

Mrs Elizabeth Gray (1831–1924): a Passion for Fossils

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Mrs Elizabeth Gray, still collecting at the age of 92; this photograph was taken on a family visit to Balclatchie in September 1923.

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1. INTRODUCTION

Amateur fossil collectors have always made a valuable contribution to palaeontology. Inevitably, during the early days of the science their collections augmented the material gathered by the professional geologists and made a substantial contribution to its development. The various specialists and professional geologists were able to make only occasional forays into the field and either employed local residents to gather specimens, or had arrangements with quarrymen, or else had to rely upon the collections of amateurs to resolve the problems they encountered. Other naturalists, like the Sowerbys, who produced the early reference books encouraged such collectors to submit material to them for determination with the hope that they might have ‘something new’, which could then result in recognition of their effort by being named accordingly (Allen, 1976; Cleevely, 1983).

In his history of Scottish Palaeontology, Clarkson (1985: 1) has shown how the discovery & description of the rich fossil assemblages of the Palaeozoic sedimentary rock sequences of Scotland was largely conducted by self-taught amateurs. This was particularly the case with the thick sequence of Ordovician rocks, mainly clastics and limestones of shallow water origin with their rich, often unique faunas occurring around Girvan, Ayrshire. Mrs Elizabeth Gray, wife of the ornithologist Robert Gray, amassed considerable collections from this district and has been described ‘as one of the foremost fossil collectors of all time’ as a result of her redoubtable activities over a period of more than fifty years (*ibid*: 7). Her initial efforts were encouraged by the research interest & need for Palaeozoic brachiopods of Thomas Davidson and subsequently, by Charles Lapworth, who utilised the fossil faunas she helped to reveal to interpret and correlate the stratigraphy of the Girvan region.

Miss Etheldred Benett (1776–1845) is regarded as the first woman geologist (Cleevely, 1983: 54) through her wide involvement in collecting British fossils, particularly from the Cretaceous exposures of Wiltshire. The Philpott sisters (1833–40) were amongst the first to collect Jurassic fossils in Dorset on behalf of the specialists and were soon joined by the more widely known Mary Anning (1799–1847), partly to provide themselves with additional income. However, a decade later, Mrs Gray began a lifetime of collecting in the Girvan district of Ayrshire solely out of interest. She was a woman of extraordinary character and considerable determination, who as a result of these activities left a lasting name in Scottish geology (see Flett, 1937).

The Gray Collections have become of particular value because:

- (a) a careful record as to the exact geographical location and geological horizon from which each fossil was obtained had been maintained; [this was also augmented by Mrs Gray's phenomenal retentive memory of each specimen!];
- (b) it was also one of the earliest collections containing information as to the relationship of the specimens to one another; or attempting to ensure that part/counterpart were kept together;
- (c) the collections formed the basis for many of the earlier descriptive papers and monographs by significant Palaeozoic palaeontologists [principally owing to its uniqueness]; this material also formed the basis of the fossil lists published by the officers of the Geological Survey in their Memoirs. As a result, the Gray collection contains many type specimens of British fossils and is also significant in the nomenclature of higher taxa.

Together with her daughters, Mrs Gray formed three collections of Girvan fossils; the first is now in the Hunterian Museum, Glasgow, the second in Edinburgh and the third, by far the most significant, was purchased by the BMNH in 1920. Later, her daughters contributed substantial material to the BMNH to augment the original collection.

Apart from providing information on the accumulation of the fossils by the Gray family and their subsequent acquisition by institutions and their use by palaeontologists, the main purpose of this paper is to indicate Mrs Gray's relationships with these scientists. The extensive correspondence now preserved in the Palaeontology Library of the British Museum (Natural History) through the efforts of her daughter Alice and the co-operation of two former Keepers of Geology, Dr W. D. Lang & Mr W. N. Edwards, has enabled us to attempt this appraisal. In fact, examination of her lengthy correspondence with Dr F. A. Bather over a period of thirty years, reveals Mrs Gray's single-mindedness. To attain her objective of ensuring the description of 'her Girvan fossils' as quickly as possible, ideally in a series of monographs based on the Gray Collection, she somewhat overlooked the other tasks and difficulties that might beset the busy specialists, whom she had persuaded to undertake the work.

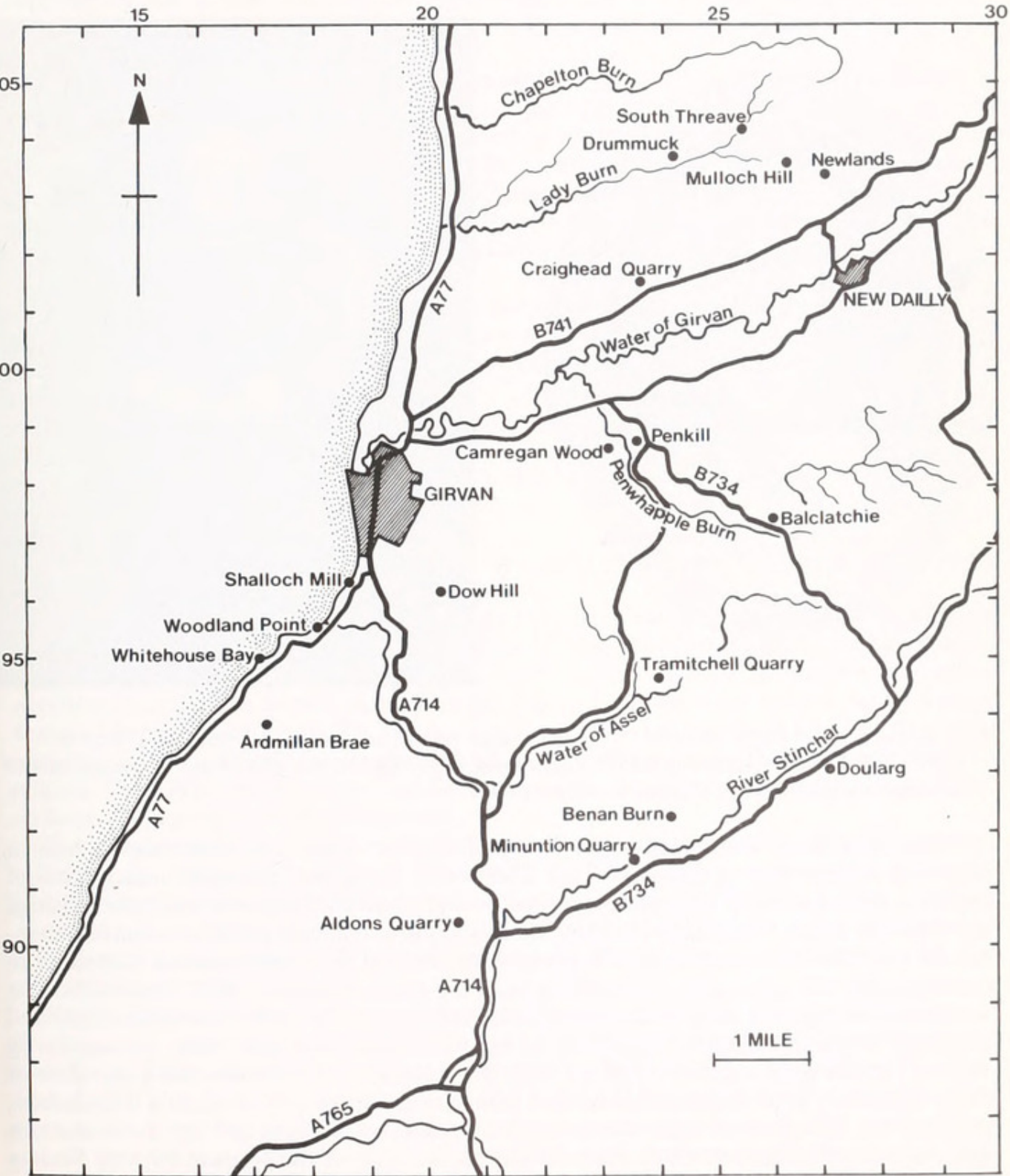
Recognition of the significance of the Gray Collection and the qualities shown by Elizabeth Gray in accumulating such a wealth of material, has led to several earlier attempts to write a short biography and record the history of the collection. However, neither the original attempt made by Alice Gray¹, nor a later effort by W. N. Edwards of the Department of Geology, BMNH² was ever published³. Fortunately, although W. N. Edwards' notes cannot be found, Alice Gray's earlier drafts have been preserved amongst the Gray papers⁴. In many respects, she might almost be considered as another author of this paper, for in addition to her biographical account of her mother, Alice was also responsible for the organisation of the Gray Correspondence, various family photographs and other relevant material into several bound volumes before presenting them to the BMNH in 1938. Furthermore, much of our own information on the Gray family and their collecting has been gleaned from the occasional reminiscences that Alice Gray made in her letters to the staff of the Department of Geology.

2. BIOGRAPHY OF MRS ELIZABETH GRAY AND HER FAMILY

The little biographical information available was provided by her daughter Alice in a brief account of Mrs Gray's life written at the request of the Geological Survey, after her mother's death⁵.

Elizabeth, the younger daughter of Thomas and Mary Anderson, was born at the Burns' Arms Inn, Alloway, nr. Ayr on 21 February 1831 according to baptismal records (pers. commun. Daniella Shippey, 17 October 1985). However, Elizabeth Gray and her family always recognised 21 March 1831 as her birthday [see Biography MSS and letter 18 March 1913].

In 1836, her parents moved to the Girvan district when her father decided to leave his occupation as an innkeeper and become a farmer. At the age of fifteen, after education



Map of the Girvan area.

at a small private school in Girvan, Elizabeth was sent to a boarding school in Glasgow for a year. She then returned to the farmhouse at Enoch to assist her mother in looking after her six younger brothers. During this period, her interest in the local fossils was aroused by her father, who gathered specimens when travelling around the neighbourhood, particularly material extracted from nearby sites used in repairing the roads. Thomas Anderson was a keen naturalist, and in their monograph on the fossils of the Girvan district, Nicholson & Etheridge (1879: 165) dedicate a trilobite *Bronteus andersoni* to this 'intelligent and enthusiastic collector' and later named a coral after him (p. 273)⁶.



Left: Robert Gray (1825–1887); pl. V from obituary published in *Glasgow Naturalist*, Vol. 4.

Right: Family photograph of Mrs Elizabeth Gray in 1905 when she was 74 and there appears to have been a lull in her geological correspondence.

When Elizabeth was twenty-four she met Robert Gray⁷, at that time a branch inspector for the City of Glasgow Bank and one of the typical gentlemen-naturalists of that era, whose interest in ornithology had brought him to Girvan to study the birds of the Ayrshire coast. Much later, in 1869, he was to publish a joint paper with his father-in-law on the birds of Ayrshire and Wigtownshire. Robert Gray also assisted Elizabeth in collecting her Girvan fossils, particularly from the easily reached Penkill and Balcletchie localities and together they made a substantial collection. They were married in 1856 and although living in Glasgow were able to continue their bird and fossil excursions by visiting Girvan each summer. The scientific partnership was helpful to both, for Robert Gray became a keen fossil collector and from the evidence of Davidson's letterbooks, possibly the instigator of their family fossil forays. It would appear from the numerous contributions that Robert Gray made to the Proceedings of the Natural History Society of Glasgow, that he was frequently travelling throughout Scotland and Elizabeth had to learn to skin and preserve the bird specimens required for their bird cabinet. In 1864,

Robert Gray read a paper in Glasgow on 'Observations in various branches of Natural History during the past summer', which referred to these fossils.

The original Gray Collection was presented to the Hunterian Museum, Glasgow University in 1866. Various short papers and accounts of exhibits based on the joint work of Mr & Mrs Gray were published in the *Proceedings of the Natural History Society of Glasgow* between 1868 and 1878, several of them dealing with the fossils. It was shortly after the first of these, in 1868, that Professor John Young, one of the authors, instituted a class in geology for women at Glasgow University⁸, and presented a ticket to Mrs Gray. Apparently, she greatly enjoyed this opportunity – her only formal geological education – 'which provided some understanding as to the scientific value of the fossils she had collected' [Alice Gray MSS: 3].

A mixture of collecting, field observation and participation in local society activities is a predictable pattern of life for any young couple with a joint interest in natural history. However, it would appear that the Girvan fossils gradually became an absorbing pursuit. The growing family continued to spend its summer holidays at Girvan, presumably benefitting economically from family associations in the area, and each of the children were gradually introduced to assisting with gathering material for the collection. Alice Gray in writing about her sister Agnes [16 October 1937] recounts:

Like all the other members of the family, she began to help our Mother in her childhood; at the age of 5 or 6 years she was a trusted worker. It was this same sister, who picked up the first *Cothurnocystis* ever found.

In another letter [18 March 1924], written after the death of her mother, Alice states:

We hope to carry on collecting as the work at Girvan has been our principal recreation ever since we can remember.

It is not surprising that in such circumstances, with all the children occupied in finding material, the Gray collection increased rapidly.

In retrospect it appears that Robert Gray may have shown good judgement when in 1874, he accepted a post at the head office of the Bank of Scotland in Edinburgh. Although he eventually became their chief cashier, his decision to move was of more significance in that his former employers the City of Glasgow Bank ceased business some 4 years later on 2 October 1878. The auditors reported that the Bank had lost its capital amounting to £1 million, the Reserve Fund of £450,000 and a further sum exceeding £5 million. The Directors, Manager and Secretary of the Bank were committed for trial and all were given periods of imprisonment.

The Gray's involvement with natural history and local societies was still continued for, following the offices and role he had held with the Natural History Society of Glasgow, Robert Gray became prominent in the various societies of Edinburgh (see Obituary *Proc. Roy. Soc. Edinb.* **15**, 1887 and *DNB* **23**: 19). In particular, after being appointed its Secretary, he was responsible for re-vitalising the Royal Physical Society, one of that city's oldest scientific bodies.

About 1880, according to Alice Gray's account, Dr Traquair, Keeper of Geology at the Royal Scottish Museum had suggested to Mrs Gray that she should describe her own material and had offered to teach her to do such work. However, she declined his offer, feeling that she could not hope to equal the authority of those who had devoted their lives to investigating particular branches of palaeontology. Instead, she preferred to devote her own energies to provide such specialists with ample material to complete their descriptions and interesting specimens upon which they could conduct their research, since her real enthusiasm lay in discovering and collecting fossils.



No. 59, George Street, the home of Mrs Gray and her daughters from the 1890s until 1945. This photograph shows the property in 1971 when the premises were occupied by the Dunfermline Building Society and the publishers T. & T. Clark (2nd floor). Alterations to the building had been made to provide the necessary separate access. No. 59 extends from the drain pipes (right centre) to a point above the doorway to the left of the Building Society's front. Reproduced with the permission of The Royal Commission on Ancient & Historical Monuments of Scotland.

Map section showing part of central Edinburgh to indicate the relationship of George St. within the city.

Robert Gray died in February 1887 having made his own particular contribution to natural history with the pioneer work on Clyde ornithology *The Birds of the West of Scotland* published in 1871. Unfortunately, its companion volume *The Birds of the East of Scotland* which he was preparing with William Evans at the time of his death was never published. Although ranging widely over the whole of the West of Scotland, the bulk of Gray's book provides the first genuine account of the birds of the Clyde area. The book has become a minor classic and one to which modern ornithologists are indebted. J. A. Gibson, to-day's specialist in Clyde ornithology, has written of the work (1981: 71): 'One of the masterly bird books of all time. As the years pass, being more and more highly regarded. . . . Gray brings the birds and bird-watching a century ago magically to life.'

It was only after her husband's death that the Gray family began their long residence at what was to become the familiar address of 59, George Street⁹, and which was occupied by various members until 1944 (see p. 210). Mrs Gray survived her husband by thirty-seven years and maintained an interest in the Girvan fossils throughout that time and resolutely collected further material with the help of her daughters for all but the last few months of her life¹⁰.

In 1903, she was awarded the Murchison Geological Fund by the Geological Society for 'her great services to geological science'. It was fitting that Professor Charles

Lapworth was the President to do this for in his address he was able to record 'that Mrs Gray had devoted the leisure hours of almost half a lifetime' to dealing with the fossils of the Ordovician and Silurian rocks of the Girvan district. Lapworth himself had accompanied her in the field, had benefitted from her collection and the precision of its accumulation, all of which he personally acknowledged in his address. (*Proc. Q. Jl. Geol. Soc.*, Lond., 59: xlvii–xlvi). In her letter of reply, Elizabeth Gray wrote that her work had given her 'lifelong pleasure' and particularly the knowledge that it had been of service to many geologists. She emphasized that initially, her husband had shared in the pursuit of the fossils and in working them out, and greatly regretted that he too could not share her satisfaction in the recognition of their joint work. Mrs Gray was elected an Honorary member of the Geological Society of Glasgow, where she was regarded as the first and foremost of all the 'Silurian' workers (MacNair & Mort, 1908: 122); she also became a Fellow of the Royal Physical Society of Edinburgh.

Mrs Gray died of heart failure on 11 February 1924 following six days of acute bronchitis and within six weeks of her ninety-third birthday, her elder daughter Mary died the following week and in both death certificates bronchitis is given as the major cause. Alice Gray writing to Dr F. A. Bather about her mother shortly afterwards wrote (24 February 1924):

The last day she was downstairs she looked over some fossils that she thought it might interest you to see . . . they were packed up . . . a letter was drafted & she was to write it next day. I now enclose a copy of it and hope to post the box of fossils tomorrow.

3. THE GRAY COLLECTION

(i) Collecting Methods

The methods adopted in collecting have been described in detail by Alice Gray (Mss p. 5). From the quarrying tools shown in the available photographs it would appear that substantial digging operations were often undertaken. Although Alice has written: 'that no rock was ever taken down needlessly and that every piece of rock was carefully broken up and if a specimen was not found immediately, examined to the last fragment.' Every effort was made to ensure that part & counterpart were kept together, particularly after several of the specialists who had utilised the collection had emphasized this point (see letters of Bather, 14 March 1900 & 31 July 1900). Alice Gray commented that they considered that: 'a fossil without its counterpart was little better than half a fossil' and if loose specimens were picked up, time was often spent searching for its other part. It may be that Bather's comment to Mrs Gray on the need for having both parts had influenced their practice, since in his view: 'having only one side merely raises the question without affording the means of settling it!'

Certainly, the earlier descriptions based on Gray material do not contain many examples of counterparts (see Nicholson & Etheridge, 1878–80, in which only 5% of the trilobites described fall into this category). In another letter, Bather (14 March 1900) comments on the particular value of specimens of starfish, where with impressions of 'both sides' available, excellent examples could be obtained in contrast to the material described previously by those authors.

Every specimen found was, at once, firmly wrapped up in paper and placed into a bag, or vasculum. In the evening, the day's work was not considered to be finished until that day's collection had been packed into small parcels and labelled with a locality. When the material was back in their home, the specimens were trimmed by means of fine chisels, or



1

2



3

1. Alice & Agnes Gray at Threave Glen, below the farmhouse at South Threave in 1922.
2. The family at the Starfish Bed, Lady Burn in October, 1922; from left to right: an unknown friend, Agnes, Mary, Mrs Gray, and Alice.
3. Alice & Agnes Gray at a roadside quarry, Balclatchie in October 1922.

a saw, so that space could be saved. All these trimmings were examined further in the search for additional specimens; [—in a letter to Bather (7 November 1907) she asks for the return of any trimmings from a specimen of *Cyclocystoides* he had agreed to develop for her]. Later letters of Alice Gray (4 May 1937) and her sister Edith (4 August 1942) mention boxes of un-examined material that they had been unable to process; the latter asks the BMNH for help in dealing with this material, pointing out that her sister had 'often come across unknown treasures on splitting stones . . . in the house'.

Subsequently, each separate piece was then labelled with its locality and horizon—often small printed tickets were used—, before the specimens were classified and placed in cabinets, or stored temporarily in boxes. Yet, for some reason, Mrs Gray had decided not to resort to numbering her specimens. There is no indication why such normal practice was not adopted and one can only assume that her phenomenal memory made

this un-necessary. Evidence of her amazing recall of individual specimens is provided by several letters (to Bather: 16 April 1904, 12 March 1914, 2 August 1915; to Lapworth: 20 November 1898, 30 September 1919) when she enquired after particular specimens that they had not returned after their research, by describing distinctive features shown by each of these specimens, which frequently enabled them to be recognised. Another aspect of this, is the family's involvement with the collection through their use of 'pet names' for particular forms e.g. 'the boot' was a reference to *Cothurnocystis* (8 November 1911); 'the hat & feather' (11 August 1915); 'plated slugs' (4 May 1937); 'trumpet' for the columella of a gastropod (6 May 1937).

Elizabeth Gray had undoubtedly been encouraged by one of her advisers, or companions to adopt meticulous methods in her collecting. It is possible that since such information was so critical for Lapworth's research on the succession in Girvan, that he was responsible for instilling the need for such precision. As a result the collection, in addition to being relatively unique and one of the few available from the richly fossiliferous deposits of that district, was scientifically reliable. Lapworth and Reed took pains to praise Mrs Gray for this aspect of her collection arising from her thoroughness. Much later, Lapworth (10 June 1914) when asked to advise over the value of the trilobites stressed that:

It was the very first collection in which the exact localities and horizons of every individual fossil . . . was written down at the time of collection . . .

Reed (23 February 1909 and 1909: 220) emphasized the value of having material, which enabled him to describe things 'with much more minuteness' and also that the regular visits and careful collecting over so many years enabled him to make conclusions as to the relative abundance of the taxa occurring at the various localities. Spencer (1914: 2) also echoed earlier remarks as to the value of having the counterparts, for . . . 'the casts are usually much easier to interpret than the specimens preserved in original calcite'.

