and required a simplicity of approach, which was, albeit paradoxically, achieved by considerable calculation, or 'art', on the photographers' part. Miller (1843b) introduced his article on the calotype with a paragraph on its current status:

> There are some two or three slight advantages which real merit has, that fictitious merit has not; among the rest, an especial advantage […] of being unobtrusive and modest. It presses itself much less on public notice than its vagabond antagonist, and makes much less noise; it walks, for a time at least, as if slippered in felt.

Miller added of an individual calotype: 'The drawing is truth itself; but there are cases in which mere truth might be no great merit.' This emphasis on truth was critically important both for Hill and for Miller. They were working within the context of a great religious revival - nature was filled with religious intimation, and it was natural sunlight which made the image.

It may be assumed that the graveyard photographs were taken in the context of Miller's second article, on 'The Calotype' itself. There were at least three photographic sessions with Miller as the subject. The first, small portraits were designed especially to show Miller's head, with his hair either falling forward or brushed back to show the height of the forehead. They are straightforward studies for the Disruption Painting, and Hill used one for the purpose. In another of these, the chair used in the studio garden is visible, and Miller has the stonemason's mallet on the table beside him. This implies that, far from being a staged or fancy picture, the graveyard picture was an extension of the formal portrait sketch - that it incorporated Miller's idea of himself; he brought the mallet with him to be photographed for the painting, and he may even have thought that it would be included in the picture as his symbol. The idea that he assumed a stonemason's garb on entering the cemetery is also confusing. In fact, all he has done is to take off his coat and roll up a sleeve.

Miller, like Hill, was probably personally interested in the potential of photography for the dissemination, both of accurate knowledge and expressive book illustration. As an example of the first case, Miller (1858, pp. 207-208) told the story of a significant fossil fragment, named *Stagonolepis*, thought to be part of a fish (it was much later re-identified as a reptile). This was brought to Patrick Duff, the Town Clerk of Elgin - an enthusiastic fossil-collector - by a builder of dry-stane walls, called dykes in Scots:

> In breaking open a building stone, the diker had found the inside of it, he said, covered over with curiously carved flowers […] The supposed flowers are the sculpturings on the scales of the ichthyolite […] the sole representative of an extinct genus […] An Elgin gentleman forwarded to [the expert, Louis Agassiz in] Neufchatel a singularly fine calotype of the fossil, taken by Mr Adamson of Edinburgh, with a full-sized drawing of one of the scales; and from the calotype and the drawing the naturalist has decided that the genus is entirely new[…].

Probably the first scientific photographs taken from fossils were shown by another worker at the British Association for the Advancement of Science meeting in Glasgow in autumn 1840 (Stevenson and Morrison-Low 2015, pp. 249-250). But, as far as *Stagonolepis* was concerned, Robert Adamson may

[1] But Miller was also photographed by James Good Tunny and Alexander Rae in the 1850s; it is possible that the lady simply thought that these were not good portraits.

have been partly prompted here by his brother and teacher in photography, Dr John Adamson (1809-1870), who used photography as a curator, making pictures of specimens of natural history for the museum of the St Andrews Literary and Philosophical Society (Morrison-Low 1993). The calotype process, as the first viable negative/positive form of photography, had an immense advantage over the contemporary daguerreotype, which was a one-off image, of great delicacy. The calotype offered the potential for direct communication - a picture on paper, which could be multiplied, so that many experts could see the same object and make authoritative comment, and which could be posted whether at home or abroad. It was a tool for scholarship, needed by the demanding and original study of geology. The fossil, *Stagonolepis robertsoni*, was reproduced in Agassiz (1844-1845, Tab. 31, fig. 14).