After each Gray collection had been acquired by an institution, the family had immediately renewed their collecting activities during their annual summer and autumn visits to Girvan. In 1922, erect of figure and with sight undimmed, Mrs Gray was photographed at all her favourite collecting spots (Balclatchie, Whitehouse Bay, the Starfish Bed, Thraive Glen, Mulloch Hill, Woodland Point) and a last visit was even made in September 1923 at the age of ninety-two. During her almost seventy years of field collecting Mrs Gray had seen localities come and go; some became exhausted, others became overgrown, or unworkable in other ways, or, as in the case of two limestone quarries Craighead & Tramitchell commercialised beyond recognition so that the fossils were lost in the processing.

The keenness of their collecting is demonstrated by an annotation made by Alice Gray (Sheet LXVI NW) concerning the locality 'Bougang':

In 1900, when my mother, her brother and I went there the quarry was almost full of water. Having been forewarned by Dr. Horne, we took a thin rope with us. It was then attached to me, held by my uncle and lying flat on the brink, I was just able to reach down and quarry stone to hand up to my mother to break up.

The stretch of time between 1855 and 1936 is a long one and it is safe to say that the work . . . during that period has been carried on in the same way . . . (Alice Gray, letter 4th May 1937).

After Mrs Gray's death, the surviving daughters had made the annual pilgrimage to continue their mother's work,—even during the difficult years of the Second World War. From her letters, it would seem that the summer of 1940 was the last occasion they had

made any real finds, when Alice recorded (15 June 1941) that their local driver had promised to do his best to overcome the petrol shortage 'rather than see us beat'. Eight months later Alice died and her surviving sister Edith then wrote:

I fear the continuity of collecting must now stop, as I have not my sister's scientific knowledge and was only her helper.

A family tradition from the summer of 1855 to September 1941, had ended after eighty-six years!

(ii) Mrs Gray's Localities

The first reference to the Gray's Girvan localities was that made by Mr J. Young (TD notebook 25 January 1865) which tells of the Grays collecting from a site they had newly opened near Penkill farm. Robert Gray adds further details in his own letter to Davidson (29 July 1865) and later (17 September) refers to Balcletchie, Craighead, and Penkill¹¹. Davidson mentioned each of these in his monograph on the brachiopods.

Another early indication of Mrs Gray's localities is obtained from a list she drafted for Lapworth's approval (see Gray Correspondence, Vol. 1, No. 1). This is also accompanied by the draft of his covering letter which suggests that the information is provided for Thomas Davidson's work on the brachiopods and also indicates their uncertainty as to the precise age of the fossils.

Dear Mrs Gray, Nuneaton
Am writing this in train. Would have answered your former note but not a moment for anything, just now—even sleep!

The above list is now correct. I should recommend you to ask Mr Davidson to use **Llandeilo**—not Upper Llandeilo.—We don't know what Upper Llandeilo is just now. The beds are Llandeilo but that is all we can be sure about. Will write whenever I've a moment.

Kindest regards to all
Kindly excuse calligraphy.
Will post this at Atherstone

Yours very sincerely
Chas. Lapworth

P.S. Please be careful about Thraive Dyke bed, and see that fossils from true Starfish Bed are not mixed with the Meristella beds. The former are Upper Bala. The latter are Lower Llandovery.

The record of a letter from Lapworth (24 February 1882) in the Davidson notebooks dates this list and confirms the reason for its compilation. The lengthy faunal list that Mrs Gray provided later for inclusion in the memoir published by Peach & Horne (1899) contains more localities, while Nicholson & Etheridge (1880: 7) had referred to forty localities in the Girvan district (see Appendix 4 for List of Gray localities)¹². Owens (1973: 3) pointed out that the main drawback is that all these original sites are only vaguely localized and other recent workers (see Howells, 1982; Harper, 1984: 7) have shown that these sites have often been confused, joined, or generally misunderstood by the specialists describing the Gray Collection and subsequent collectors. Full detailed lists of the localities for particular fossils have been provided in the monographic studies made by Williams, 1962; Howells, 1982; Harper, 1982; and Paul, 1984, who have all listed them under the relevant stratigraphic formation.

The first Gray collections were undoubtedly obtained from local sites around Girvan

within walking distance of the home of their relatives. It must have taken at least an hour to reach Drummuck, where many of the specimens described by Nicholson & Etheridge were found. Horse and carriage, and later rail were the only transport available for longer journeys; later Alice Gray refers to their use of a hired car (see letters to W. N. Edwards c. 1941). The lack of material from rich fossiliferous sites in the Stinchar Valley, suggests that Mrs Gray did not venture into that area; there is only one trilobite from Aldons [the unique harpid mentioned by Reed, 1903], little from the highly fossiliferous basal Superstes Mudstones, and only two pygidia of the trilobite *Pliomerella craigensis* (Reed, 1906) in her collection from the enormously rich Auchensoul Quarry. She is unlikely to have visited any of these sites without coming away with abundant material. There is also only a handful of specimens from the localities of Benan Burn, Doularg, Minuntion and Tormitchell, all of which were known to Lapworth (1882)¹³. It is possible that the Gray family were quite satisfied to concentrate on the places that they knew and had always exploited. There was some sense in this for it is now known that the Gray family's locality 'Bargany Pond Burn' was not that of other collectors, but a quite different locality that they had discovered as a result of following and mis-interpreting directions to the original site.

Mrs Gray never recorded her localities on any map, but in 1937 Alice Gray endeavoured to record them all from memory on six-inch Ordnance Survey maps, which she presented to the BMNH. In her letter to W. N. Edwards (4 May 1937) she wrote:

... I found that the present generation of geologists, who have worked in the Girvan district, are not so well acquainted with some of the localities as we are ...

She provided the set of maps¹⁴

marked with all the localities from which my mother collected her fossils ... in case of any doubt or dispute.

It would appear from her letter that comment by current geologists over Lapworth's account of the exposure of a particular bed had prompted this action for Alice Gray continued:

Professor Lapworth was right and to-day's geologists wrong! We worked at the bed in question before to-day's geologists were born and for many years it has been overgrown¹⁵.

However, despite her own assurance, it would appear that at times her memory was at fault, or more likely, that she was unfamiliar with reading maps to establish the sites of localities, for several of those marked are quite impossible for the horizons of the material (see Howells, 1972: 4, for several instances of this). Her annotations to the maps indicate that she had considerable uncertainty: see sheet LVI NW where several localities are marked 'to the best of my recollection' and Sheet LVI SE where she has written against the locality 'Auchensoul':

on the Auchensoul Burn somewhere—I myself was never there!

Harper (1984: 7) has provided a method for differentiating between the localities 'Drummuck', 'South Thraive', 'Starfish Bed' and 'Cliff Section' as used by the Gray family and subsequently treated as one by Reed. Howells (1982: 3) has shown how to distinguish specimens obtained from several sites denoted as 'Mulloch Hill', the general area from which they were collected, on the basis of their lithology and differences in

weathering. A photograph in the Gray Album of the three sea stacks at Whitehouse Bay, enabled Ingham to identify the site despite its now being worked out.

(iii) The use and users of the Gray Collections

A glance at the accompanying bibliography will reveal the principal users of the material that Mrs Gray and her family had collected. These were relatively few and somewhat alarmingly, most were essentially institution-based palaeontologists. Only Lapworth had any real interest in, or knowledge of the Girvan district and of the others perhaps only Davidson & Nicholson (and later Spencer) had any real field experience, consequently mistakes were made in naming taxa and determining relationships and age. Comparison of Mrs Gray's relationship with the various users of her collection from the few surviving letters and other records indicates that, in many respects, the degree of affability was governed by the extent and speed with which these palaeontologists fulfilled her goals for the determination and description of the fossils. Although obviously any personal, rather than just scientific acquaintance, affected the level.

One of Mrs Gray's earliest correspondents was Thomas Davidson¹⁶, who was probably the first specialist worker to utilise her material when describing several new species from her collection in his monograph on the *British Fossil Brachiopoda* (1866–71). Alice Gray, in her biographical Mss states: 'as far back as . . . 1860, she was in correspondence with Thomas Davidson'. This is unlikely, for as Mrs Gray herself apparently wrote in a later letter to Davidson (8th April 1882): 'I may mention that it was in 1863, I first collected fossils . . .' and in even later letters to Dr Bather (27 March 1913 & 15 October 1914) this period is indicated! There is undoubtedly some confusion as to the time the collection was begun, for in other letters Alice Gray refers (24 January and 4 May 1937) to 1855 as being the year that the family custom of collecting fossils at Girvan was begun by her mother, in fact this would be the year that she met her husband! It is possible that Mrs Gray's comment quoted above referred to the time that she began to collect in a more precise manner, for some of the Hunterian material was undoubtedly collected earlier.

(a) Thomas Davidson (1817–1885)

Davidson was born in Edinburgh (17 May 1817), the son of a wealthy Scottish landowner, but was educated in Europe. His inclination for the fine arts was encouraged through attending classes in Paris, while his interest in natural history was influenced by access to the various institutions and the guidance of Constant Prevost¹⁷ in accumulating a collection of geological specimens from the Paris Basin. This new interest in geology was maintained by his attending lectures in Britain, surveying in Scotland and subsequent field work throughout Europe. After making the acquaintance of Leopold von Buch¹⁸ during a visit to Italy in 1837, Davidson was persuaded to undertake a comprehensive study of both living and fossil Brachiopoda.

As a man with private means he was able to devote much of his time to such research in his own home, first in London and subsequently at various places in Brighton. Davidson's artistic abilities enabled him to overcome one of the main problems in dealing with a wealth of material and ensuring its recognition. His working methods have been described elsewhere (Cocks, 1978; Mancenido & Cocks, 1986) but the letterbooks demonstrate that Davidson endeavoured to just concentrate on particular taxa at any one time. For that period, his correspondence is only with other interested parties and solely devoted to that subject until it had been resolved.

Davidson's role and scientific achievements were widely acknowledged during his lifetime by numerous society awards. Professor Young (26 October 1882) had recognised that it was Davidson's enthusiasm which encouraged everyone to assist in the provision of material, particularly that from the strata of 'Dear Auld Scotland'!¹⁹

Triplesia extans Grayia Dav. Silurian

T. extans? Conrad M.S. Hall. vol. 1. P. N.Y. P. 139
Pl. XXXIII fig. 1. 6 & 7

from Canada? Pennsylvanian glau about 100 yards below
Pennsylvanian bridge, on the Ohio Road, found imbedded in a
deep green Breccia. 3 miles
S.E. of Old Daily church Givens
valley.



my coll

Mr. J. Thomson found
these D.V. of this
interior species

This valve is
trilobed the central
lobe becoming much
elevated and angular
the external surface
is covered with numerous
fine radial striae

Mr. J. Thomson coll



from Bistyll Dewi
Llandeilo
coll. J. Thomson

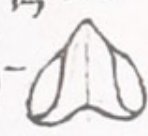
W. Lightfoot
has found this shell
also in the Givens
of Llandeilo (Birds Hill)



Givens Craig head
Pennsylvanian glau

from Huntian
mus. Glasgow.

found by Mr. Gray



Craig head
my coll

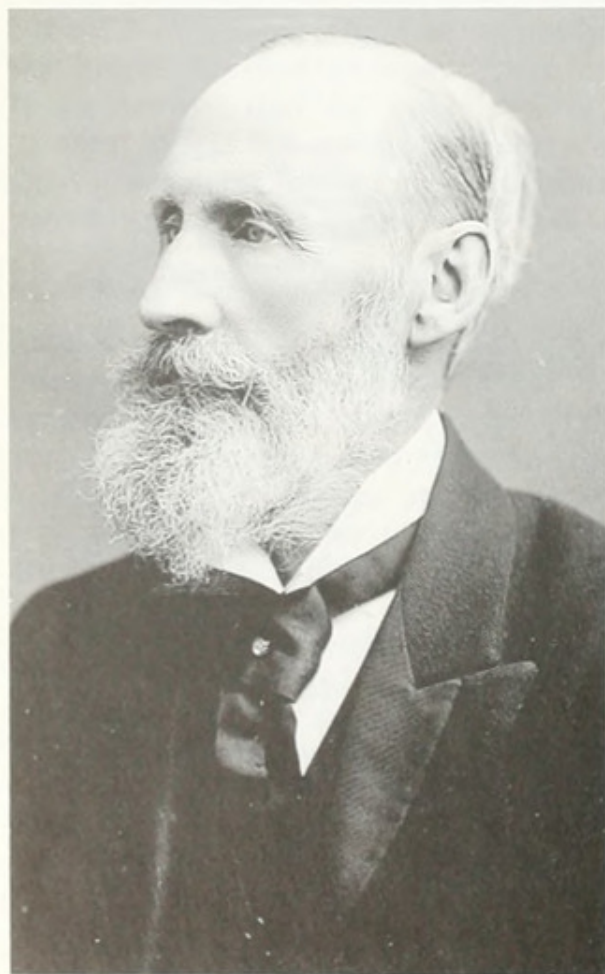
found by Mr. Gray
at Craig head
Givens
(Pennsylvanian)

A page from Davidson's notebook showing his notes on *Triplesia grayii* and other specimens borrowed from the Gray collection during the preparation of his monograph; Mss held by the Brachiopod section, Department of Palaeontology, BMNH.

Davidson's notebooks²⁰, preserved in the Brachiopod section of the Department of Palaeontology, [for further description see Cocks, 1978: 4] contain some indication of his use of her material in the preparation of his monograph, through the annotations he made to the drawings of the specimens he had borrowed, but give no clear evidence of the dates. However, another series of letterbooks preserved in the Palaeontology Library, in which Davidson listed all his correspondence and appointments, provides definite evidence concerning his collaboration with Mrs Gray during the period between

1867–1884 and an idea as to the frequency of their communications. These references also indicate, not surprisingly, that ‘Mr.’ John Young²¹ provided the introduction through his association with Robert Gray at the Natural History Society of Glasgow. They also demonstrate that, initially, Robert Gray himself, was also more directly involved in collecting the fossils than had been thought.

It was in January 1865, that Young informed Davidson of the Gray Collection in which ‘... many of the Brachiopoda were in a fairish state of preservation ... only wanting a little trimming & cleaning ... to make them worthy of figuring.’ Robert Gray confirmed his readiness to let Davidson examine all their Girvan brachiopods (22 July 1865) and gave an account of his activities in opening up various exposures to obtain the fossils (e.g. Penkill: 29 July & 17 September). The promised box of specimens arrived on 13 September and Davidson promptly returned them a month later. This pattern was repeated in subsequent years after the Grays had returned from their summer forays to Girvan and, at that time, they willingly agreed to Davidson having any duplicate specimens he required and undertook to search for anything else he needed. Virtually all the references to this correspondence record the receipt, or despatch of specimens. The year 1882 was particularly busy as Davidson borrowed many of the brachiopods in the Gray collection in a series of Lots sent over a period of four months, during the preparation of the Supplements to his Monograph. Contrary to Alice Gray’s assertion, the first letter written by Mrs Gray appears to be that of 7 October 1867, when from Girvan, she sent a complete specimen of the *Triplexia* that was eventually named after her.



Left: Professor H. A. Nicholson, FRS (1844–1899) photograph in Palaeontology Library Archives, BMNH. Right: Thomas Davidson (1847–1885) photograph in *Challenger Expedition Archives* held by the Mineralogy Library, BMNH.

Thomas Davidson very probably set the pattern by which Mrs Gray subsequently judged everyone else, while his research on the Palaeozoic brachiopods may also have led to Mrs Gray devoting her life to the acquisition of the Girvan fossils. His prompt treatment of the various consignments sent for examination in the preparation of the Palaeontographical Society monograph on the Brachiopoda, gave her little anxiety; the material was always sent back within a few months and usually a few weeks and occasionally within days. The inclusion of several rare forms in the earlier samples encouraged the Gray family to search for other examples e.g. *Triplesia Grayi*. As pointed out above, initially Mrs Gray—or very probably her husband—was also far less possessive over the material and their collecting activities were undertaken to provide the specimens that might be of assistance to Davidson. The fact that he utilised their observations also added to their pleasure and gave a feeling of involvement with the science.

Impressed by the quality of Davidson's figures, Mrs Gray promised to supply him with a set of duplicates. She repeated this promise frequently, until, in 1884, it was eventually fulfilled and their correspondence apparently ended for there is no further reference to her in his letterbooks. In view of her pleasure with Davidson's work and thoroughness, it is odd that Mrs Gray did not preserve many of his letters – only a single example has survived and that is not really of any consequence! The protracted promises about duplicates made by Mrs Gray suggest that her acquisitiveness—even at that early stage—was far stronger than any obligation she may have felt towards him. It is interesting to note that although Davidson made frequent visits to Scotland and embarked on occasional field trips, he seldom visited the Gray family.

(b) *Charles Lapworth* (1842–1920)²²

In 1873,—a few years after Mrs Gray's introduction to Davidson and the subject of geology,—Charles Lapworth began work in the Girvan District. Mrs Gray assisted in his exploration of the area and provided many of the fossils cited in his faunal lists and upon which his work of correlation was based. Often at Lapworth's instigation, her collecting forays were in search of particular taxa that he predicted, or expected careful collecting should reveal, as occurring at certain horizons. References in later letters indicate that their association was enjoyable:

Those were happy days (in spite of the hard work) when the geology of the Girvan district was being worked out . . . and your family put in such fine work among the fossils; all of which was of the greatest service to myself then; and to the Geological Survey and Geological science in general ever since. (Lapworth, 12 February 1917)

In other letters there are frequent reference to the '*dear old Girvan land*' and Lapworth's interest in particular beds. (T. Davidson: 26 October 1882).

Lapworth's early life was spent in the Home Counties, born at Faringdon, educated in Buckland and then becoming a pupil teacher at his own school, before entering a training college at Culham, near Oxford. In 1864, he chose to take an appointment at Galashiels in the Border country and his first paper 'On the Silurian Rocks of Galashiels' was read to the Geological Society in 1870. After being appointed to Madras College, St Andrews, he became friends with Professor H. A. Nicholson and D'Arcy Thompson. Soon after, he published (1879) the paper in which he founded the Ordovician System and which has been considered to be a masterpiece of moderation and persuasive writing. In 1881, he was appointed to the newly established chair of Geology at Mason College (now Birmingham University), and this enabled him to undertake several seasons of arduous field work, but his health suffered under the strain. He was able to complete a paper on 'The Girvan Succession' (1882), in which he made use of Mrs Gray's collection and also

confirmed the zonal value of graptolites which he had established in his earlier paper on the Moffat Series (1878). In due course, after considerable argument, the officers of the Geological Survey adopted his structural interpretation in the preparation of their memoir on the Southern Uplands (Peach & Horne, 1899); Mrs Gray's collection was also the basis for several of the lists given in this work.

Lapworth went on to investigate the Northwest Highlands and his work helped to resolve the controversy over the structure of this area. In the last phase of his career, he investigated the rocks around Birmingham, in particular the Cambrian of the Lickey Hills. Although his field ability and interpretative insight enabled Lapworth to make significant contributions to British structural geology, official recognition of his achievements has also emphasized the influence made by his teaching concluding that his original ideas had fertilised the research of generations of geologists (1899: xl; Watts, 1939: 277).

His main characteristic was an intense mental and bodily energy, which were so great that they frequently overtaxed his health. A burning enthusiasm to discover the truth and a delight in overcoming obstacles contributed to this driving force. Having made a substantial contribution to British Geology, he died on 13 March 1920 after another long illness.

Undoubtedly, Mrs Gray's contact with Charles Lapworth was conducted on a friendlier level than most of her other correspondence. Their letters to one another are much longer and frequently mention other personal matters. On each occasion that she considered selling her collection to the British Museum, Mrs Gray sought advice from Lapworth²³. He, in turn, went to a considerable amount of trouble to assist her and sent a lengthy letter outlining all the possibilities but concluded with a suggestion as to the course she should follow. Yet, despite their good relationship, when there were problems over her specimens, Mrs Gray was still capable of chasing him for missing material. Their last surviving letters concern Lapworth's embarrassment at the loss of several graptolites over the years, probably occurring during the transfer of his Department into new premises²⁴.

It would seem that Lapworth was also involved in Davidson's later arrangements to use the Gray Collection, for he endeavoured to co-operate with Davidson's revision by completing his own contribution on the geological succession occurring in the Girvan district (see TD: 24 February 1882). Lapworth also wrote to Davidson (TD: 27 February 1882) assuring him over certain specimens: 'I doubt not that Mrs Gray is right in her locality'. Mrs Gray repeated this assurance herself (TD: 2 March 1882), when she had:

... much pleasure in sending the rest of the Brachiopods Horizon by Horizon according to Prof. Lapworth's work. You may feel assured I shall be the most particular with respect to the localities of all the specimens I send you ... and the plan you have chosen ... will I think, render mistakes impossible

Yet, a number of letters during September and October 1882 concern her finding a specimen of *Triplexia grayi* at the locality of Minuntion, which Mrs Gray finally admits was a mistake (TD: 26 October 1882).

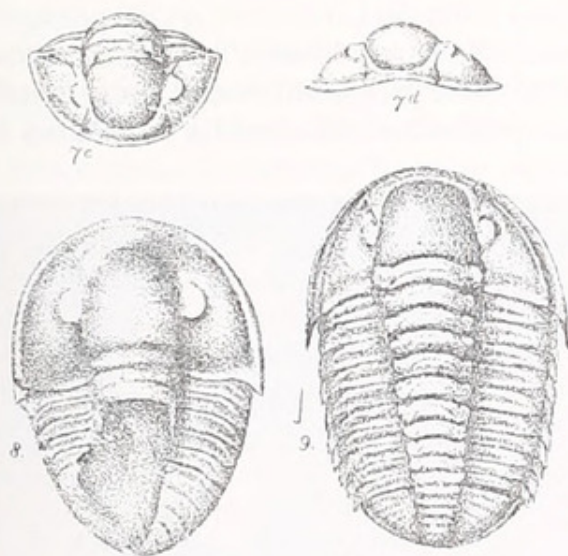
Within a few months, Davidson had dealt with much of the material, for Professor Lapworth wrote (TD: 25 May 1882) to congratulate him on the 'magnificent table of Mrs Gray's shells' and declared: 'it is the most brilliant useful bit of work from another palaeontologist that has ever fell to my assistance & benefit'. According to later entries, Davidson had completed his examination of the Gray material by the end of 1882; even in June, Lapworth had written: 'I was certainly amazed at the work you had done during the past 5 weeks.'

(c) H. A. Nicholson and R. Etheridge, *Jnr*

The three fascicules of the first major monograph (1878–80) on the fossils of the Girvan district by H. A. Nicholson and R. Etheridge²⁵ were also largely based upon material in the 'Gray Collection' as is indicated by the title of the work. The Preface acknowledged their debt for 'the free and uncontrolled use of her cabinet' and 'for providing the most complete series of the . . . fossils of Ayrshire'. Subsequent collecting by Mrs Gray in the succeeding summer seasons, often at new localities, led to description of the additional material in a further fascicule (see Benton, 1979: 7).

It is not quite clear, how Nicholson & Etheridge became aware of the Gray collection, but a clue is provided by their reference to her father's collection being well known to all Scottish geologists (see p. 172) and a considerable number of the species are named after members of the family²⁶. However, none of their correspondence has survived and the only evidence for a visit to Mrs Gray is provided in a letter by Etheridge to Davidson (TD: 22 November 1881) reporting that he had borrowed some brachiopods, which he felt Davidson should also examine. Although, in their monograph, it is mentioned (1878: p.vi) that: 'a visit to the ground in person has resulted . . . in giving us a direct knowledge of the rocks.'

Plate XII.



Left: Original figures of *Proetus girvanensis* published by Nicholson & Etheridge (1880) in *Silurian Fossils of the Girvan District in Ayrshire*, pl. XII, figs. 7, 8 & 9. Right: Lectotype of *Paraproetus girvanensis* (N. & E.), BMNH In. 21926 × 1, Upper Ordovician, Ardmillan Series, Drummuck Group Mudstones, Drummuck, Mrs R. Gray Coll'n. 1920.

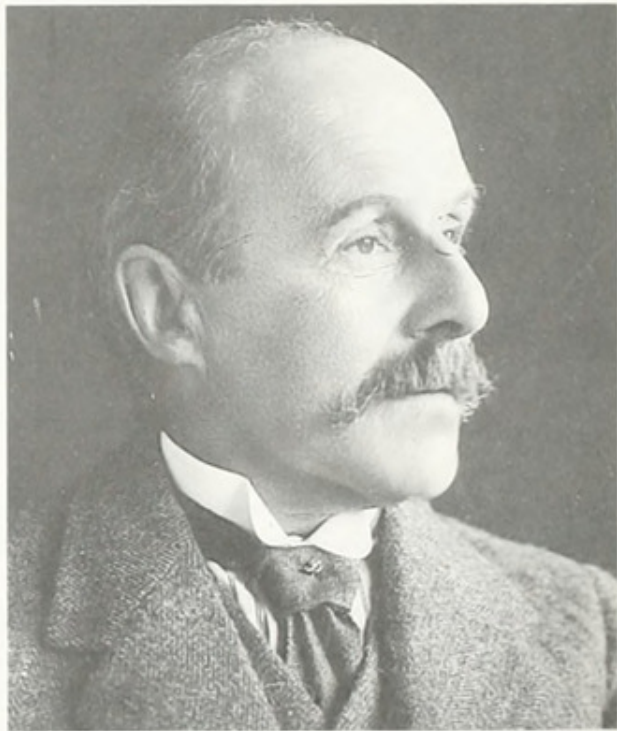
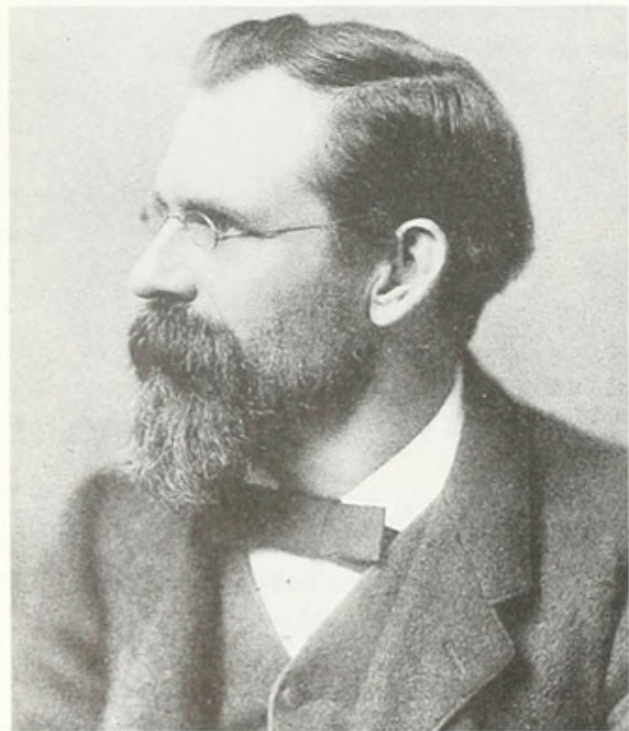
Henry Alleyne Nicholson (1844–1899) had been appointed to the chair of Natural History at St Andrews in 1875 and later, in 1882, became Professor at Aberdeen. His palaeontological work ranged over most fossil invertebrate phyla and remains of fundamental taxonomic importance; he specialized in stromatoporoids and corals (see Benton 1979: iii–v; Cleevely, 1983: 214). Benton (*ibid*: iii) established that Nicholson

was one of the earliest workers to use thin sections for determining internal structures of bryozoans and corals and to then utilise this information for taxonomic work. Since it is thought that Nicholson cut many of the sections himself, we can only assume that the Gray material was dealt with at St Andrews.

His collaborator, Robert Etheridge, Jnr (1847–1920) had begun his career as a field geologist in Australia with the Geological Survey of Victoria. When this organisation was disbanded in 1873, he returned to the U.K. joining the Geological Survey of Scotland. At the time of his work with Nicholson, Etheridge had been appointed to the staff of the British Museum (Natural History) and both father and son were engaged in dealing with the transfer of the collections from Bloomsbury to South Kensington. He worked principally on Palaeozoic invertebrate fossils. Subsequently, in 1887, Etheridge returned to Australia, holding several Survey and Museum appointments, before becoming the Director of the Australian Museum, Sydney in 1917 (see *Rec. Aust. Mus.* **15**: 1–27, 1926).

Their Girvan publication was supported by a grant from the Royal Society of Edinburgh and in the Preface of the first Fascicule, the two authors also recorded their gratitude to Robert Gray for providing additional financial help towards publication (see p. vi). Later, in a letter (TD: 19 November 1881) Mrs Gray reported that progress on 'Nicholson's Ayrshire work' had stopped owing to lack of a further grant from the Royal Society [of Edinburgh]. The following year, in another letter (TD: 25 March 1882) Mrs Gray expressed her obligation to Davidson for having 'worked out' her Girvan material, unlike Nicholson & Etheridge, who had decided not to continue. Mrs Gray seems to have gradually become disenchanted with the progress of their monograph and its eventual abandonment caused her to seek the help of other specialists to deal with the undescribed mollusca.

Both Henry Woodward²⁷ and his friends Professor T. Rupert Jones²⁸ provided notes to be used in the second fascicule (see pp. 211, 216) and as a result were later, briefly involved again. Woodward (1885) described two specimens collected by Mrs Gray at



Left: Professor Charles Lapworth (1842–1920) portrait in *Geol. Mag.*, 1901, Dec.IV, Vol.8: opp. p. 289. Right: F. R. Cowper Reed (1869–1946) photograph in Palaeontology Library Archives, BMNH.

Thraive and named a new chiton after her in recognition of her contributions to palaeontology; this species *Helminthochiton Grayiae* has since been recognised as the type species of the genus *Septemchiton* Bergenhayn (see Rolfe, 1981). T. R. Jones dealt with several of her specimens of Ostracoda in later papers (1886, 1893*a,b*).

(d) *F. R. Cowper Reed* (1869–1946)

It would appear that Bather was responsible for suggesting that Reed should deal with Mrs Gray's trilobites, following Nicholson's reluctance to continue²⁹. Reed later succeeded Davidson in dealing with her brachiopods and the high quality of his revision of these Palaeozoic fossils is reflected in its relevance and acceptance to-day. A letter from Mrs Gray (c. Feb. 1911) concerning her reluctance to allow the use of the Girvan material by any researcher, mentions his involvement. Her reaction to the use of 'her specimens' by O. T. Jones without 'her permission', prompted a stream of letters to various geologists. By way of explanation, Mrs Gray argued that since the specimens 'were never trusted to him [O. T. Jones] ... for examination' she should refuse her consent to any proposal that might rob Reed's future work of 'some of its interest'—by this we infer she meant the chance of describing new taxa.

Reed spent the greater part of his life in Cambridge, arriving as an undergraduate in 1888, then later obtaining an appointment as an Assistant to the Woodwardian Professor of Geology in 1892. He retained that post, essentially curatorial, for a further twenty-five years while T. McKenny Hughes held that Chair. Reed's doctoral thesis (? 1890) was on volcanic intrusives, and he received the Sedgwick Prize for work on the geological history of the rivers of East Yorkshire. But, after writing on the geology of the Fishguard district (1895), Reed appears to have concentrated on palaeontology. According to A. G. Brighton (pers. commun.) his chief duties as assistant were the curation of the collections at the Sedgwick Museum. When the Chair became vacant c. 1917, Reed was so disappointed at J. E. Marr's appointment that having independent means, he relinquished all his official duties with the Sedgwick, but maintained his room for research work.

It was through earnings from his research and descriptive work, mainly undertaken for the Geological Survey of India, that Reed was able to augment his private income. Consequently, although he was primarily concerned with Palaeozoic fossils, in such circumstances, he did not hesitate to investigate much younger faunas. As a result, Reed covered a very wide field, dealing with many groups of invertebrates, but was especially interested in the brachiopods and trilobites. He frequently sought advice from his contemporaries, while correspondence with Dr Bather from 1904–1925, shows that they collaborated in describing and obtaining foreign echinoderm material³⁰. During his life, Reed made numerous journeys overseas, mainly visiting countries forming part of the British Empire in collaboration with his work for the Colonial Survey and leading to the publication of a textbook *The Geology of the British Empire* (1921).

Immersed in his work, Reed gave the impression that he lead a somewhat solitary existence, e.g. James Begg considered him to be a recluse. Although married but with no children, it may be that his wife's habit of kitting him out each day with a spare pair of socks (carried in a binocular case) and his practice of arriving and leaving his room in the Museum without seeing anyone, contributed to this view. His use and knowledge of geological literature was extensive; it is said that although he was seldom seen in the Geological Society's library, he used and borrowed more of their books than anyone else.

Over the years Reed produced a steady stream of papers describing Girvan fossils, but it would appear that he never visited the area. In a letter to Mrs Gray (23 February 1909) following the completion of a paper on hyolithids, he commented that her material had enabled him to describe new species 'with much more minuteness than is generally possible' and that the meagre accounts of other British species made comparison very

irritating! He quickly dealt with all material, seldom developed a specimen and relied upon his memory and previous publications; the ready availability of his own first rate artist, who was experienced in presenting the essential features of any specimen contributed to his quick turnover. Once he had 'retired', Reed's time was solely devoted to such research. Inevitably, it was this fast rate of progress that led, in 1911 (see p. 198), to Mrs Gray asking Reed to undertake the description of her cystids, after experiencing years of exasperation with Bather's promises and the protracted loan of her material. However, even Reed took time dealing with her specimens when preparing his various contributions for his Palaeontographical Society monograph on the Girvan Trilobites (1903–35).

Apparently, Mrs Gray had such a good impression of Reed, that in 1917, when his position at Cambridge lapsed, she sought Lapworth's help to obtain another post for him. Lapworth readily appreciated his palaeontological work and promised to bear him in mind, musing that were he a millionaire Reed would be just the man to pay for as the first Professor, researcher and lecturer in palaeontology in Britain (20 November 1917).

(e) Other Users

The problem of determining the starfish specimens is frequently mentioned in surviving Gray correspondence. Nicholson & Etheridge (1880: 318) stated that her first starfish specimens were found in 1879 at Thraive Glen. Initially, J. R. Gregory³¹ had undertaken to deal with them, but upon leaving the BMNH in 1899 for a post in Melbourne he returned everything to Mrs Gray (19 December 1899), suggesting that he would have preferred to have dealt with a larger series in order to distinguish their specific characters. Shortly after, Charles Schuchert then at the U.S. National Museum, Washington used casts of new Gray material provided by Bather, which were far better than those originally figured by Nicholson & Etheridge.

In 1908, after Mrs Gray had again raised the matter, Bather (1 December 1908) suggested the names of W. K. Spencer (see below), a school inspector, and Dr F. Schöndorf of Hannover, but admitted that he did not have sufficient confidence in Spencer's ability to tackle the difficult Palaeozoic forms. Schuchert, after having moved to the Peabody Museum, Yale University, wrote (31 March 1911) that museum duties at Washington had prevented him from producing a monograph on the Palaeozoic starfish, but he now hoped to complete a descriptive list of their taxa³².

The same year, following the cystid confrontation³³, Bather also had occasion to amend his opinion of Spencer's competence (8 April 1911) and considered that this 'seemed the best chance of getting the work accomplished' and it was arranged for Mrs Gray's material to be sent to the BMNH on his behalf.

William Kingdon Spencer (1878–1955). On completing his degree, he had served as demonstrator/lecturer at Oxford in 1903, and it was during this period he first became interested in Palaeozoic echinoderms. Shortly after his marriage, and then lecturing at Bangor, Spencer joined the Board of Education as an Inspector of Schools in 1904, and was eventually appointed as Inspector for East Suffolk (1914–38), becoming a significant figure in the world of education through his methods and schemes.

His research on Palaeozoic and Cretaceous starfishes was carried out during his leisure and consequently, he had little opportunity for fieldwork. Spencer's ingenuity in preparing the natural casts of the Palaeozoic material contributed to the success which enabled him to become a world authority³⁴.

On being approached to deal with the Gray material, Spencer responded immediately (15 May 1911) and gave his opinion that the valuable Gray collection was: 'in many respects the best collection of Palaeozoic Asteroids in existence.' A few years later, Mrs Gray wrote to Bather (27 March 1913) reporting that the Palaeontographical Society had



W. K. Spencer, FRS, FGS (1878–1955) portrait in *Biogr. Mem. Fell. Roy. Soc., London*, 2, 1956: opp. p. 291.

accepted Spencer's monograph on *British Palaeozoic Asteroidea* and exclaimed: 'I owe you a debt of gratitude for introducing him to me.'

Whether Mrs Gray remained pleased is doubtful, for Spencer emulated his sponsor and never completed the monograph, although various parts were published between 1914–1940. Yet, he did fulfil his original promise to Mrs Gray by producing a general paper to provide due recognition of her contribution to science (Spencer, 1929). From correspondence with Bather, it would appear that much of Spencer's work was achieved by means of casts made from the Gray material held at the BMNH, only occasionally did he find it necessary to see and ask for the originals (see FAB file: 16 September 1915, 12 October 1916).

Mrs. J. Longstaff (née Donald) (1855–1935). Jane Donald was encouraged to undertake research on Palaeozoic gastropods by J. G. Goodchild (1844–1906) of the Geological Survey, who had incidentally provided Dr Bather with Mrs Gray's address in 1892. L. R. Cox, in her obituary notice (*Q.J.G.S.* 91: xcvi–xcviii), wrote that 'possessing the necessary means of leisure she was able to carry out her work in a painstaking manner' and after marrying the entomologist Dr George Blundell Longstaff in 1906, she was still able to find time to continue.

Consequently, in response to another plea from Mrs Gray (10 April 1904), Bather had earlier provided the name of Jane Donald as the only possible person in the country who could work on her large collection of Gastropoda, but again expressed doubts because her previous work, although excellent, had been limited to a few genera (11 April 1904). He also commented that inducements for palaeontological work were not very great causing the few, who did undertake it for love, to be overburdened. Mrs Gray reported that Miss Donald was already working on her *Murchisonia* specimens. In fact, she had already published several other papers prior to this, all mentioning the Girvan material. This association was also maintained after her marriage and move south to Sussex and then on to various places in Surrey, in fact lasting until 1924, when Mrs Longstaff was

nearly 70. Many of her papers dealt solely with material in 'the magnificent Gray Collection'. Following Mrs Gray's death, she wrote:

I shall often think of the pleasant visits I paid . . . she always gave me such a hearty welcome. . . . she has made the most wonderful collection . . . and being in the British Museum it forms a grand memorial of her.

Many of her Girvan taxa were only represented by a few specimens, most were crushed, some being founded on unique specimens, while some features that Jane Donald described now appear to be questionable (see Brookes Knight, 1941: 298).

Wheelton H. Hind (1860–1920)³⁵. Apart from a letter of J. Horne's to Mrs Gray there is no evidence as to how Wheelton Hind became involved in describing the bivalves from Girvan. However, MacNair & Mort (1908: 138) mention his name in discussing the wide influence of John Young; since they also refer to Hind's palaeontological work elsewhere, and list his election as an Honorary member in 1909, it must be assumed that Hind had a close link with the Geological Society of Glasgow. Horne's letter (9 January 1908) informed Mrs Gray that Hind had virtually completed his examination of her Girvan material and suggested that the Royal Society of Edinburgh should publish the results. This idea was followed (Hind, 1910) and in his introduction, the author declared that:

the task of . . . determining the fine series of lamellibranchs collected by Mrs Gray . . . has been no light one! The number of specimens which I could refer to no known species is comparatively large.

Hind went on to remark that he had been compelled to describe new taxa on single specimens.

The indifferent preservation of this material undoubtedly contributed to his difficulty, for comment by subsequent workers frequently alludes to this lack of features e.g. 'hinge not visible', 'really unrecognisable!', 'only a shape'. In retrospect, Hind was less successful in dealing with this Lower Palaeozoic material, and confused matters by ascribing specimens from quite different ages and horizons to the same species e.g. *Goniophora antiqua* (p. 539). Various letters in the Gray Correspondence relate to material that Dr Hind had borrowed, shortly before his death, for comparison with specimens in the BMNH and which Bather had to 'unearth' for return.

Thomas Henry Withers (1883–1953)³⁶. Stearn (1981: 240) has briefly outlined the career of this 'jaunty cockney character', who after entering the museum as a boy attendant in 1898 and later given encouragement by Bather, became a world authority on the virtually neglected group of fossil barnacles. It took several years of negotiations by both Smith-Woodward and Bather before the Treasury sanctioned his appointment to the scientific staff as an Assistant in 1925.

Withers became another of Bather's later recommendations to Mrs Gray, although she had been made aware of his presence in 1915 when Bather had borrowed a specimen on Withers' behalf, as well as through replies by him to her letters whenever Bather was absent. A joint work on the Palaeozoic Cirripedes was interrupted by Withers' transfer to the Ministry of Munitions for the duration of the war (7 December 1916). Withers eventually completed a paper on the Ordovician specimens, naming a species *Lepidocoleus grayae* (1922), which prompted an appreciative note from Mrs Gray to which a hard-pressed chagrined Bather curtly replied (17 June 1922):

Mr Withers, not being Deputy Keeper, can find plenty of time to do scientific work. I on the other hand can hardly get time at all, even by staying here all day!

Later, Withers recognition that these 'strange-stalked' fossils warranted the establishment of a new group, resulted in the publication of *Catalogue of the Machaeridia* (1926)³⁷. This included further references to Gray material, (see p. 219). Subsequently, Withers completed his *Catalogue of Fossil Cirripedia*, which dealt with all the material held by the BMNH.

At the time the Gray Collection was purchased by the BMNH, Gregory³⁸ had borrowed the coral & bryozoan material, including the specimens described by Nicholson & Etheridge, but there is no evidence that he made any significant contribution with it before it was retrieved (8 March 1921). Much earlier, Ida Slater utilised specimens from Mrs Gray's collection for her monograph on the British Conulariae (1907)—another bizarre columnar fossil invertebrate—describing three new species and figuring examples of two other European species.

The eventual purchase of the Gray Collection overcame possible later problems from figured material being in private hands, that could have resulted from Mrs Gray's policy of encouraging specialists to undertake their research on her material and then insisting that it was returned to her. Although the collection was adequately labelled and the figured specimens marked, the fact that Mrs Gray did not always adopt a system of numbering the specimens, meant that describers and subsequent users had no means of referring to, or identifying particular specimens. Such practice would not have been condoned by present-day editors of geological publications, nor the International Commission of Zoological Nomenclature.