The issue of expressive photography was a little more complicated. In his article on the calotype, Miller says (1843b):

> Another very curious result will be, in all probability, a new mode of design for the purposes of the engraver, especially for all the illustrations of books. For a large class of works the labours of the artist bid fair to be restricted to the composition of *tableaux vivants*, which it will be the part of the photographer to fix, and then transfer to the engraver. […] Compared with the mediocre prints of nine-tenths of the illustrated works now issuing from the press, these productions serve admirably to show how immense the distance between nature and her less skilful imitators. There is a truth, breadth, and power about them, which we find in only the highest, and not often even in these.

Miller connected this thought directly to the stonemason portrait. But here he lays a mild false trail; he makes the image anonymous, and refers to Walter Scott's novel, *Old Mortality*:

> We have two well-marked drawings before us, in which we recognise the capabilities of the art for producing pictures of composition. They are *tableaux vivants* transferred by the calotype. In the one a bonneted mechanic rests over his mallet on a tombstone - his one arm bared above his elbow; the other wrapped up in the well-indicated shirt folds, and resting on a piece of grotesque sculpture. There is a powerful sun; the somewhat rigid folds in the dress of coarse stuff are well-marked; one half the face is in deep shade, the other in strong light; the churchyard wall throws a broad shadow behind, while in the foreground there is a gracefully chequered breadth of intermingled dark and light in the form of a mass of rank grass and foliage. Had an old thin man of striking figure and features been selected and some study-worn scholar introduced in front of him, the result would have been a design ready for the engraver when employed in illustrating the Old Mortality of Sir Walter.

There is an interesting point here about the truthfulness of the calotype as it connects to the truthful, or factual, basis of Scott's writing, and to the enthusiasm expressed by Miller for the process - both Miller and Hill were clearly aware at this very early stage in photography that a photograph did not *necessarily* tell the truth. Hill was interested in taking photographs to illustrate Scott's work. In doing this, he was not simply looking for picturesque models, he was looking for people of the similar admirable and strong character that Scott described. The truth would not lie in the appearance but in the reality pictured. This distinguishes his practice from the common choice of models among the painters and indeed among the photographers of the 19th century. Scott met the original 'Old Mortality', a stonemason who restored the graves of members of the strict Cameronian sect in the 18th century, and Scott's novel about the 17th century Covenanters used the mason as the narrator of the history. The story concerned the military campaign led by John Graham of Claverhouse against the Covenanters, who resisted the Government's determination to establish Episcopalian government by bishops in the Church of Scotland in 1679. Miller's own passion for the Free Church was tied to an idea of returning to the Covenanting principle - the refusal to accept Government interference and patronage - and this was an idea he shared with the leaders of the Church.

Miller (1850, pp. 428-429) wrote of the emotional intensity he found in the monumental mason's work:

> Perhaps no personage of real life can be more properly regarded as a hermit of the churchyard than the itinerant sculptor, who wanders from one country burying-ground to another, recording on his tablets of stone the tears of the living and the worth of the dead [...] How often have I suffered my mallet to rest on the unfinished epitaph, when listening to some friend of the buried expatiating, with all the eloquence of grief, on the mysterious warning - and the sad deathbed - on the worth that had departed - and the sorrow that remained behind! [...] I have risen from my employment to mark the shadow of tombstone and burial-mound creeping over the sward at my feet, and have been rendered serious by the reflection, that as those

Figure 4. David Octavius Hill and Robert Adamson, Hugh Miller, calotype, 1844. Courtesy and copyright National Galleries of Scotland, PGPHA 283.

> gnomons of the dead marked out no line of hours, though the hours passed as the shadows moved, so, in that eternity in which the dead exist, there is a nameless tide of continuity, but no division of time.

Miller himself had experienced this melancholy reality, which connects the picture to his ideal and imaginative life. His self-image was that of a man of spiritual sensitivity and humility, coupled with a pride in his physical strength and skill: the stonemason fitted that ideal more readily than the bank accountant and, later, the newspaper editor, that he successively was. This feeling would have been reinforced when his beloved small daughter died and he took up his mason's tools for the last time to carve her gravestone. When Hill found himself mourning the death of his only surviving daughter in 1861, he responded in the same professional way, by taking up his brush and painting two landscape paintings in her memory (see Stevenson 2002).