(f) Visitors

Apart from the specialists known to have worked on her material, there is documentary evidence for only two other scientific visitors³⁹. The Gray/Bather correspondence reveals that Miss Elsa Warburg, the eminent Swedish trilobite worker, visited her in Edinburgh during 1913 (27 August 1913) but did not have time to go to Girvan. Another Girvan fossil collector, A. S. Alexander, provided a colourful account of a visit during 1904 in his autobiography (1939: 54):

Quarrymen told me the aged widow might still be seen in early Spring sitting alone the whole day, breaking the hard limestone of Craighead, and searching with unwearying patience for fossils.

As I longed to see her collection, I called at 59, George Street; was welcomed and ushered into her private 'sanctorum sanctorum', workshop, fossil store, and scientific library—all in one compact form. The one back window looked North and down on the grandly-wooded grey capital and over Forth waters to the green, sunny fields of Fife—a quiet suitable room for microscope work. Cases of specimens, or cabinets covered the greater part of available space of the other three walls. On the left, or West wide of the window was a small but strong wooden bench, with a powerful winch affixed in front. On the bench were rough specimens, hammers, chisels, and other geological tools for dressing the specimens. She pointed to the winch [? = vice] and said 'this has been of great service.' She opened a cabinet, fully taller than herself, and there appeared a tier of drawers of various depths from one inch in the higher to two or more inches in the lower. Beginning at the top she pulled out a draw and placed this on the broad window-sill which served as a table—there being a single chair in front which she requested me to occupy. The specimens in the drawer were arranged in rows. Each specimen, thinned and shaped, has a cardboard fastened on the lower surface. On the cardboard was written the name of the specimen, the name of the expert responsible for the naming, the locality where obtained, and other information or remarks anent. Some very special specimens had notes of experts, correspondence, illustrations, or publications in journals and science magazines. She directed my attention to special points of interest, and chatted in a free, homely, humble, modest

way about the specimen shown. Certain localities I had searched, but failed to find fossiliferous beds, I inquired about. This she satisfactorily explained and rendered the reason. The burn in one case had altered its course and grass now overgrows the outcrop of the bed [Penkill, see note]. In another case, the locality should be searched at low tide as the bed is covered with water and sea-weed every tide. She seemed to know every curve and cranny of the Girvan district. We roamed in thought over the old haunts; and she expressed a hope to revisit and continue to search for trilobites or other. Drawer after drawer was placed thus on the window-sill for an hour without her resting or sitting. Finally, she pointed to another cabinet and explained that it contained the corals that my Professor Nicholson described in the *Monograph of the Silurian Fossils of Girvan*. We chatted to the door and gratefully bade good-bye, but to be held in memory while memory lasts.

There is a slight suspicion that this is not altogether an authentic account and could represent a compression of events, whether real or imagined, for Mrs Gray continued to visit Girvan most years and occasionally went to London, even travelling to Europe in 1907. If the date is correct, only a few specialists had used the Gray Collection, at this stage, although the significance of her work had been recognised by an award of the Geological Society. Later (1 March 1914), Alexander requested Alice Gray for photographs of her mother for use in his book but before acceding to this she asked to see what he had written.

4. BIOGRAPHICAL ACCOUNT OF F. A. BATHER

W. D. Lang in tributes to his predecessor (1934)⁴⁰ provided adequate evidence of the multifarious interests and abilities of Francis Bather, in addition to recording the stages of his professional career. Bather's personal qualities and characteristics may have contributed to the difficulties in dealing with Mrs Gray and her material (see p. 198), for his intellect appears to have required a wide range of activity. W. N. Edwards, writing later (29 May 1937) to Alice Gray commented that: 'Dr. Bather was extremely able, but had far too many irons in the fire.' This phenomenal range of interests led to acknowledgement by his associates that he was an enjoyable companion; all accounts mention his kindly, witty and urbane nature, but although it is said he was beloved by his staff, there is a suggestion that Bather's occasional impishness, abruptness and precise fussiness caused problems. His trait for establishing exactly the correct procedure for any task⁴¹, whether sketching, making tea, an omelette, or to write a sentence, arrange an index, or a collection, might be thoroughly commendable in theory for most museum work, yet, could be very irksome to those who had to endure such tuition, or comply with his succession of maxims, however pertinent and rewarding. Apparently, at times, the Geology Department had the atmosphere of a schoolroom! It is conceivable that the delays he experienced in processing specimens may have been the result of staff relationships, even though discipline at that period was more severe. Several references in surviving correspondence to mislaid specimens, or delays in dealing with other matters, also imply that Bather may have ignored his own standards, although Raymond (1953: 173)⁴² had vouched that every needed specimen was readily accessible.

All biographies of Dr Bather refer to his devotion to research on fossil Echinodermata throughout his life, resulting in an acknowledged position as a world authority, particularly on the Crinoidea, the group in which he became especially interested. He made significant contributions to the understanding of the morphology of echinoderms



Dr F. A. Bather FRS, FGS (1863–1934). From BMNH staff photograph June 1924.

and, although not a field geologist, never lost sight of the effect of the environment, or the role of palaeoecology, nor the fact that the organisms he dealt with were once living animals. In some respects, Bather was an innovator of the current practice of applying biological concepts and evidence to fossil studies⁴³. There is ample evidence of his willing assistance for contemporary workers; frequent letters from both Reed and Spencer seek Bather's valuable advice, help or comment on all aspects of their work. In addition to the involvement with Mrs Gray, Bather had much friendlier correspondence with other amateur collectors, notably W. R. Billings of Ottawa, who supplied most of the material described in Bather's various shorter papers. Such correspondence was often the result of Bather's immediate response to reports of new, or significant specimens, for he sought to borrow anything that might be of assistance to his studies of the Echinodermata.

Lang has commented on Bather's talent and leaning for writing reviews and popular articles—a task that he found more congenial since it enabled him to utilise a wide knowledge of literature, art and language. The length of Bather's scientific bibliography is adequate evidence of his prolific pen;⁴⁴ with more than 212 papers, half of these on Echinodermata, and more than half of those on the Crinoidea, several being significant long-lasting contributions; this list alone would refute any contention as to the neglect of his official duties! Other facets of Bather's aptitude for the written word was a willingness to act as editor, both official and un-asked, or his co-operation in the production of various journals. Finally, the evidence of countless index cards forming part of several different systems—one the Catalogue of Cystids and Crinoids that caused the reaction of Mrs Gray in 1911—survived for many years and their compilation must have occupied a considerable amount of his time⁴⁵.

His efforts to popularise geology and demonstrate the usefulness of palaeontology by exhibition, arose from a lifelong involvement with most aspects of museum administration. Bather's realisation of the importance of informative exhibits to interest every category of visitor, led to visits to most major museums in the world, in order to examine their technique and galleries. This concern for museum management & development, together with his flair for writing, also led Bather to produce a defence against the philistine political criticism of museums during the period of the First World War. In many respects, Bather might be considered the most learned and versatile of those appointed to the position of Keeper of Geology, being familiar with most of the different aspects entailed in that office. Yet, his significant influence to the curation and administration of the BMNH was achieved before his appointment to that post (in 1924), which he was only to hold for four years⁴⁶. The situation became even more difficult once he was made President of the Geological Society of London in 1926, which imposed further arduous duties upon such a responsible and dedicated individual. Although the cause of Dr Bather's death in 1934 could be attributed to an illness arising from his participation in a local dramatic production that winter, it was generally believed that his health had suffered during these appointments and contributed to the situation, as well as limiting his research output after retirement.

There is evidence that Bather attended almost every annual conference of the Museums Association, participating as an able and witty debater, or a capable chairman. He was keen on amateur dramatics; Bather is also known to have been a zealous champion for the cause of Woman's Suffrage (very probably at the period Mrs Gray was berating him for not dealing with her crinoids!); and also very involved with local matters in the area of Wimbledon where he lived⁴⁷. Two letters⁴⁸ from Bather's home librarian and secretary mention other occupations. These ranged from the compilation of an index to the puns by Shakespeare, to the more practical tasks of binding the books in his library and establishing a Private Press ['FABO'] to publish specialized reference works on echinoderms.

Throughout his correspondence and publications, Dr Bather complained that his 'official duties' occupied most of his time and hindered scientific work, but our reappraisal suggests that it was very likely the range and volume of his interests and activities that impeded progress. In our view, the papers he did accomplish, together with his numerous professional achievements and official museum administrative function, demonstrate that Francis Bather fulfilled every responsibility required by each of his roles. The understandable chiding of an enthusiastic elderly Scottish gentlewoman, although justified in part, was the result of her own anxiety and lack of understanding about the environment of her eminent professional collaborator. In fact, the many facets of Bather's life and work, as well as the hints of his acquaintances concerning 'that Lonely Intelligence' who had an impish personality, indicate that he probably warrants a more detailed biography.

5. THE CORRESPONDENCE BETWEEN MRS ELIZABETH GRAY AND DR F. A. BATHER

The correspondence between Dr Bather and Mrs Elizabeth Gray spans a period of over thirty years, from October 1892 until her death in February 1924. It forms seventy percent of the letters forming the two volumes of the Gray Correspondence and is primarily concerned with the identification, borrowing and return of her numerous fossil specimens belonging to the phylum Echinodermata in which Bather specialised. However,

BRITISH MUSEUM (NATURAL HISTORY),

CROMWELL ROAD,

LONDON: S.W.

30 Oct. 1892.

Dear Madam,

Having this morning received
your address from my friend
Mr. J. G. Goodchild, I beg to in-
form you that I should find
much pleasure and profit in
the examination of the Ordovician
& Silurian Echinoderms in your
collection, and that I should
be extremely obliged to you if

The letter that began the Bather - Gray correspondence: Dr Bather's request to borrow the Gray material written on 3 October 1892.

that statement although broadly summarising the theme does not convey anything of the difficult relationship produced by two such differently motivated people. Their dissimilar environments, interests and responsibilities caused considerable friction and the letters reveal a pattern of highs and lows in their working relationship, largely arising from mis-understandings over comments and intentions. Although Dr Bather partly understood Mrs Gray's wish to have various specialists examine and describe the material in her collection, he had no conception that this was almost an obsession. Nor did he realise that the need to relinquish her cherished specimens to achieve this caused her considerable anxiety. In the circumstances, her patient forbearance of his, to her, apparently dilatory approach in dealing with '*her fossils*' can be appreciated. Equally her own narrow outlook and selfish preoccupation led to her failure to fully realise that someone in Bather's position⁴⁹—an administrative scientist at an internationally-renowned museum—would have many other duties and calls on his time. Although, in part, this complete lack of understanding by Mrs Gray can be excused by her age and social background; while on Bather's side, Mrs Gray herself had encouraged him to examine much of the material.

The tone of their correspondence is very polite, but although they exchanged greetings and enquired after each others families, it cannot be considered really friendly. In fact, the frequency of the letters reflects the current state of their 'business' relationship; only occurring at close intervals during a period of difficulty, or on those occasions when Mrs Gray's concern prompts her to seek drastic remedies to achieve her life-long aims. Such alarums are in contrast to her more normal procedure of making brief periodic enquiries as to the progress that Bather might have made with any of the main projects he had undertaken. The letters convey the full nature of their reluctant collaboration and as W. D. Lang has remarked (12 February 1938): 'the complete sequence . . . makes an interesting story'.

It began with Bather requesting the loan of the Ordovician and Silurian echinoderms in the Gray collection (3 October 1892) and commenting that he: 'would find much pleasure and profit in their examination'. Mrs Gray responded immediately: 'Thank you for your kindness in offering to examine the Echinoderms in my collection', but was unable to despatch the material for several weeks owing to illness. Bather within weeks of having asked for this material wrote (20 October 1892) that he had very little time available owing to the approach of winter and the fewer hours of suitable daylight when such private work could be accomplished. Two years later, Mrs Gray offers new crinoid material for him to study, refers to her fossils and comments that she would be glad to hear from him. Bather replied promptly, explaining that for almost all the intervening time he had been unable to work, owing to an eye problem, but re-assured her that the specimens were quite safe. In fact, during that period, Bather had taken a voyage to Japan to recuperate and had also been to Scandinavia where he had met his future wife. Next, presumably in an attempt to gain information, Mrs Gray used the pretext of listing all her fossils from Girvan to make another request (17 May 1896) about the specimens with Bather; which brought an immediate reply that he had not the time to deal with them and since most were only fragments of crinoid stems, he would not venture to name them. Thus the pattern of enquiry from Mrs Gray and the plea of 'too little time' from Bather was established almost from the outset. The real practical problem of adequate light in which to examine the specimens occurred again when Mrs Gray supplied specimens of a new Pleurocystid in the early months of 1899⁵⁰.

In March 1900, a few months after J. W. Gregory had declined to undertake the description of Mrs Gray's starfish, Bather wrote to ask her permission to send casts to Dr Schuchert at Yale, since he had taken over responsibility for the Museum's starfish collections following Gregory's departure for Australia. At the same time, Bather informed her that he had begun a Catalogue of all Cystidea and Crinoidea and would

work systematically through her collection (and many others), returning specimens when they had been finished with. Mrs Gray took the opportunity and sent all the specimens of starfish that she had, having concluded from his remarks that Bather had also taken up their study. Although retaining this excellent new material, Bather pointed out she was mistaken and asked: 'please remember, at present, my whole energies are—or should be—devoted to the Cystidea?' That summer, Mrs Gray responded by sending her finds of cystids and crinoids, asking that the latter should be placed with the others still with Bather 'in the hope that they may ere long find an interpreter!' To help her understanding of these cystids, Bather referred Mrs Gray to his contribution on the Echinodermata in Lankester's *Treatise on Zoology*, which had been his principal task during that period.

Over the next few years, it would appear that there were only brief exchanges between them. In January 1901, prompted by a request for a list of her fossils from the Geological Survey to update their Memoir, Mrs Gray used this as an excuse to spur Bather, who responded by suggesting that the best course was for him to update the Survey list himself as conditions at the BMNH 'were getting much worse, not better as he had hoped!' The following year, with F. R. C. Reed reporting that he had nearly finished dealing with her trilobites, Mrs Gray was anxious to learn whether Bather had made any progress with his examination of her Crinoids—(and starfishes!), stating that she also wished to put her collection in order. Bather, having then just been appointed Assistant Keeper, pleaded that his official duties did not allow time for private work, but promised to return everything that was not of immediate use.

It was at this time that Bather had become fully involved with other facets of museum work, introducing his ideas on curatorial practice into the Department of Geology, establishing himself as an authority on zoological nomenclature, and eventually with his active interest in the developing Museums Association, becoming that organisation's President in 1903. Apparently, after explaining that pressure of work prevented him from dealing with her material,—much of it in fact stemming from these additional interests, Bather decided that the best course as Mrs Gray was so anxious about her specimens, was to return all the Echinoderms and this was done in September 1903. During 1904, Mrs Gray sought Bather's help over finding a specialist to deal with her gastropods, but it transpired that Jane Donald, who Bather suggested as the only possible person, was already working on part of the Gray collection. In 1906, Mrs Gray's annual collecting trip to Girvan produced two possibly new cystids, which she asked him to examine and in her single letter that year, added the inevitable enquiry about those he already had. Bather replied at once asking her to wait as he wanted to complete a long-term research project and avoid all other interruptions. Presumably, this was his *Triassic Echinoderms of Bakony* (1909), for in its introduction Bather indicated that a long time had elapsed between his receiving the fossils (in 1901, 1902 & 1903) and the completion of that memoir. Over this same period Bather was also occupied in compiling the section on the Department of Geology for A. S. Woodward's⁵¹ contribution to the museum's *History of the Collections* (1906), but he would not have described this as a research project.

In July of 1907, at the age of 76, Mrs Gray visited a friend in Dresden and she also asked Bather to provide an introduction so that she could visit Prague at the same time, in order to examine Barrande's collection in the Narodni Muzeum. On her return a month later, and after leaving material at the BMNH on her way home, she enquired about a specimen lent to Bather in 1899 that had not been returned to her, but with which she wished to make some comparison. Bather only replied after she had written again that October, informing him of the new season's fossil haul, when he encouraged her to preserve every fragment of the various echinoid-like fossils she has found in the Starfish Bed⁵².

Their joint interest in the Pelmatozoan Cystids and other bizarre Echinodermata⁵³,

appears to have fostered an increase in her activity and their communication, which persisted until its culmination in the memoir *Caradocian Cystidea from Girvan* that Bather eventually produced in 1913. This episode opens with Mrs Gray musing (21 November 1908): 'I sometimes wonder if you have had time to do anything with the fossils that I left with you ...' and Bather replying with the dramatic opening (1 December 1908)⁵⁴: 'I always see with fear and trembling an envelope addressed by you'. Both in that letter, and in his introduction to the cystid memoir, Bather explained that his apparent procrastination was merely the result of other work preventing any real progress: 'if only people would stop sending me all sorts of other fossils, I should have some chance of getting on!'⁵⁵ and that it was necessary to study allied species and genera before he could proceed with Mrs Gray's Girvan material. He expressed his gratitude to her with the opening sentence of the memoir and underlined his indebtedness for allowing her specimens to remain in his hands for such a lengthy period. Mrs Gray's keen interest in the class may be explained by her comment: 'every time I go to Girvan ... I find specimens new to my collection ...' for it was certainly this that induced her to borrow Jaekel's work on⁵⁶ Cystideans on several occasions. Although she apparently enjoyed looking through that book (17 December 1910), Mrs Gray later conceded 'it was to no great avail in determining her own material'.

Mrs Gray's preoccupation with the cystids is apparent from her letters. Bather mentioned that he was compiling a catalogue of all the cystids in the British Museum's collection (25 November 1910); 'doing all he can on the Cystidea' by taking his holiday to do so and working at home (17 December 1910). The first letter brought the comment from Mrs Gray (1 December 1910): 'Of course, if you are not likely to be able to take up my cystideans ... I need hardly continue to send specimens to you!' She explained that being 'a long way past the allotted three score years and ten' she was anxious to see work on her British fossils completed and reminded Bather that she had been sending him fossils for 18 years. This was followed by a second letter (29 December 1910) enquiring whether Bather intended working on her material as well as that of the BM?; was that collection very large? had she omitted to see anything important? was there a collection as large as her own, or with a greater variety of species? Mrs Gray continued by expressing her goal:

I know that you are the authority, but I am so anxious to know what mine are, & which are new that I would willingly put them into the hands of any competent worker, who would undertake to examine them at once! Every other group in my collection has proved to contain **new** material.

These continual enquiries ought to have fore-warned Bather of a potential crisis. However, he simply replied (2 January 1911) by describing the nature of the catalogue he was compiling but compounded his error by inadvertently mentioning that, in common with all other British Museum Catalogues, only their own material would be figured. Misguidedly, by way of appeasing Mrs Gray, he suggested that descriptions of species in the Gray Collection could be included in this Catalogue. His preoccupation with the catalogue and in providing a straightforward answer to all her questions, caused Bather to omit mentioning that his descriptive manuscript on the cystids was in an advanced state of completion—that might have mollified her a little. Within three weeks, she had acted and made other arrangements for her 'beloved specimens' and notified Bather (21 January 1911) that he should return them all as Mr Reed 'although diffident about working on a group upon which you are the authority' was prepared to do so that summer. Mrs Gray had effected the very situation outlined in her earlier letter and though, in her opinion, 'the description will lack ... high distinction ... I feel Mr Reed will do excellent work'.

It was a complete and most unpleasant surprise to Dr Bather, particularly as he felt he was taking a great deal of trouble over helping her. No doubt it was this event, more than any other subsequent occasion, that led to his accurate and colourful description of his position, or that of any specialist, at the British Museum:

A palaeontologist at the BM is often envied, much as Dionysius of Syracuse was envied by Damocles. If any Damocles were to take my place he would see, it is true, a rich feast of Cystids and Crinoids laid before him. But the chains of Office would perpetually hinder him from feeding, and every day he would dread the fall of the sword in the shape of a peremptory letter demanding the immediate return of some necessary specimens⁵⁷.

Replying immediately (23 January 1911), Bather gave a detailed analysis of the situation over the cystids and pointed out that although 'Mr Cowper Reed will begin work on them in the summer, . . . he had begun work Already!' He acknowledged that perhaps she had not appreciated the hours of work that had been spent preparing specimens, or making notes and pointed out that 'some of the more curious among them have been perpetually in my mind's eye' and that he had been accumulating material from all parts of the world for the necessary comparisons. Consequently, he would still need to study her material, whoever described it, since he was compelled to complete the task. Although Mrs Gray apologised for her misunderstanding over his original letter and acknowledged Bather's need of her material, she was adamant about her request: 'Let me have my cystids soon—it will take me some time to look them over'—she even reminded him of a single specimen left at the BM in 1907. She hoped he would sympathise with her great desire to know just what her collection contained and would endure the step she had taken with patience. She admitted (28 January 1911) that she was quite unaware of the time he had spent working on them for: 'Indeed, I sometimes wondered if you thought them as interesting as I did.'

Events took their course and produced what might have been a memorable confrontation between Bather and Reed at the British Museum on 30th January, which resulted in Reed's prudent withdrawal following his recognition of the considerable amount of work that Bather had already accomplished. Apart from this, Bather was in a very strong position, for he had a good working relationship with Reed, who was dependent upon him for help with the numerous descriptive projects undertaken for other bodies with which Reed augmented his university income. In a friendly letter⁵⁸ to Bather (3 February 1911), Reed explained that he had pointed out to Mrs Gray that 'it is impossible for me to deal with her collection' since he felt that under existing circumstances 'she was [not] free to offer me the work'. However, he emphasized to Bather that 'mere reference to, or description of her material would not satisfy' Mrs Gray since 'it is independent treatment of her collection with figures which she requires'. Although appreciating Bather's special difficulties, Reed advised him to propose a smooth and rapid course for dealing with the material, although he realised such 'work cannot be hurried'.

Letters from the two protagonists crossed giving their interpretation of Reed's conclusions. With Bather emphasizing (6 February 1911) the amount of difficult time-consuming work involved in the preparation of such fossils (often between 60–120 hours per specimen) but to allay Mrs Gray's fears of further delay, stating that progress should now be quicker since most of this work had now been done. She, in turn (6 February 1911), confirmed Reed's opinion, and sought to defend her action as protection of her material from its likely fate of becoming a mere mention in a BM Catalogue, unrepresented and undignified by the illustration it deserved!

This did not end the issue between them, it dragged on for several months, reached other identical crises as they tried to resolve their quite different objectives. Both plainly

stated their opposing views, Mrs Gray insisting on the early publication of any work on 'my Cystids' and that it should preferably be in the form of a Monograph. Bather on the other hand, (15 February 1911) felt that this was impractical and proposed the gradual treatment of her fossils genus by genus and publication of their descriptions in a series of papers. In that way, she would have the assurance of seeing her fossils dealt with and returned to her as they were completed and he would have the satisfaction of seeing the plates were published as they were produced. He felt that monographic treatment was unsuitable for such a difficult group of fossils and that the difficulties and prohibitive cost of ensuring satisfactory and adequate illustration made it even more so.

Mrs Gray at one point (19 February 1911) considered that their views on publication were so widely divergent 'that if it were carried out to the satisfaction of one, it could only be to the dis-satisfaction of the other' and again called for the return of all her specimens. In order to clarify matters further, Bather had explained (15 February 1911) that he had originally intended to utilise the Gray material 'to the best advantage of science', but that he was not in a position to undertake a complete monograph on the Cystidea, nor was he prepared to produce an inferior work. Despite having spent considerable time dealing with the material and feeling that he had made enough concessions, Bather began to arrange the re-packing of the cystid specimens for their return to Edinburgh.

Very likely, Mrs Gray must have had second thoughts, realising that she would probably never obtain the descriptions she so badly wanted since Bather was the only person, who could provide them. The following day, as a conciliatory gesture, she sent a token note suggesting that Bather might consider offering a paper to the Royal Society of Edinburgh. Somehow Dr Horne of the Geological Survey became involved and acted as a mediator. He informed Bather that Mrs Gray was sending all her cystid material to London for him to assess the size of the task involved in their description and then suggest a possible time for its completion. After the allotted month, Bather duly made his report (8 April 1911) and agreed to undertake the preparation of a memoir restricted to the Starfish Bed Cystidea within a year, despite his reluctance previously to commit himself on this point of completion, but would still not make any definite promise about publication dates. He also pointed out that his own position could be made much easier, if a selection of the material was presented to the BMNH, thereby enabling him to work upon the task officially. Without openly agreeing to all these proposals, Mrs Gray informed Bather that Dr Horne, as editor, would apply for a grant to publish the plates if he intended to submit the memoir to the Royal Society of Edinburgh. Bather replied that he intended to do so and Mrs Gray expressed her pleasure that the work was to be published by a Scottish Society. The following year, despite numerous distractions and tasks during the preceding months, Bather presented a paper, as promised, at a meeting of the Edinburgh Royal Society on 13 May 1912. By accident, Mrs Gray was unaware of the meeting and had been at Girvan that week. However, as Bather pointed out to her, the memoir itself still required to be 'knocked into shape' and this would take considerable time; it was eventually received for publication in March 1913.

Having achieved her first objective, Mrs Gray (16 November 1912) immediately began to bother Bather about her crinoids and other echinoderm taxa, particularly as she was continuing to discover further material. After expressing her gratitude for his work on the cystids she continually tried to needle him, in a succession of letters during the winter months of the following years, into producing another monograph on the Girvan crinoids. One letter (28 November 1912) probably demonstrates her great anxiety:

On thinking it over, I seem only to feel that I am likely to be deprived . . . of seeing the description of my Crinoids, which were first sent to you—at your request! in 1892 . . . the cystids followed in 1899. Surely you have no other material with a claim prior to mine!

At first, still trying to complete that on the cystids, Bather is compelled to use all available time to fulfil his current commitment and attempted to dissuade her by explaining (19 November 1912) that he had many other pressing tasks once the cystids had been 'got rid of'. After outlining his working methods, Bather endeavoured to appease her further, by explaining that the bulk of the crinoids had been provisionally examined and that he intended dealing with them in conjunction with his official task of compiling a complete catalogue. Upon completing the Cystid memoir Bather wrote (19 March 1913): '... if you have any idea of the work entailed ... you can understand I am in very urgent need of ... the first holiday since starting the task.' but to ease her mind he reported that the preliminary work on her edioasteroids had also been completed.

Having reached her 82nd birthday Mrs Gray responded (27 March 1913) with the questions:

Can none of your ... research be laid aside ... to let me have the satisfaction of knowing after many years of patient waiting ... the result of my 50 years work? Is there anyone in the wide world who can do it? The other people ... making demands on your time are probably much younger ... and can ... afford to wait!

At the end of that summer, this is followed by the even more plaintive cry (27 August 1913):

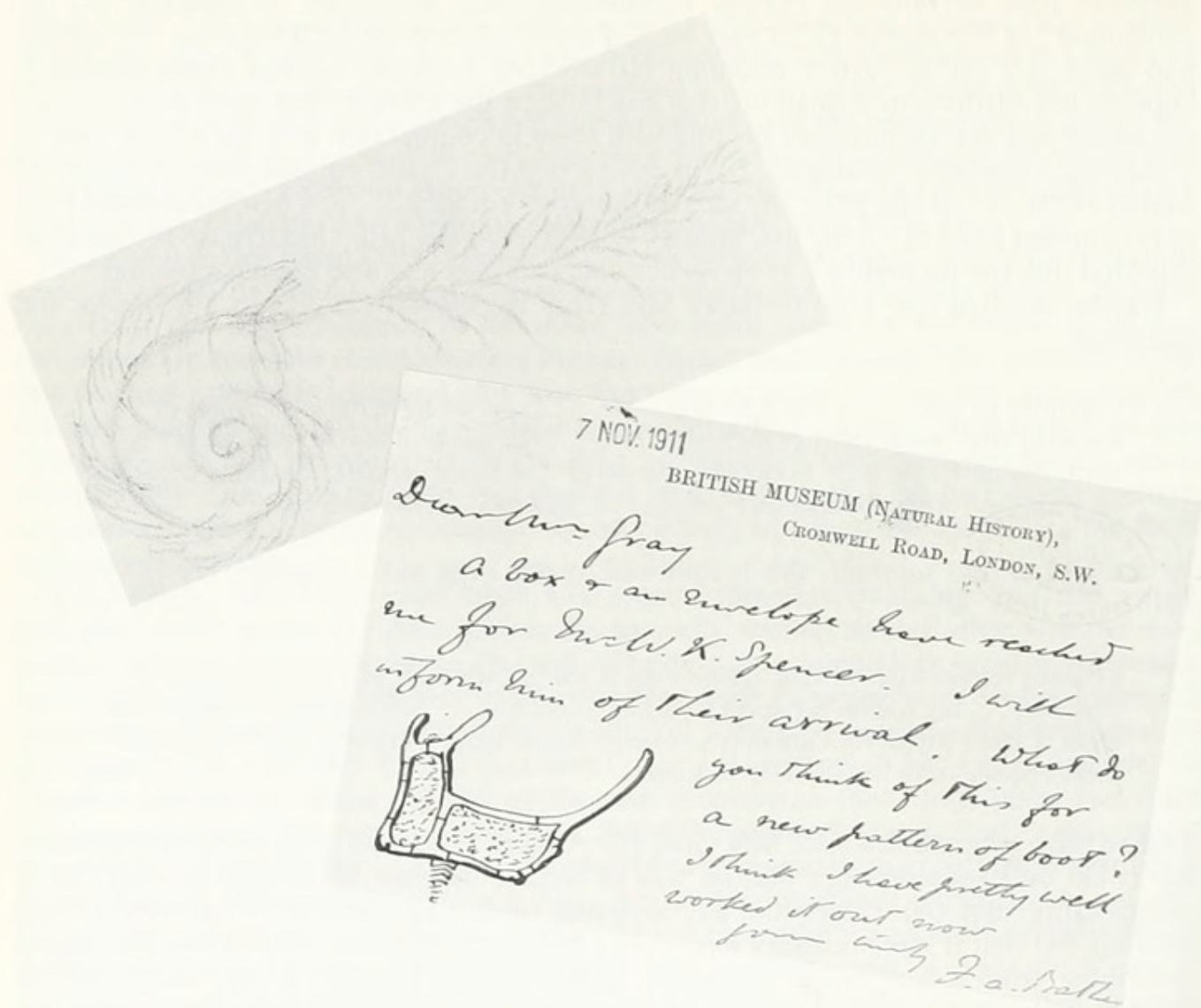
I cannot refrain from writing again to ask if you ... see your way to working on my crinoids? ... my reason for doing so always increases ... In the wakeful hours of the night, I often wonder if I am ever to see my fossils again and think that I cannot let them remain away from me much longer.

Bather fully sympathized with Mrs Gray (29 August 1912) and understood her anxiety, but could only reassure her that he was as equally anxious to proceed himself, while emphasizing that the Palaeozoic echinoderms presented exceptional difficulties and pointing out that it was necessary to consider her fossils together with others, for simply describing 'what is new' as she requested, would scarcely produce a work intelligible on its own. He ended by stating that: 'your echinoderms occupy a leading place among the things I have set myself to do'. Later, that year, most of Mrs Gray's cystid material was returned to her, an act which caused Bather a month of further problems, following his recognition that several specimens belonged to other taxa upon which he was still working and had led to their retention. His comment to Mrs Gray that she would find 'a few missing' on this account, simply did not register with her. Much to Bather's consternation, the possessor of that phenomenal memory was soon demanding the return of individual missing specimens that she could recall. Although Museum staff had numbered and labelled all the cystids that had been returned, there was no method of recognising particular original specimens

I really do not know what I am to do ...
I don't in the least know how you manage to identify particular specimens
... but it is certainly impossible for me to do so ...

are some of Bather's responses, but fortunately for both of them matters were soon rectified. An identical situation occurred the following year, after Bather had returned other specimens and Mrs Gray expected to find a particular example showing both a crinoid arm and a gastropod, known to the family as the 'hat and feather'.

Soon afterwards, the First World War caused various problems as many activities of the Museum and its Departments had to be suspended. Bather completed a series of



Terminology: Mrs Gray's sketch of 'the hat & feather' specimen see her letter of 2 August 1915 (p. 201); Bather's postcard concerning the 'boot' dated 7 Nov. 1911 (p. 218).

papers on the edrioasteroids, which he also published privately together as a book, and this work pleased Mrs Gray to some extent (14 January 1915), although he was never to produce the intended monograph on her crinoid material. At intervals throughout the remainder of her life, Mrs Gray's letters ask whether there has been any progress and Bather always pleaded pressure of other research, his daily routine of official duties, or else too few staff. During the war, this became true and on several occasions Mrs Gray considered requesting the return of her specimens (30 January 1915): 'I feel that I cannot allow my specimens to remain out of my possession for an indefinite period, and at times I feel very anxious about their safety.'

In his history of the Natural History Museum, Stearn (1981: 106–109) has described the difficulties caused by the Government of the time, particularly the threat in January 1918 when it was proposed to take over both museums at Bloomsbury and South Kensington to provide additional accommodation for use as Government offices. Fortunately, this was averted by representations from various scientific and professional societies acting together with the 'media' of that period⁵⁹. Naturally, since in response to

Is there any likelihood
of your paper on the
Crinoids appearing in the
near future?

With kindest regards &
hoping you are all well,

I am

Yours sincerely

Elizabeth Gray.

Extracts from Mrs Gray's letter to Dr Bather concerning her collection, 22 November 1923 [aged 92].

her usual enquiry, Bather had reported (7 December 1916) that in the circumstances: 'not much progress is being made with scientific work and your specimens have to share the fate of . . . others', Mrs Gray became very concerned. However, by the time that she had decided to do anything, the Government had abandoned their attack and Bather was able to report (10 January 1918) that staff had been engaged to remove specimens to basement storage and re-assure her that: 'your specimens will be next to what we consider the most valuable fossil in the world'⁶⁰.

The war also affected⁶¹ the normal scientific interchange of reference material. At one period, Bather (4 February 1915) explained to Mrs Gray that the reluctance of the Americans to send specimens across the Atlantic had prevented him from making further progress with his crinoid research. A few months later, on behalf of Professor Schuchert at Yale, Bather requested the loan of a rare coral of hers from Girvan (16 October 1915). After clarifying matters and only agreeing to this after imposing the condition that everything should be returned to her afterwards, Mrs Gray commented that: 'as it now seems to be safe for my corals to cross the Atlantic, I hope the crinoids you require are being sent to you!' Much earlier, she had vanquished another of Bather's excuses when in response to his argument that expenditure resulting from the war made it more difficult for him to undertake 'unpaid private work', she had riposted with the retort that for 55 years she had worked as an 'unpaid fossil collector!'

The crinoid episode dragged on; Mrs Gray adopted the tactic of requesting all her new finds to be returned immediately after their preliminary examination and identification

(27 December 1912): 'as I have not seen any of my crinoids for many years'. She also tried to get Bather to inform her whether any of the specimens in her main collection might be new species (17 June 1922). The last word might be said to have gone to Bather, for the 'new finds' included examples of the Crinoid *Herpetocrinus*, which he reminded her (23 January 1923):

'my first letter asked to lend specimens of this genus . . . unfortunately, for my purpose, you sent me so much else,—for which I did not ask—, that I have never been able to complete my paper!'

In some respects, it is surprising that this research was not completed, for the majority of Bather's scientific papers dealt with crinoids and one can only assume that he was never sufficiently satisfied with his results. Yet, Mrs Gray's 'hounding' over the Girvan crinoids was continued after her death in 1924, by her daughter Alice (see 23 February 1925), even though by then most of the material really belonged to the BMNH.

6. ACQUISITION OF THE VARIOUS GRAY COLLECTIONS

(i) The Original collections

The material from the earliest Gray Collection accumulated by both Elizabeth and Robert Gray as well as her father Thomas Anderson, was presented to the Hunterian Museum in 1866. As discussed above, it formed the basis of several short papers, or was used in other ways by the Natural History Society of Glasgow. The interest this aroused led to the Gray family's pre-occupation with fossil collecting in the Girvan area on behalf of known and unknown specialists and for the science in general. Donations of various geological specimens were subsequently made to the Hunterian⁶².

Letters of R. H. Traquair provide details of the transactions preceding the purchase of a representative collection by the Royal Scottish Museum in 1889. It would appear that Mrs Gray had offered a selection of her duplicates to Traquair for £60, but in a reply (21 January 1889) he declined with 'unfeigned regret' since he could not recommend paying 'so high a price for them'. Her immediate response was to write back to Traquair and ask just what figure he would be prepared to pay? In an apologetic letter several months later (24 May 1889), Dr Traquair explained his 'extreme discomfort of finding myself involved in a dispute with a friend about money'. The long delay before replying was solely due to his putting off the disagreeable duty of making an offer 'which from its smallness' might be considered offensive to her. In quoting a figure of £35, in his view a quite liberal price, Traquair declared that it was the highest he would acquiesce to and if this did not suit the matter must be dropped. This ultimatum led to general agreement, but in a subsequent letter (29 May 1889) Traquair mentioned that he had no objection to any 'un-necessary duplicates' being excluded from the purchase and being returned to Mrs Gray. This condition was apparently the lady's compromise in settling for the sum offered.

Much later (21 February 1920) when referring to the matter, Mrs Gray stated that she had sold 750 specimens for the sum of £35. She also revealed that a year later [c. 1890?] 1100 specimens had also been sold to the Geological Survey for £50 and commented that:

these small collections contained . . . neither types nor figured specimens, nor my best specimens, nor any of the rare species . . . and they were representative of my collection only as it was 30 years ago

Several collections of Girvan fossils were presented to the Sedgwick Museum, Cambridge by Mrs Gray between 1907 and 1910, and were identified by F. R. C. Reed.

A letter to Mrs Gray from D'Arcy Thompson at St Andrews (23 February 1921), mentions the donation of various items at this period. But, his particular reference to a small collection of graptolites and its association with Lapworth marking them as a very appropriate accession for St Andrews, raises an element of uncertainty as to their source. However, his final comment: 'You have given away many things in your time, and I know perfectly well that you will send us nothing which is not worth having ...' suggests that they are merely Gray specimens Lapworth had used, or examples of species he had originally described.

After her negotiations with the Royal Scottish Museum, it is possible that Elizabeth Gray had turned to another friend when considering further disposal. A letter from Lapworth to her (12 April 1914) referring to the scientific reliability of her material, regrets that his Department at Birmingham University 'living from hand to mouth' could not afford a complete set.

Shortly after (20 May 1914), Mrs Gray wrote to Smith-Woodward at the BMNH, who had earlier expressed an interest:

I write to inform you that I have decided to offer for sale the Trilobites in my collection ... It consists of 157 different species ... and included the types of 53 new species ... described by Nicholson & Etheridge (1878) and Mr F. R. C. Reed (1903–1906, 1914). ... my collection represents in a very complete form the Trilobites of the Girvan District and has therefore a special value!

This time after her experience with the RSM, Edinburgh from quoting a price, Mrs Gray decided to seek an offer from the British Museum. Inevitably their response was that they were unable to fix the price and asked her to name a figure for consideration. She in turn, felt unqualified to do so and duly sought Lapworth's help (1 June 1914). He hesitated, but a week later, after having fully investigated the matter, suggested a figure of £300 based on a range of £250–£500. He had arrived at this amount based on the recent purchase of the Ketley Collection for a similar sum and various sales of specimens from the Dudley area, including one collection of more than a thousand specimens that was bought by the Natural History Museum for £550. However, in a detailed explanation (10 June 1914) he stressed that although the Girvan specimens were less beautiful and more incomplete, her collection contained more new species.

Presumably, this valuation satisfied Mrs Gray, for the next day (12 June 1914) she wrote back to Smith-Woodward mentioning that she had consulted a knowledgeable friend and offered the trilobites for £300. Her letter is annotated 'price much too high—delay until Autumn' and it would appear that it was then intended to refer the matter to the Trustees. In a reply to this refusal, Mrs Gray commented (29 July 1914) that she had consulted two specialists and still believed the price was moderate. The matter languished until she reminded Smith-Woodward (21 January 1915), who responded (2 February)⁶³ by an inferred reply that a more comprehensive offer of the whole collection would be preferred at a later date. This was acknowledged (5 February 1914) by everyone in the Gray family, who all wanted the British Museum to purchase the entire collection, as the best way of dealing with the Girvan fossils.

Within a month or so of the war ending, Mrs Gray wrote (21 December 1918): asking whether the British Museum still wished to purchase her collection. She expected a good price, as apart from its being representative of the difficult Girvan District, she maintained it was unique having been examined by various specialists, who had then described her material. Her letter ended: 'In view of my advance age (I am in my 87th year), I would like to have the disposal of my collection settled.' and had begun: 'the

59 George Street
Edinburgh.

20th May 1914.

*120/1000
for the
we cannot*

Dear Dr Smith Woodward,

I write to inform you
that I have decided to offer for
sale the Trilobites in my collection.
This collection contains about
1100 specimens; each specimen with

59 George Street
Edinburgh.

29th July 1914.

Dear Dr Smith Woodward,

I have to acknowledge

having received your letter with
reference to Dr. Bather's absence.

I regret to note that you
think the price I have fixed
for the Trilobites is too high

British Museum . . . is where I should like it to be.' Smith-Woodward asked (1 January 1919) for lists and separate estimates of the value of each group exclaiming that: 'we are very anxious to acquire your collection if reasonable terms can be arranged, as soon as we have funds again.'

A year passed as each side clarified the position and Mrs Gray produced the requested lists and the BMNH asserted that they wanted the total collection including all duplicates. This preoccupation with numbers left considerable margin for adjustment, particularly as the nature of the material and the inclusion of unseen duplicates left uncertainty. In February 1920, Smith-Woodward, after consulting Bather again, asked Mrs Gray to provide her value for each group. She, understandably explained that with her limited experience it was not possible for her to price the collection in sections. Her letter (21 February 1920) continued:

In disposing of . . . my material, I feel that I may reasonably look for a price that will in some measure repay me for my life's work. . . . I feel that I can price my collection only as a whole . . . and that I should like to get £2,500 for it. . . . I know that the Gray Collection has for many years been regarded as a special collection and one of importance. . . . therefore . . . for such a special collection I am justified in asking a special price!

A surviving internal memorandum (27 February), compiled by Dr Bather⁶⁴, outlines the basis for pricing Mrs Gray's collection and also emphasized that some allowance needed to be made for potential types. After making due allowances for counterparts, material on loan and applying his own unit figures to Mrs Gray's lists, Bather calculated a figure of £1750; to ensure that every aspect was covered, including the possibility of further material, he suggested the value of the whole collection might be estimated at £2000. Smith-Woodward informed Mrs Gray of this figure (3 March) and enlarged on the various matters that had been taken into account such as the rarity of some groups, the lower value and fragmentary nature of others. He emphasized that Dr Bather had added a liberal allowance to compensate for any failure to recognise important material, or any mistake over numbers. Finally, in an effort to re-assure Mrs Gray that the figure was in accord with established practice, he misguidedly explained that it corresponded with 'our usual rate' and with her previous sales to Edinburgh. By way of encouragement, Smith-Woodward suggested that it should be possible for the Museum to make the first of the three agreed part payments within the month.