Miller was far from content with his editorial role. He said: 'the newspaper editor writes in sand when the flood is coming in' (Miller 1854, p. 530). The biblical analogy between building on the shifting sand or on the stability of the stone immediately comes to mind.

The apparently casual character of the graveyard photographs taken in 1843 is clearly qualified by the professionalism and intensity behind them. The importance of the image to both Hill and Miller caused them to restage it for a far larger camera in 1844, taking the image out of the context of book illustration and into the arena occupied by the larger-

scale engravings of the day, which could be hung on the wall alongside paintings (Figure 4). The simplicity of the staging makes it an inherently natural picture - a point of importance to the process and the result.

These may be simple pictures but they had, like nature itself, the potential for a layered density of truth. A cultural sophistication, based on historical, literary and biblical reference, would enable both men, Miller and Hill, to see and feel the natural power of such analogies, which would be made effective through the force of the illuminating sun, printing the image of a complicated, and therefore more accurate, sense of reality upon the paper.

Acknowledgements

I am grateful as ever to my friends, the historians and photographers, for their interest and intelligence, in this case principally Michael Taylor, Robin Gillanders, and Jane Brettle, who found the stone after I had searched for it twice.Figures 1 and 4 were provided courtesy of the National Galleries of Scotland (www.nationalgalleries.org/art-and-artists/9500 and www.nationalgalleries.org/art-and-artists/10641).

References

AGASSIZ, J.L.R. 1844-1845. *Monographie des poissons fossiles du Vieux Grès Rouge ou Système Dévonien (Old Red Sandstone) des Îles Britanniques et de la Russie*. xxxvi + 171 pp + atlas of 43pl. Soleure, Neuchâtel.

ANON. 1858. Photography and Art. *The Art Review and Photographic Record* (Edinburgh), 31 Mar., **1**, 531.

BROWN, S.J. and FRY, M. 1993. *Scotland in the age of the Disruption*. Edinburgh University Press, Edinburgh, xi + 183 pp.

GUTHRIE, D.K. and GUTHRIE, C.J. 1975. *Autobiography of Thomas Guthrie, D.D. and memoir by his sons* […]. 2 vols. Daldy, Isbister, London.

MILLER, H. 1843a. The two prints. *The Witness* 24 Jun.

MILLER, H. 1843b. The Calotype. *The Witness* 12 Jul. [reprinted as Miller (2003)].

MILLER, H. 1850. *Scenes and legends of the north of Scotland; or, the traditional history of Cromarty*. Second edition. Johnstone and Hunter, London, xiv + 481pp.

MILLER, H. 1854. *My schools and schoolmasters; or, the story of my education*. Johnstone and Hunter, Edinburgh, v + 537pp.

MILLER, H. 1858. *The cruise of the* Betsey, *or, a summer ramble among the fossiliferous deposits of the Hebrides*. Constable, Edinburgh, ii + 486pp [first edition; reissued 2003 in facsimile by NMS Publishing, Edinburgh].

MILLER, H., 2003 The calotype. *History of Photography* **27**, 7-12.

MORRISON-LOW, A.D. 1993. Dr John Adamson and Thomas Rodger: amateur and professional photography in nineteenth-century St Andrews. *In*: LAWSON, J., McKENZIE, R., and MORRISON-LOW, A.D. (eds.) *Photography 1900. The Edinburgh symposium*. […] National Museums of Scotland and National Galleries of Scotland, Edinburgh, 1993, 18-37.

SHORTLAND, M. 1996. Bonneted mechanic and narrative hero: the self-modelling of Hugh Miller. *In*: SHORTLAND, M. (ed.) *Hugh Miller and the controversies of Victorian science*. Clarendon Press, Oxford, 14-75.