Mrs Gray replied immediately with a lengthy letter (6 March 1920), underlining her own view that the Gray Collection was a special collection of considerable scientific importance and cited figures that she felt demonstrated its greater frequency of 'new species'. To justify her opinion she quoted comments made by several users as to its special merits in comparison with other Museum collections. Understandably, she seized upon the unwitting remarks made by Smith-Woodward and exclaimed:

I feel that I should like it to be valued at a somewhat higher rate than your 'usual rate' and that at which I sold **small** collections thirty years ago!

She concluded with the comment that: 'a collection such as mine can never be repeated'. Although convinced of her own valuation, in the 'interests of Science', Mrs Gray agreed to compromise on a figure of £2250⁶⁵.

In an effort to appease all parties and complete the transaction, Bather was prepared to add a further comment to her letter acknowledging that his original estimate might be wrong in the light of Mrs Gray's fresh lists and recommending the agreement of the Trustees to her figure. Smith-Woodward informed her of this decision (8 March) and

List of Boxes Sent

1920

April 22. *Eccyliomphalus*. (one box) Complete.

" " *Ostracoda* (two boxes) "

" " *Turriculidae* (one box) "

" " *Helminthodonta*. (one box) "

" " *Hyalithes*. (three boxes) "

" 28th *Gastropods*. Unexamined.

" " *Graptolites*.

" " *Ischadites*.

May 1st *Gastropods*.

" " *Gastropods*.

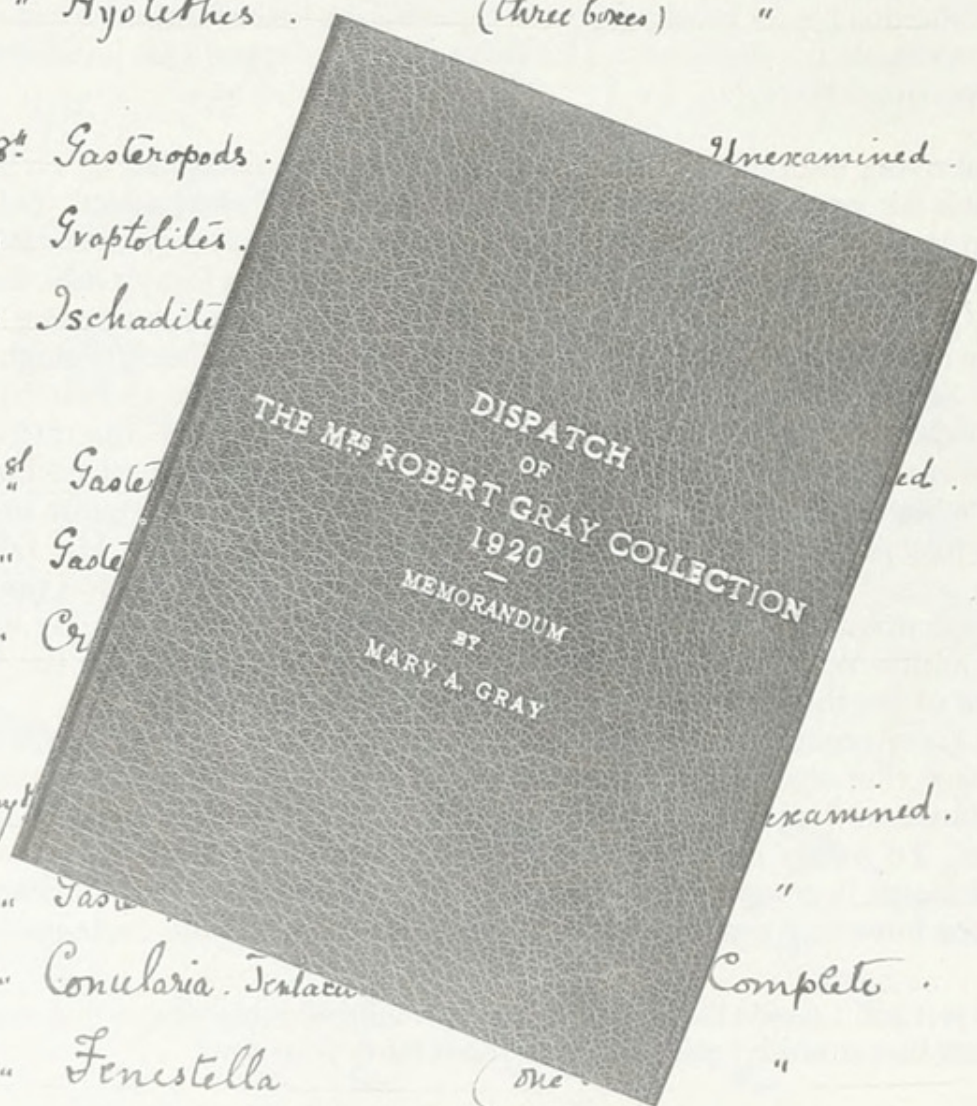
" " *Crinoids*.

" " *Gastropods*. Examined.

" " *Gastropods*. "

" " *Conularia*. Tentative. Complete.

" " *Fenestella* (one box) "



The memorandum book containing details of the despatch of the Gray Collection to the BMNH in 1920 superimposed over a page of its contents.

asked for a selection of the 'choicest things' to tempt the Trustees. On the 29 March, he was able to write that the purchase had been agreed and payment would be made during

the next four years, but that he intended to arrange that most of the sum would be paid within two.

Numerous letters over the next few years deal with a succession of problems and details concerning the despatch and contents of the Gray collection. By May, the first third of the collection had reached the Museum, entitling her to the first payment of £850 and Bather confirmed that well over this quota had been received. The major part of the collection was installed at South Kensington within the year and only the various loans to other specialists remained to be gathered in (see letter 26 October 1921). Inevitably, the constant re-use of boxes and ropes etc. added to the confusion, and Mrs Gray found some fossil shells belonging to the Lewis Abbott collection, which were duly returned⁶⁶.

Mrs Gray's peremptory concern over prompt payment as she fulfilled each of the conditions laid down was warranted; the precision of the operation was only evident at the Edinburgh end⁶⁷. Each payment had to be sought after promised fulfillment was overdue, allegedly this was largely due to administrative oversight or intentional delay. However, Smith-Woodward kept his own promise and managed to ensure that full payment was made within his specified two years⁶⁸. Finally, Mrs Gray wrote to him (24 March 1922) acknowledging the receipt of the final payment and thanking him for 'all the consideration' during the purchase of her collection. She had achieved her object and was able to say: 'It is a matter of complete satisfaction to me to know that the result of over sixty year's work is in safe keeping.'

With the money that she received Mrs Gray set up a fund for her unmarried daughters, two of whom were simply referred to as fundholders on their later death certificates. At the time the first payment was due to her from the BMNH, she had written to Smith-Woodward (27 May 1920) asking that the money should be made payable to both her and her daughters jointly, since they had always been her co-workers and collectors. Unfortunately, this could not be effected as authority for the payment had only been sought in her name.

(ii) Subsequent Collections

In January 1937, Alice Gray wrote to Dr Lang offering the BMNH all the fossil material that the family had collected at Girvan since their earlier collection was purchased in 1920. Although several specialists⁶⁹ had since examined particular groups, most of the 16,000 specimens came into her 'un-examined' category. W. N. Edwards, in the absence of the Keeper, hurriedly accepted what he described as their 'extremely generous offer'. Lang, on his return, immediately repeated the Museum's appreciation of their gift. In response to the request of Mrs Gray's daughters, that the additional material should be added to the main Gray Collection and held under the same conditions, he explained that: 'Mrs Gray's collection was purchased ... in normal circumstances, that is unconditionally, as indeed all specimens ... have officially to be.' Lang described the procedures adopted by his Department for dealing with such material, at length. He endeavoured to assure them that the practice of using distinctive printed labels to identify the specimens, ensured that the source identity was maintained even when particular groups were dispersed to the relevant sections. Commenting on Mrs Gray's original request that her material should be retained as a single unit, Lang explained that this was not possible for the methods adopted by the museum to assist research and organise its collections, meant that the various parts had to be distributed amongst different areas of the main Collection. However, Lang again re-assured Alice Gray that there was never any problem in recognising material from a particular collection. He undertook to pay the carriage and offered assistance with its packing.

Subsequent correspondence over the succeeding months dealt with matters of packing and transport, and it was arranged to despatch it locality by locality. However, after

dealing with the first consignment, Alice asked Lang for assistance since the time and energy involved in packing the entire collection 'is more than we can undertake'. He promptly sent two members of the Department to assist in its preparation and movement down the flights of stairs at 59, George Street⁷⁰. By the beginning of May, all the later Gray material had reached the BMNH and Alice Gray asked that it should be incorporated into her mother's collection: 'as our mother took part in the work for three years . . . and we wonder, if this and our mother's collection should be regarded as a whole?' The designation of 'Mrs Robert Gray Collection, 1937' adopted to record this donation delighted the family and satisfied the needs of curation.

The Sedgwick Museum, Cambridge also received various smaller donations from the Gray Collection, as a result of Reed's publication of the descriptions of particular groups⁷¹. Further donations were made later by Alice Gray *c.* 1937–38 as Reed produced other papers based on subsequent material (see Alice Gray's correspondence: Reed, 13 January 1938 Mss list) and this donation has been recorded in the literature as 'Coll'n. the Misses Gray' (see letter 14 February 1938)⁷².

After the death of Alice Gray in February 1942, Edith her surviving sister, wrote to both Dr Lang and W. N. Edwards (4 August 1942) informing them of a further quantity of material 'the results of their collection from time to time' that needed to be added to the Gray Collection. Its despatch to London had to be left until the termination of the Second World War when transport was more readily available. Unfortunately, Edith Gray also died during this period and it was only through the astuteness of her solicitors that the last phase of the Gray Collection was obtained by the BMNH⁷³. When the premises at George Street had to be vacated quickly, the BMNH sought the assistance of the Geological Survey staff in Edinburgh to pack and arrange the storage of this material. Although this was achieved by April 1945, the matter was only finally resolved at the end of June owing to a disagreement with the Survey by W. N. Edwards over the wording of the bill, which mentioned the assistance and services of a firm of carriers and cabinet-makers, to carry out the transfer.

7. THE GIRVAN FAUNA

(i) The Ordovician Age in relation to the Girvan fauna

The majority of the specimens in the Gray Collection are from a thick sequence of Ordovician rocks occurring in the Girvan area, which are part of a chain of Palaeozoic inliers stretching along the Midland Valley from Edinburgh to the coast. The basic stratigraphical succession of the Girvan 'shelly faunas' was worked out with precise geological mapping and palaeontological observation by Charles Lapworth (1882). He used graptolites as biostratigraphic indicators, a method he had introduced when dealing with the 'Moffat Series' (1878) for correlating the two sequences and recognised that an immense thickness of rocks was present at Girvan, in contrast to that in the Southern Uplands. Although his succession has been refined, it had never been seriously questioned (Clarkson, 1985: 4), but an alternative explanation for the structure present in the latter area has now been established. Harper (1982*b*, 1984) has provided a revised interpretation of the stratigraphy of the Upper Ordovician Girvan sequence and shown that it is of late Caradoc (Onnian) to late Ashgillian (Hirnantian) in age.

The Ordovician Period is remarkable in earth history for a number of important reasons (Jaanusson, 1984). Its most distinctive feature was the extent of the epicontinental seas which covered a greater area of the globe than in any other geological period, with the land areas mainly represented by small archipelagos rather than continents.

Consequently, the supply of terrigenous material was very low and this favoured the wide deposition of carbonate sediments suitable for marine organisms.

The period is also marked by considerable changes in both flora and fauna, particularly in the composition of its marine faunas. One reason for this is that a number of major invertebrate groups appear, become common, or more diverse for the first time. Among the most important benthic groups are the stromatoporoids, corals, cystids, crinoids and echinoids, although the bivalves and cephalopods also show significant changes—and of even more significance, the planktic graptolites. Jaanusson emphasized that important effects were produced amongst the skeleton-bearing associations and assemblages resulting in the establishment of the characteristic Palaeozoic biotic organisation of the epifauna. However, he also pointed out that the full explanation for many relationships has not been established, owing to the difficulty of distinguishing between ecological and geographical factors. The Ordovician is also characterised by extreme biogeographical differentiation in its marine faunas, which occurs to a greater degree in the benthic elements. The classification and correlation of Ordovician deposits is further complicated, since the benthic and planktic faunas are often not contemporaneous, features which have led Jaanusson to conclude that it is, perhaps, the most confused of all periods.

Fortey (1984) by examining global Ordovician transgressions and regressions has provided explanations for several of these aspects. Using a series of biogeographical models to demonstrate the occurrence of trilobite and graptolite biofacies he showed that the faunal changes that had occurred were as much the result of 'environmental shift as of evolutionary novelty'. He also indicated that 'ancestral faunas' had often been overlooked owing to the scarcity of the preservation of the relevant facies, but that these were available in the correct situations. Brenchley (1984) has outlined the possible causes of the significant Late Ordovician extinctions in many invertebrate families, genera and species. He pointed out that the earliest phase affected the deep-shelf Trilobite—Cystoid—Gastropod faunas that had already been displaced over the shelf edge by the initial phase of falling sea-level. Many groups show a sharp decrease in numbers and the gradual depletion of species richness in Trilobites, Brachiopods and Gastropods towards the Ordovician—Silurian boundary had been demonstrated by Williams & Wright (1981). Such changes were attributed to a drastic decrease in habitable area as a result of successive changes in sea level, which resulted from the growth and decay of the Gondwana ice cap. Associated changes in salinity and ocean temperature may have also caused extinction in planktic faunas.

The historic Gray Collection, with its relatively well-localised Ordovician material has considerable significance in resolving some of these questions of spatial distribution. Although several Ordovician specialists have collected better and more reliably-zoned specimens (see Harper, 1984: 12) the taxonomic importance of Mrs Gray specimens is fundamental to their identifying such material. In addition, several of her sites are no longer available, having been worked out, or even lost. Jaanusson concluded (p. 3) that a solid taxonomic framework is a necessary foundation before stratigraphical, ecological, or palaeogeographical conclusions can be made.

Ingham (1978) and others⁷⁴ have described the general palaeogeographical setting as that of a proximal fore-arc basin occurring on the northwestern margin of the Palaeozoic Iapetus ocean. But Curry *et al* (1984) have emphasized (quoting Dewey, 1982):

plate tectonism operates on such a vast scale that it becomes extremely difficult to deal meaningfully with relatively minute field phenomena

The Girvan succession has been interpreted as recording the development of two fan-delta systems (Ince, 1984) with the Stinchur Limestone being a shallow marine fan-delta abandonment facies. On the basis of such research, Clarkson (1985) summarised the

current picture of the Girvan Ordovician as an area of subsidence, in which the sedimentation was controlled by a series of moving large strike faults. Several giant alluvial submarine fans contributed sediment from the North and this spilled over the edges of the fault-bounded shelves. As this model was based on palaeontological research and biostratigraphy, it demonstrates the effective contribution that these disciplines can still make to good geology.

(ii) The Silurian Rocks of the Girvan Area

By L. R. M. Cocks

(a) Summary of Silurian Stratigraphy

Silurian rocks occur in two main areas north and south of the Girvan valley, which is occupied by Upper Palaeozoic rocks. These formations are nearly 3000m thick and were chiefly deposited in a turbidite environment. The initial indifferent work of the early nineteenth-century geologists, including Murchison (1851), and Lapworth's classic work (1882) was superceded by a revision carried out by the Geological Survey (Peach & Horne, 1899). This largely confirmed Lapworth's results and was reliable for the next seventy years. However, at the end of that period it became clear from studies of Silurian rocks in the Welsh Borderland and elsewhere, that the succession in the Girvan region needed to be revised and that many of the stratigraphical formations devised by Lapworth needed adjustment to modern standards. Thus the area was re-mapped, and further fossils collected by Cocks and Toghil (1973), who devised a new stratigraphy, made fresh correlations from their results, but endeavoured to conserve much of Lapworth's terminology.

Cocks & Toghil found that the Silurian rocks were confined to the Llandoverly, apart from the very highest beds in the Knockgardner area which are of basal Wenlock age. They established three separate stratigraphical successions (*ibid*, t.-figs. 8 & 9):

1. the Coastal region;
2. the Main Outcrop (which runs from Saugh Hill to Straiton); and
3. the Craig Head Inlier.

1. On the coast, south-west of Girvan there are two areas: The Haven (Shalloch Forge) and Woodland Point. At these, the Craigs Kelly Conglomerate unconformably overlies the Ordovician Shalloch Formation of Middle Ashgill age, and that conglomerate is succeeded by the Woodland Formation, which in turn is overlain by the coarse turbidites of the Scart Grits. The Woodland Formation yields abundant late Rhuddanian brachiopods, including *Stricklandia lens lens*, which are overlain by graptolites of the *cyphus* Zone.

2. In the Main Outcrop all the beds are steeply inclined and often inverted, while they underlie the older Ordovician rocks to the South. There is also a strong unconformity, but with no conglomerate and only rare shells in the beds overlying it. The lowest Silurian beds are the dark mudstones of the Tralorg Formation, which also yield *cyphus* Zone graptolites. These are followed by the turbiditic Saugh Hill Grits and then the Pencleuch Shale yielding *convolutus* Zone graptolites of Aeronian age. These are overlain by another unconformity, followed by the transgressive beds of the Lower Camregan Grits that contain a shelly-fauna, which includes the stratigraphically important rhynchonellide *Eocoelia curtisi* in abundance; and then the deeper water, but still shell-bearing mudstones of the Wood Burn Formation. A series of shales and turbidites, named in succession as: Maxwellston Mudstones, Upper Camregan Grits, Penkill Formation, Protovirgularia Grits, Lauchlan Formation, Drumyork Formation, and Blair Shale. Successively, each of these yield graptolites that represent the complete Telychian

sequence of *turriculatus*, *crispus*, *griestoniensis* and *crenulata* Zones, but with no shelly faunas. After this there is a regressive sequence commencing with the conformable beds of the Knockgardner Formation that yield basal Wenlock shelly faunas. The overlying Straiton Grits carry a few ostracods and bivalves interbedded with 'Old Red Sandstone' facies of presumably Wenlock age, representing the marine regression seen in other inliers in the Midland Valley of Scotland. These Grits occur immediately below the substantial unconformity overlain by the true Old Red Sandstone of Middle Devonian age.

3. The Craighead Inlier is an asymmetrical anticline with a core of Ordovician rocks and is completely surrounded by Old Red Sandstone and Carboniferous formations. Lapworth (*ibid*) formulated the succession of this inlier; Lamont (1935) augmented and divided some of these terms; while Freshney (1959) replaced the latter's names for the divided Mulloch Hill Sandstone and indicated that the inlier extended further to the northeast. In ascending order, the basal Silurian unit—The Lady Burn Conglomerate—rests on different Ordovician formations at different localities and only one of these junctions is well exposed (C. & T., 1973: 213) with an unconformity being postulated for the other. This massive conglomerate contains sandy lenses that can be fossiliferous with a low diversity *Cryptothyrella* community (of Rhuddanian age) and sediments that indicate deposition in shallow water. The successive Mulloch Hill Formation is the most fossiliferous unit of the inlier and consists of green 'Rough Neuk' and buff 'Craigens' sandstones, which are interbedded with each other. The faunas represent shallow water to mid-shelf communities. However, near the top a quite different and richer fauna, identified as a *Clorinda* community, suggests deposition at greater depths and is a prelude to those occurring above. The succeeding laminated light and dark units of the Glenwells Shale contain a graptolite fauna indicating the upper *cyphus* Zone. This is overlain by the easily mappable, unfossiliferous, coarse and poorly sorted Glenwells Conglomerate. The Newlands Formation, with its diverse fossil assemblages of *Stricklandia* and *Clorinda* communities, comprises the only shelly Middle Llandovery in the whole of Scotland and was possibly deposited upon the deeper part of the shelf. The soft thinly bedded shales of the Glenshalloch Shale have yielded well preserved graptolite faunas at some localities of *gregarius* Zone age with two different Subzones. The Upper Saugh Hill Grits comprise massive greyish-green turbidites, mostly coarse-grained and unfossiliferous. The limited exposure of the overlying Pencleuch Shale has yielded a graptolite fauna typical of the upper *convolutus* Zone, but which may be close to the faunal boundary. Similarly, exposure of the Lower Camregan Grits is poor, but elements from both *Eocoelia* and *Pentamerus* communities have been obtained from different localities.

(b) *The value of the Gray Collection*

The Girvan fossils were known long before the Gray family came to prominence, but by the time that Lapworth wrote his paper, their collection numbered 'between 20,000 and 30,000 specimens' (Lapworth, 1882: 551) and has formed the basis for many palaeontological papers both beforehand and afterwards. However, the main disadvantage to subsequent users is that the Gray collection is very biased towards the shelly fossils; there are very few graptolites despite Lapworth's utilisation of such fossils and that 14 of the 23 Silurian formations commonly have graptolites. This is also in contrast to the greater thickness of graptolite-bearing rocks occurring in the sequences of the Girvan area, which amount to more than ten times the thickness of the shell-bearing formations. It would appear that the Gray family were more interested in fossils that they could easily recognise and preferred to work at a relatively small number of localities where they could be sure to obtain them. This is borne out by the collections in the BMNH, for there

are 23 closely-packed drawers of brachiopods collected from the Llandovery locality of Woodland Point, but other equally rich localities are either entirely absent in the Gray Collection, or merely represented by a handful of specimens. Nevertheless, the assiduity of the Gray family meant that nineteenth-century palaeontologists had a valuable pool of first-rate specimens available for their research. In turn these monographs were extremely influential in making 'Girvan' an international byword as a source of Lower Palaeozoic invertebrate fossils.

(iii) Interpretation of the Girvan Fauna

In a presidential address, Robert Etheridge (1881) when emphasizing the importance of fossils in interpreting the Palaeozoic rocks of Scotland, mentioned (p. 6) that the first record of material from the Girvan strata was a short list provided by Professor Nicol (1844)⁷⁵. Apparently, Sedgwick had only briefly visited the district during his tour of 1841 and was not able to collect any material until a later visit in 1848⁷⁶. M'Coy described this in a series of papers (1851–52), that must be regarded as containing the first descriptions of Girvan fossils⁷⁷. These, together with others were subsequently included in their joint publication on *British Palaeozoic Fossils* (1851–1855)⁷⁸; Etheridge estimated that thirty-four species were from the Girvan area. J. W. Salter⁷⁹, was another responsible for the early description of Girvan fossils, his first contribution being appended as a list to Murchison's memoir on the Silurian of southern Scotland (1855)⁸⁰. These fossils had been obtained by Murchison in 1850 with the assistance of Alexander MacCallum, a local weaver, who is said to have been the first person to collect fossils from the area (*ibid* p. 9) and to have acted as a guide for all visiting geologists. Salter described thirty-seven species some of which provided the first indication of the link between the Girvan and North American faunas. More recent descriptive work has led to the correlation of the dominant phylla in these Scottish faunas with those found in North America. In particular, it has shown that the brachiopods had 'little in common with Caradoc faunas found elsewhere in Britain and Europe' but that their Girvan sequence is recognisable in the Mohawk stages of the southern Appalachians (Williams, 1962: 62).

Harper (1979) has established the faunal associations that occur throughout the Girvan sequence and shown that brachiopods are frequently numerically dominant in many of these. Trilobites occasionally dominate several of the associations found in the Upper Whitehouse Group e.g. the 'Foliomena fauna' (*ibid.*: 440) and graptolites provide adequate stratigraphical correlation. The later Drummock Group has a great many distinctive faunal associations and in its upper part contains the very diverse and abundant faunas of the Lady Burn Starfish Beds (Lamont, 1935; also provided lists of the fauna).

The majority of the earlier faunal studies were based upon the large collections accumulated by Mrs Gray and the Misses Gray; John Smith of Dalry; and James Begg of Glasgow. As these descriptions were produced by palaeontologists, who were strictly museum specialists and who neither had the opportunity, or often the inclination to conduct fieldwork⁸¹, their results inevitably contained errors arising from confusion over fossil relationships and occurrences. F. R. C. Reed, in particular, treated material from a number of localities together and created a false homogeneity within his faunas and taxa (see Harper, 1984: 22, for example of *L. mediotriata*). It is only with modern collecting techniques ensuring precise stratigraphical provenance and descriptions based on the numerical analysis of the fossils in certain groups (brachiopods, trilobites, cystoids and graptolites) that their mistakes have been rectified. A cursory examination of the range of the fauna's descriptive literature suggests that it was produced in three periods. An 'exploratory phase' arising from the work of Murchison, Sedgwick and others; then a

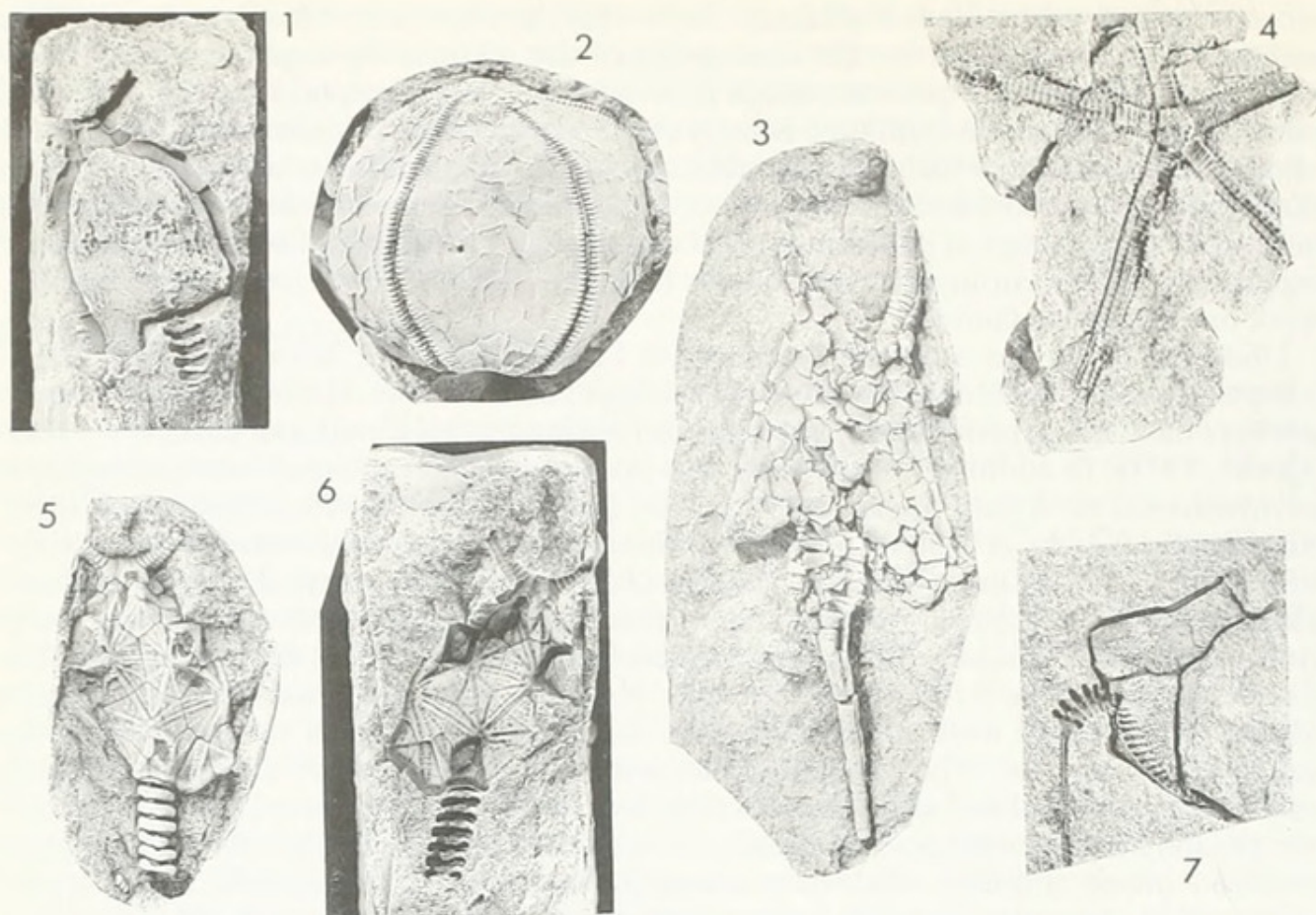
more sustained 'accumulative' phase (c. 1870–1924) prompted by Mrs Gray's collecting activities and her concern for the description of the material by experts to reveal the number of 'new species' present, which then extended into a second stage (c. 1930–46) partly as the result of the continued activity of the Misses Gray, but also from the interest of other keen collectors such as Begg and Lamont; and finally the present one (1956–84) that might be termed the 'authoritative, or interpretative' phase arising from the active interest of a wide range of palaeontological and stratigraphical specialists investigating all aspects of Ordovician invertebrate faunas [Harper, 1982*b*: 253–4, has summarised all work on the Girvan fauna]⁸².

Understandably the numerically abundant brachiopods have been dealt with most completely and provided much of our knowledge of these faunas. Ordovician brachiopod workers have made considerable progress in revising the systematics of earlier workers (Cocks, 1978); in addition, others have also interpreted the ecological associations and environments in which the Girvan species lived (Harper, 1979, 1984); and their stratigraphy (Cocks & Toghil, 1973). Williams (1962) used brachiopods as a further stratigraphic key to unravel the structure of the area, since many of the species are identical to those occurring in the undeformed platform carbonates of eastern North America, where the succession is well-defined. Harper (1979, 1984) has also worked on the formations of the Ardmillan succession, which form the sequence from which most of Mrs Gray's fossils were collected and has shown that very few of the fossils occur in indigenous situations. The changing composition and structure of these brachiopod associations reflected an essentially unstable environment. He suggested (1979: 443) that the predominantly common association of small dalmanellids and plectambonitaceans occurred on an unstable offshore continental slope and as a possible site, Harper envisaged a constantly changing submarine fan in relatively deep water. The damaged condition of the majority of these brachiopods, which include individuals from both presumed shelf and slope communities, indicated they had undergone transport from their original site and the lack of juvenile forms tended to confirm this view.

Initially, the trilobites were dealt with by Nicholson & Etheridge in their general description of the Girvan fauna. Reed (1903–35) subsequently revised and described them more completely and apart from Howell's full treatment of all the Silurian species (1982), the current approach has been for specialists to deal with particular families (Whittington, 1950; Lane, 1971; Owens, 1973) after supplementing original material by making personal collections. However, various authors (Tripp; Ingham; Hughes *et al*) have examined other aspects of the Girvan trilobites.

In comparison with the other groups, the relatively rich British Ordovician fauna of primitive echinoderms has been considered to be poorly known. One reason for this is the rapid disarticulation of such animals after death (Donovan, 1986: 1) and Smith and Paul (1982: 604) have indicated the relevant rate of this disassociation in the enigmatic cyclocystoids. Without being suddenly overwhelmed and pinioned by debris, or sediment, the weak compound skeletal elements of echinodermata would soon begin to separate as their skeleton disintegrates very rapidly after death. Goldring & Stephenson (1972) in their discussion of the preservation of ophiuroids and echinoderms indicated that the only chance for their fossilisation was instantaneous burial by slumped sediment⁸³. Their conclusion that the Girvan Starfish Bed fossils had resulted from such rapid entombment in a turbulent, shallow water environment was modified by Harper (1982*a*: 30) to burial during sudden downslope movement of both sediment and fauna.

In part, the apparent abundance of primitive echinoderms can be explained by the explosive radiation of echinoderm classes that occurred during the Lower Palaeozoic. Paul (1973: 1; 1984) in his monograph of the British Ordovician Cystoids stated that it was one of the richest cystoid faunas in the world, ... and was the result of migration from three separate faunal provinces into the area. He listed eleven taxa from Girvan



Echinodermata found in the Starfish Bed, Lady Burn.

1, 5 & 6 *Pleurocystis quadrata* Bather

1 & 6: Part & counterpart of original specimen E 23298b $\times 1$;

5: Latex pull from specimen $\times 1$; Mrs. R. Gray Coll'n., 1920.

2. *Aulechinus grayae* MacBridge & Spencer. E 405522a $\times 1$; Coll'd. Alice Gray, 1934.

3. *Dendrocystis scoticus* (Bather). A latex pull from E 23700 $\times 1$; Pres'd. Misses Gray, 1937.

4. *Cnemidactis girvanensis* (Schuchert). E 53835 $\times 1$; Purch'd. from Mrs R. Gray, 1920.

7. *Cothurnocystis elizae* Bather. E 23702b $\times 1$ approx.

localities (p. 76) and suggested (p. 121) that ideal conditions for pleurocystids apparently prevailed during Starfish Bed times, since three species are recognised; and their preservation indicated that they were buried alive by a sudden influx of sediment.

Despite Bather's predominant interest in the Crinoidea, he made very little contribution to knowledge of the Girvan crinoids. Prior to Ramsbottom's monograph (1961), only one of the five described Ordovician crinoids had been recorded from Girvan⁸⁴; he increased the number of known species to twenty-three, with twelve of these being found at Girvan⁸⁵. Ramsbottom questioned the occurrence and identity of the material previously described by Nicholson and Etheridge (1880) and Bather (1896); and in

Cothurnocystis elizae Bather.

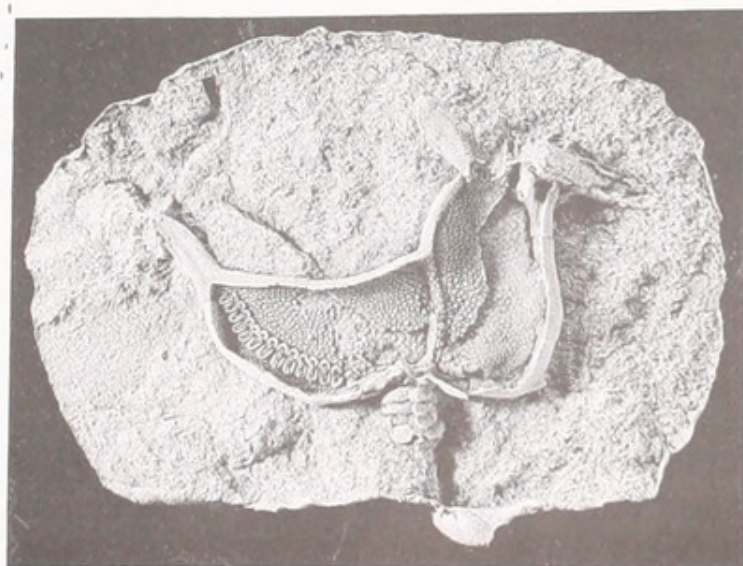
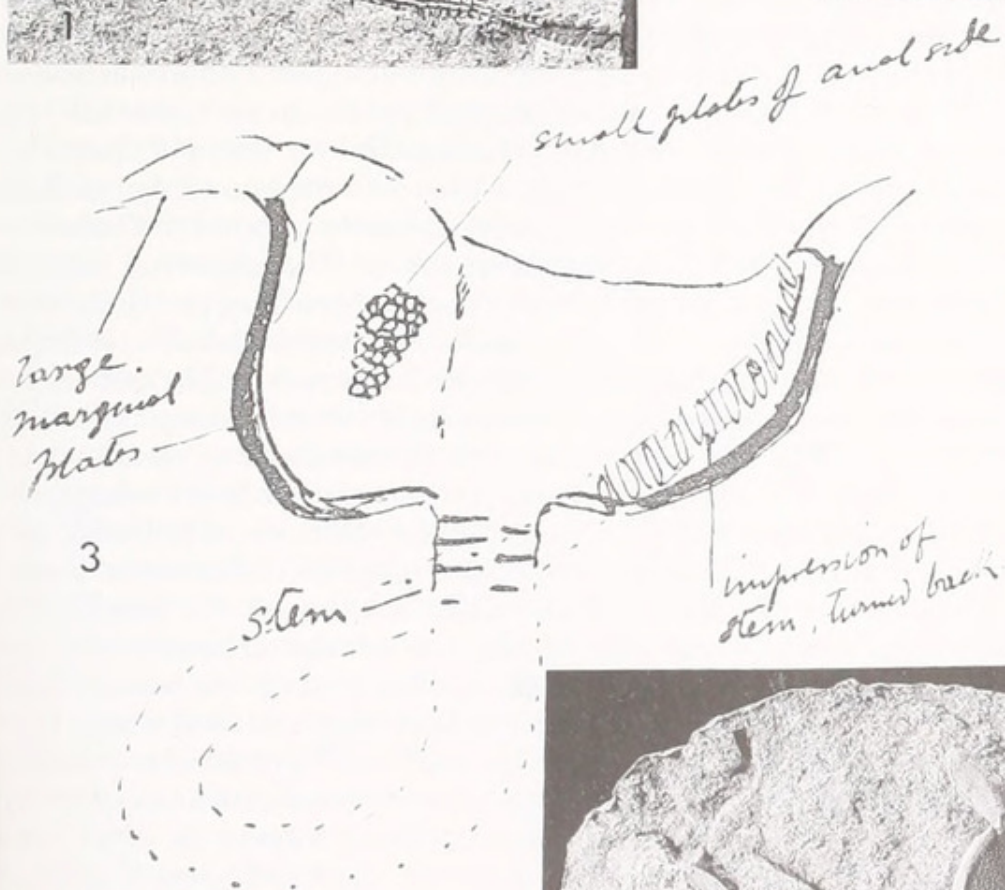
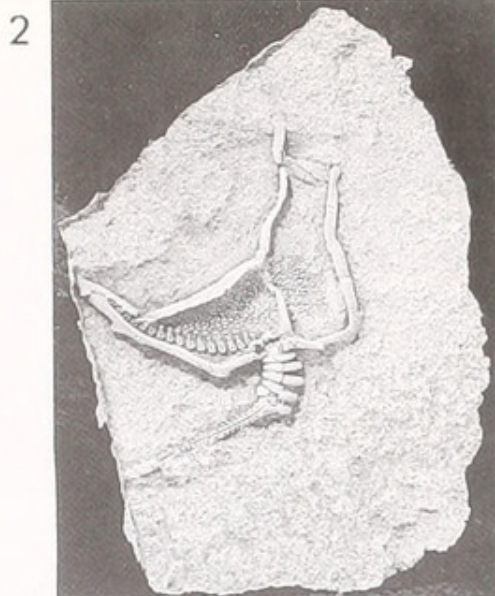
1. Original specimen BMNH E 23702b $\times 2$ approx., presented by 'The Misses Gray' in June 1937.

2. A latex impression taken from the original $\times 1$.

3. Another Gray specimen depicted in a rough sketch showing Bather's interpretation (letter 16 January 1899):

The specimen . . . though so imperfect as to be scarcely recognisable . . . is, I think, different from any previously described. But is hardly good enough to give a name. . . . We have no British specimens . . . in this Museum!

4. Latex pull from E 23172 $\times 1$, showing the fine detail that is preserved in some specimens.



recognising (p. 111) that the latter had misinterpreted crinoid features incorrectly as a result of the imperfect techniques available to him for dealing with difficult material, may have given a reason for Bather's limited results. Later, Strimple (1972) and Donovan (1983) made further nomenclatorial revisions and increased the number of crinoid species (Brower, 1974; Donovan, *In Press*) to thirty. Paul (1965) had earlier described the only record of the class Paracrinoidea from Britain. Spencer's work on the Palaeozoic starfishes is discussed elsewhere (p. 188).

The most significant element in the Girvan echinoderm fauna must be the specimens of 'carpoids' that Jefferies (1968, 1986) has now convincingly interpreted as calcichordates⁸⁶. These strange fossils, traditionally regarded as primitive echinoderms, were in fact chordates, an idea that had first been postulated by Gislen in 1930. They have many chordate, and sometimes vertebrate, characteristics, but they also possess certain echinoderm-like features. The detailed analyses of these fossils by Jefferies *et al* are based upon functional explanations for virtually all their anatomical features, particularly their internal anatomy, and establish that they were ancestral to all modern chordates including the vertebrates. Alternative theories on these 'carpoid' groups (the solutes, mitrates, cornutes) recognising them as echinoderms, founder on several aspects of functional interpretation and always lack vital structures. The two cornutes *Cothurnocystis elizae* and *Scotiaecystis curvata*, both described by Bather from the Gray collection, had an important role in the investigation, which led to the new theory and has solved one of the problems of classical zoology. In his original paper, in fact, Bather too, considered that *Cothurnocystis* might be a chordate, but rejected the idea (1913: 417).

Bather's paper has been recognised as an enormous advance in the knowledge of these bizarre-looking fossils. Both he and the Gray family independently referred to *Cothurnocystis elizae* as 'the boot' (see letters 7 & 8 November 1911). The following year, in recognition of her contribution, Bather named the species after Mrs Gray and decided to use the form *elizae* because it made a 'pleasant sounding combination'⁸⁷. Jefferies (1986), in his detailed and readable explanation, described this species as 'one of the strangest-looking animals that ever existed' and acknowledged its companion cornute to be a more specialized form (p. 207). We wonder just how Elizabeth Gray would regard the first comment and the fact that Bather named such a creature after her! Perhaps, the final sentence in that book would have convinced her that the effort was worthwhile, for together with his predecessors, Jefferies acknowledges that 'the nub of the whole matter is the extraordinary group of fossils called calcichordates'. Although the two Girvan species do not occupy vital positions in the cladogram of the Dexiothetica, the investigation of their features had a major part in the development of this research and led to the development of new investigative techniques. That alone, we feel would have pleased her, but the realisation that her beloved 'cystid' material⁸⁸ provided two British scientists with a significant part of their life's work [she was somewhat patriotic!] and had a substantial part in the development of a new theory, would we suspect, in Mrs Gray's view, have been a reward equivalent to her recognition by the Geological Society in 1903.

It would appear that apart from the less numerically abundant elements of the faunas e.g. sponges, conularids (see Slater, 1907), hyolithids etc. only the various classes of mollusca have received less attention than they deserve, with the bivalves faring worst of all; although treatment of the newly recognised classes of the monoplacophorans and rostroconchs is equally poor⁸⁹. In many respects, aside from problems of preservation (which can be overcome), this is due to the practice within molluscan taxonomy of describing material on a zoological rather than a faunal, or stratigraphic approach⁹⁰.

The 'strange-stalked forms' that initially were referred to as Cirripedia attracted the interest of Woodward (1880); Bather (see letters & 1926: vi); Reed (1901); and ultimately after the Gray Coll'n. had been acquired by the BMNH, Withers (1922), who

recognised their distinctive characters and established the Group Machaeridia (1926) to accommodate them.