STEVENSON, S. 2002. *The personal art of David Octavius Hill*. Yale University Press, New Haven, 256pp.

STEVENSON, S. and MORRISON-LOW, A.D. 2015. *Scottish photography: the first thirty years*. National Museums of Scotland, Edinburgh, xii + 383pp.

TAYLOR, M.A. 2007. *Hugh Miller. Stonemason, geologist, writer*. NMS Publishing, Edinburgh, 176pp.

TAYLOR, M.A. 2017. A memoir of Hugh Miller (1802-1856) attributed to his son Hugh Miller F.G.S. (1850-1896). *Archives of Natural History* **44**, 103-109.

THE GEOLOGICAL CURATOR

Publication scheme

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

Notes to authors

Articles should be submitted by email to the Editor (journal@geocurator.org). One file in MS Word is preferred for the manuscript. Please follow the style of papers in the journal, especially in the title, authorship and abstract layout. Figures can be included in the Word file on original submission for review purposes, but must be supplied as individual jpg or tiff files with the final accepted version. Figures should be designed to be legible and meaningful if printed in greyscale, although colour may be used if justified. If colour is essential, authors are advised to discuss with the Editor, prior to submission. If original images are in colour, the pdf supplied to authors will be in colour, even if the journal issue is printed in greyscale. Captions to figures should be included with the figures, but can be in a separate list. Both drawings and photographs should be proportioned to utilise either the full width of one column (85mm) or two (175mm). References in the text follow the Harvard system, i.e. name and date '(Jones 1980)' or 'Jones (1980)'. All references are listed alphabetically at the end of the article and journal titles should be cited in full.

Authors will normally receive proofs of text for correction. Major articles are refereed. Copyright is retained by authors.
If submitting articles, please note the following:

1. Do not 'upper case' headings. **Keep <u>all</u> headings in sentence case**.
2. **Use italics** rather than underline for latin names and expressions, journal names and book titles. **Use bold** for volume numbers in references.
3. **Single space** your file. Use a **single (hard) carriage return** at the end of each paragraph.
4. Single space-bar between words, **double space-bar between sentences**.
5. **Do not attempt** to format your article into columns. Use a minimum of tabs and indents.
6. Author names in the references should be in capitals.

If no computer facilities are available to authors, please discuss submission of proposed articles with the Editor, Matthew A. Parkes, Natural History Museum, Merrion St., Dublin 2, Ireland (tel 353-87-122-1967; e-mail: journal@geocurator.org).

Regular features

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

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

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

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

INFORMATION SERIES ON GEOLOGICAL COLLECTION LABELS consists of reproductions of specimen labels usually written by a collector of historic importance. The aim of the series is to aid recognition of specimens originating from historically important collections. Contact the Editor.

Advertisement charges

Full A4 page: £80 per issue / Half A4 page: £60 per issue / Quarter A4 page: £40 per issue
25% discount for space bought in three or more issues. Please discuss options with the Editor.
Inserts such as publishers' 'flyers' can be mailed with issues of *The Geological Curator* for a fee of £80 per issue (negotiable).
300 copies of any insert should be sent to the Editor.

Subscription charges 2017

UK Personal Subscription £20 per annum (optional concessionary rate for the unwaged - £15)
UK Institutional Subscription £25 per annum.
Overseas Personal Subscription £23 per annum (US $30 / €25)
Overseas Institutional Subscription £27 per annum (US $35 / €30)

All enquiries to the Treasurer, Rachel Walcott, Principal Curator, Earth Systems, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, U.K. Tel: +44 (0) 131 2474068; email: treasurer@geocurator.org

Backnumbers

Backnumbers of *The Geological Curator* (and its predecessor, the *Newsletter of the Geological Curators' Group*) are available – please enquire with your requirements. All but the last two years are freely available for download from www.geocurator.org.

THE GEOLOGICAL CURATOR

VOLUME 10, NO. 7

HUGH MILLER

CONTENTS