(iv) The Starfish Bed, Lady Burn

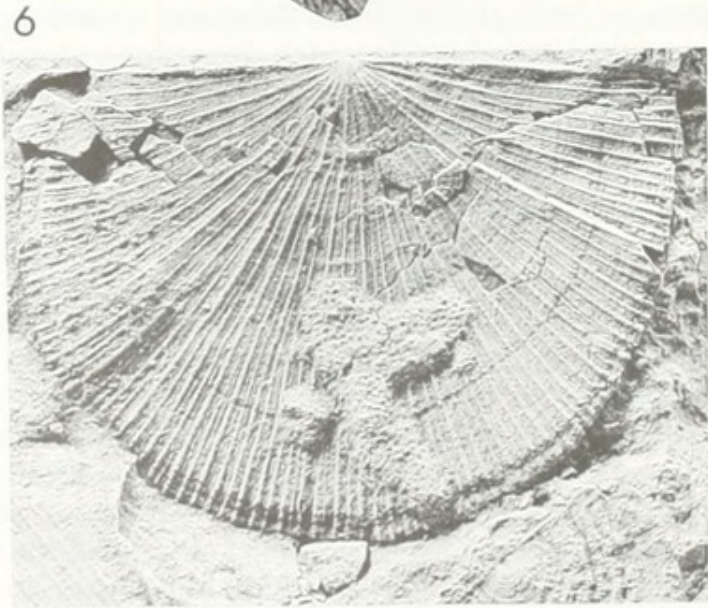
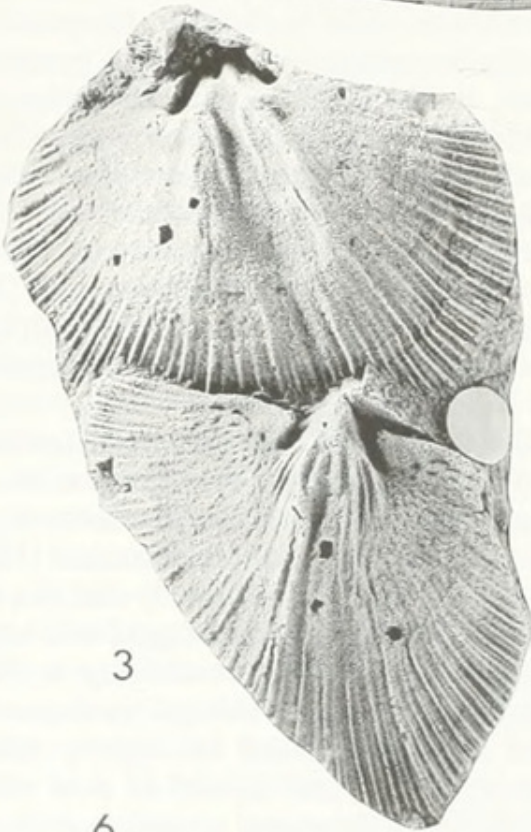
In a postscript of a letter to Professor Lapworth, Mrs Gray mentioned her 'discovery' of the now famous Starfish Bed at Lady Burn (20 November 1898). A subsequent and much later note by Alice Gray⁹¹ indicates the importance that the family attached to this discovery, for the Grays were under the impression that their site was not the Starfish band, West of Quarrel Hill described by Lapworth (1882: 619, fig. 21). This was thought to have been in an old quarry, for which the family had searched in vain. However, although Lapworth referred to a fossiliferous sandstone being found in an old quarry, there is no precise evidence that he encountered these rocks *in situ* (see Harper, 1982a: 30), but merely correlated that bed with the similar sandstone occurring beneath the waterfall at the head of the Lady Burn. In fact, in his letter to Mrs Gray, Lapworth confirmed that his best specimens had been obtained from walls in the neighbourhood of Quarrel Hill. In the Gray's opinion, Lapworth never saw their 'new' Starfish Bed. However, we consider that this is a slight misapprehension and agree with Harper (*ibid*) that the Gray's re-discovered the Starfish Bed and were probably the first to collect such material *in situ*. The general photograph of Mrs Gray at the Starfish Bed locality [Fig. 2, p. 176] shows a considerable exposure of rock, with the Starfish Bed near the piece of newspaper at the top. The Starfish Bed is the hardest rock available for repairing a drystone dyke and it is very likely that it would have been quarried here.

Lapworth's short faunal list is in accordance with the belief that only one Starfish Bed locality is involved. However, Harper endeavoured to establish the occurrence of the Bed at its type locality over several years and in 1978 successfully located three fossiliferous sandstone beds, which in part substantiated Begg's documentation (1946) of several fossiliferous units at this classic site. Harper concluded (1982a: 31) that the lowest bed corresponded with the original Starfish Bed as its lithology and fauna was virtually identical with material in museum collections. The excellence of preservation at all three levels was unusual with most of the fossils being complete and breakage, or wear almost negligible. He concluded that each bed had been deposited in slightly different conditions on the indications of their faunal composition and agreed in part with the opinions of Goldring and Stephenson (1972) but felt that there was no strong evidence to deny that rapid entombment of the fossils followed sudden downslope movement.

Examination of current faunal lists reveals that a wealth of new invertebrate forms have been described from this Bed since Mrs Gray provided Nicholson & Etheridge with two new Star-fish (1879: 318)⁹². Collecting proceeded rapidly and her correspondence with Bather and other palaeontologists continued in earnest to ensure that the exceptionally large collections resulting from the relentless activity of the Gray family at this locality were dealt with. [Gregory originally undertook to deal with the interesting starfish and Bather requested the crinoids]. She herself expressed amazement in a letter to Bather (12 March 1914): 'I seem to have sent [you] an astonishing number of specimens from the small Starfish bed.'

James Begg, a local property agent, magistrate and a renowned amateur fossil collector, has related how the Grays regularly covered up the exposure of the Starfish bed with rubble before they left the site each day, in an effort to conceal the exposure from others. Begg obtained the assistance of a local poacher (and part-time miner) Tom Mactaggart, who lived close by at New Dailly, to enable him to discover the site of the bed and reach it at an un-worked level six feet deeper than the area cleared by the Gray family.

The Starfish Bed at Threave Glen (NS 250037), now included in the Upper Drummuck



Group is considered to be of Rawtheyan age (Williams *et al*, 1972). It has proved to be the most productive locality in the Girvan District and this importance has led to its registration as a site of Special Scientific Importance. Yet, information on the fauna is insufficient to permit a succinct appraisal; trilobites are particularly abundant and together with brachiopods numerically dominate the fauna, but bellerophonitids may locally dominate the rich shelly fauna (Harper, *ibid*: 32). Regrettably, in common with much of the other molluscan material in the Gray Collection, these taxa need further systematic treatment.

8. CONCLUSIONS

The importance of the Girvan fossils for understanding Ordovician geology and the evolution of many invertebrate phyla, in addition to other palaeontological aspects, is widely accepted. Yet, the significance of the Girvan material would certainly not have been apparent at the time Mrs Gray began to collect. Why did she collect? It would be interesting, at the very least, to know the answer to that question. We suspect that she had several reasons and that these changed and developed over the years. Unfortunately, as no member of the Gray family kept a journal, and their surviving correspondence is essentially concerned with practical matters concerning the use of the collection, these cannot be verified. Occasional glimpses of Mrs Gray's attitude can be obtained from terse comments in her letters to Bather, or Davidson. While the much later accounts of the family's activities over the years, provided by Alice Gray, yield more tangible evidence.

In part, Mrs Gray's fossil collecting probably arose from her father's interest in local natural history; her own activities certainly increased after meeting Robert Gray another naturalist, but it is difficult to avoid the assumption that initially there would probably have been no real purpose to their collecting, other than providing themselves with a pleasant pastime. Many years later she acknowledged that such collecting had given her 'lifelong pleasure'.

The Gray family were fortunate, firstly, in that their collecting interest coincided with [and possibly stemmed from?] the establishment of the Natural History Society in Glasgow. Then, secondly, through the encouragement of its Secretary, Mr John Young and his contacts, their collection was utilised by Thomas Davidson. As a result, Mrs Gray was immediately provided with a particular objective and could contribute to the development of scientific knowledge. It would appear from the records that Davidson

Various Ordovician invertebrate fossils from localities near Girvan, Ayrshire in the Mrs Robert Gray Collection purchased in 1920.

1. Bivalve: *Cuneamya grandis* (Hind, 1910). L 49886, internal mould $\times 1$ (the external impressions of both valves are also preserved); Upper Ordovician, Starfish Bed, Drummuck Group, Thraive Glen.
2. Gastropod: '*Loxonema*' *grayianum* (Longstaff). Holotype G 43539 $\times 2$; Mulloch Hill.
3. Brachiopod: *Fardenia* (*Fardenia*) *columbana* (Reed). Lectotype B 72928, brachial valve, $\times 2$ approx; Lwr. Llandovery, Mulloch Hill Quarry [= Rough Neuk].
4. Gastropod: *Cyclonema crebricostata*. G 47843 $\times 1$; Upper Ordovician, Whitehouse Gp., Shalloch Mill.
5. A biserial Graptolite: *Orthograptus truncatus* var. *intermedius*. H 1915 $\times 2$; Llandeilo, Lwr. Ordovician, Pinmore Cutting, S.E. of Girvan.
6. Brachiopod: *Fardenia* (*Saughina*) *pertinax* (Reed). B 72948 $\times 1.5$; Middle Llandovery, Woodland Point.

kept of his correspondence that he provided no particular direction to her collecting activities, but dealt with whatever was found. However, anything that was thought to be unusual or rare by either party, obviously led to particular use of Mrs Gray's 'good discriminating eye' on her next foray!

The unusual circumstances, which enabled Davidson to concentrate on his brachiopod research, possibly influenced Mrs Gray's understanding of the nature of such work. Subsequently, when allowing her material to be used by specialists such as Bather, or Lapworth, who had other tasks to perform, she frequently felt that they took an excessive amount of time to complete their research. Her view was also influenced by the fact that two other specialists, Mrs Longstaff and F. R. C. Reed, who also dealt with the Gray material, were able to determine the use of their own time and returned the fossils they examined quickly.

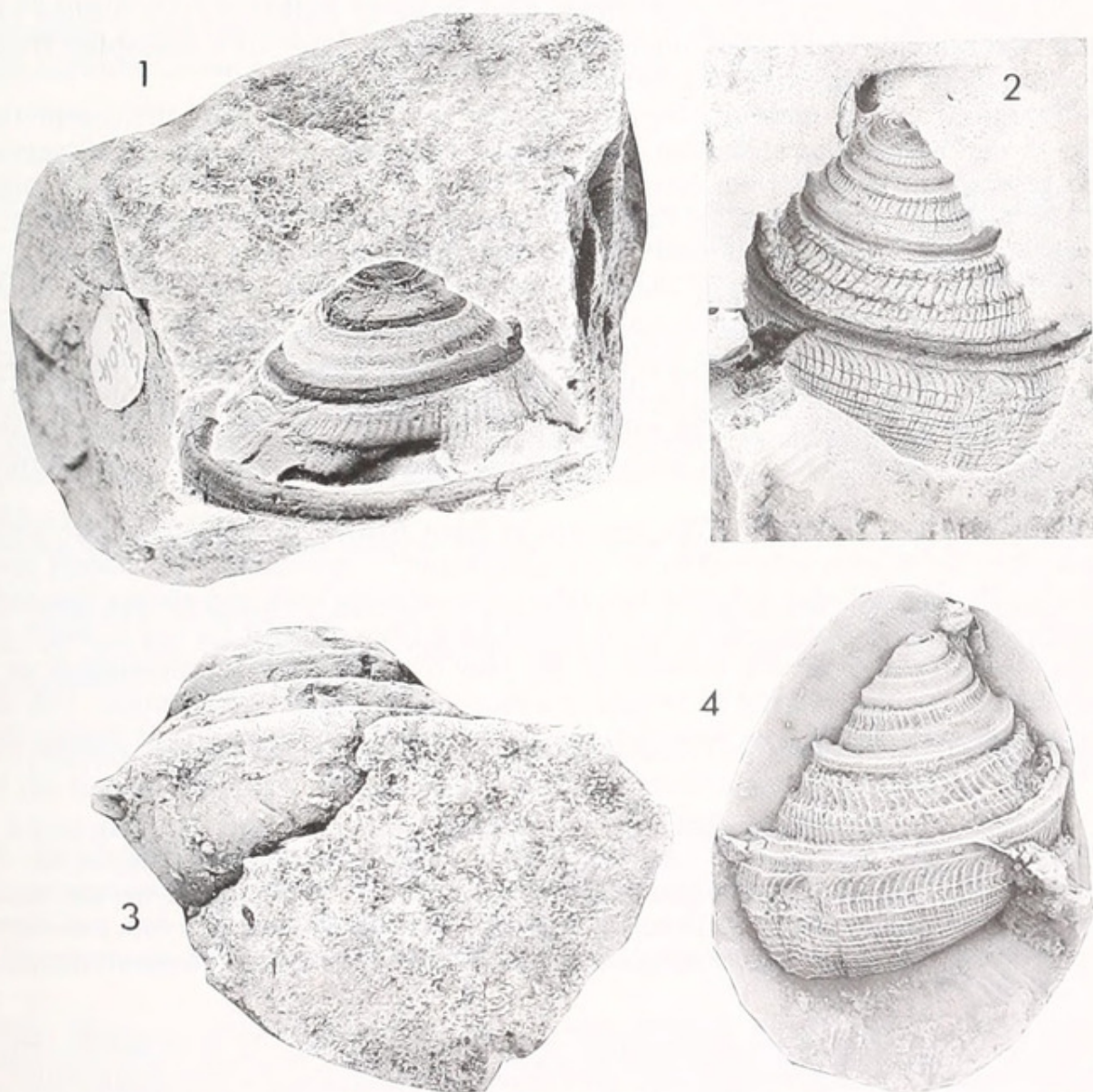
Through her contact with the needs of these workers, and her continuing field experience, Mrs Gray and the various members of her family were able to increase their knowledge of the various fossils they collected. Lapworth's field work resolving the Girvan succession undoubtedly provided her with useful experience and insight as to the significance of '**her fossils**' at an opportune moment. Subsequently, the long association with Bather's work on various fossil echinodermata provided the necessary continuation of purpose and contact, even though ultimately it may not have been particularly productive for either party with regard to their original objectives. However, this particular link provided the majority of the other specialists who worked upon Mrs Gray's material and probably led to the acquisition of her third and major collection by the British Museum (Natural History).

In our view, the reasons that Mrs Gray and eventually her daughters collected the Girvan fossils, developed over the years. As discussed above, Mrs Gray initially took an interest partly through a family background of local natural history and the fact that it gave her an interesting occupation. Indeed, there is no real indication as to the necessity of her becoming involved in the more practical duties of house-keeping, or whether she was able to avoid such tasks by her fossil collecting activities⁹³. Once becoming involved in assisting specialists, an interest and awareness of the nature of fossil species led to objectives of extending faunal lists, discovering new species and⁹⁴ establishing occurrences. Her letters to Woodward (20 May 1914; 21 February 1920) emphasize the number of different species, new species, rare species, and larger, or finer specimens present in the Gray collection.

Eventually having acquired the necessary practical, technical, collecting and storing skills their material became extremely useful and unique. Ultimately, as Alice Gray recounted, the annual summer visits to relatives at Girvan were customarily spent collecting fossils — it had become a family tradition! There is even a suggestion that it had even become compulsive—almost an addiction—for immediately after each of the Gray collections had been disposed of another was begun.

Apart from her interest in fossils, we have little real knowledge of Mrs Gray's life. There is no information on the style in which the family lived; whether she had to carry out the normal tasks involved in bringing them up, or whether many of these duties were achieved by servants? The factual letters that survive provide no indication of other interests, or her opinions on events of the period. Although the difficulties the Gray family experienced during the Great War are briefly mentioned, these are relatively minor and there is no reference to the more significant events of those years and their consequences. The single surviving draft of a letter to another member of the Gray family in Australia⁹⁵ reveals that Elizabeth Gray was delighted to receive letters herself, but that: 'I always seem to find something to do—or take a rest!' and seldom wrote any herself. Even much of that letter is concerned with the Gray Collection and her obituary notice apparently confirms that all her leisure time, consistent with her limited domestic duties, was spent in dealing with her fossils.

At an early stage, Mrs Gray decided that she did not wish to acquire the necessary scientific knowledge to describe some of her own fossil material, but felt that her best role was to provide specimens for others⁹⁶. However, her curiosity frequently compelled her to seek advice, or references to fossil organisms to improve her understanding⁹⁷ and on a few occasions to visit museums in order to examine comparative material⁹⁸. At one time she even enquired as to the possibility of borrowing specimens from the Barrande collection herself. Several of her letters to Bather indicate that she had acquired considerable knowledge concerning the relationships of her material and could understand the problems they presented⁹⁹ and realised the significance of slight differences in ornament and size¹⁰⁰. It would also appear that Mrs Gray had an awareness of brachiopod variability for many of the forms that she sent to Davidson have now been recognised as belonging to several different species and her original queries vindicated¹⁰¹.



Part & counterpart examples of '*Lophospira*' *thraivensis* Longstaff from the Starfish Bed, Threave Glen, Girvan, Ayrshire, in the Gray Collection, 1920.

1. Block with External mould, G 25404 $\times$ 2.5;
3. its counterpart internal mould;
2. Another external mould, G 25407 $\times$ 2;
4. a latex pull taken from this mould showing shape and ornament of the shell, $\times$ 2.

In common with the layman, Mrs Gray had little real idea of the technical skills needed to deal with her material, or the time that such preparation required; or the difficulties involved in the illustration of such material. The inadequacy of the materials and equipment available at that period¹⁰² were another factor—this is indicated by the subsequent re-interpretation of many Girvan taxa when techniques improved¹⁰³. Although her letters indicate some awareness of these problems, the initial objective of having her material identified, ultimately became something of an obsession, and influenced her relationships with the users of the collection. In later life, Mrs Gray understandably became even more concerned to see the results of 'her lifetime's work' and was particularly exasperated that some of the earliest projects—those begun by Bather on the crinoids and starfish—were not completed. Her fixation leading to her comment (28 November 1912): 'surely you have no other material with a prior claim to mine', is excusable in view of her considerable anxiety expressed in a later letter (18 March 1913). According to Alice Gray (5 December 1937) the only letters of a forceful nature that Mrs Gray ever wrote, were those to Bather on this subject of 'her cystids and crinoids', and some others concerning the 'mis-use' of brachiopods from her collection by O. T. Jones without her sanction.

Although Mrs Gray undoubtedly obtained her main pleasure from the completion of work on material in her collection, she always professed to enjoy being of 'service to many geologists'. However her constant assertion as to ownership of the fossils, suggests that she did not fully ascribe to the view of other more philanthropic collectors, who recognised that their specimens really belonged to science. (see letters from W. R. Billings to Bather during the same period)¹⁰⁴. Perhaps, it should also be asked whether it is right for one individual to occupy all the attentions of the few available specialist workers in a particular science at the same time? particularly as the object was as much for her own satisfaction as the benefit to science. Still in mitigation, it has to be acknowledged that Mrs Gray determinedly set out to ensure that the material should ultimately be available in the principal institutions holding similar palaeontological collections.

Throughout her life, Mrs Gray appears to have had a close involvement with her fossils, they are always referred to as 'my' specimens¹⁰⁵, several had pet names and she undoubtedly worried about them when they were away on loan and always insisted that everything should be returned to her. It would have been difficult for her to insist on the return of type and figured specimens to-day, for the ICZN Recommendation on type specimens is that they should be lodged in a recognised Research institution. The extent of her personal concern was demonstrated by an incident that occurred during the 1st World War, when:

During a Zeppelin raid on Edinburgh . . . we spent most of the night in a bank on the opposite side of George St. — as being a much stronger building than the house we live in, which is one of the original houses and dates from 1790 — My mother put into a large handbag as many of her very best Cystids as it would hold and sat with it on her lap for 3 to 4 hours until the danger was past. She had some anxious moments during the War¹⁰⁶.

This trait became more accentuated as she grew older. It is possible that this possessiveness in the later years, may have reflected a realisation of the commercial value of her collection. Mrs Gray had certainly understood the significance of her collection when she first offered the trilobites to the BMNH in 1914 and the various users had always commented on the unique contribution it had made to their scientific work. Later, when the sale of the entire collection was negotiated in 1920, she was thinking in terms of obtaining a reasonable return for all her years of collecting the material. However, once the sum had been decided her attempt to have part paid to her daughters indicates that

she also had their welfare in mind. This is confirmed by the Fund that was set up after investing the money on their behalf.

Whatever her motives, and despite some understandable quirks, Mrs Elizabeth Gray's devotion to discovering the fossil faunas of the Lower Palaeozoic rocks of the Girvan District made a substantial contribution to British geology. Her determination to ensure that the material was adequately described by the most competent persons available was an even greater achievement. She completed the task she had undertaken by ensuring that the various collections she had accumulated were safely housed in the most reputable establishments in existence. Their value is exemplified by the comment of one of to-day's specialists: 'Anyone wanting to work on Ordovician faunas is compelled to use the Gray Collection!'

It is unlikely that Mrs Gray had set out to disprove the widely held belief of the early part of the nineteenth-century that '*Scotland was . . . poor in organic remains*'¹⁰⁷, but she certainly ensured that no one could ever assert so again! Her achievement is commemorated by the many Palaeozoic fossils that either bear her own surname, or that of one of the localities in the Girvan area, while Bather's use of *elizae* for the type species of the bizarre cornute *Cothurnocystis* makes a more personal tribute to her zeal¹⁰⁸.

9. ACKNOWLEDGEMENTS

Inevitably, in a collaborative study that has been pursued over several years, its authors will have incurred obligations to many individuals for help, advice and information. Our appreciation and gratitude is owed to many of our colleagues at the various institutions in which we have worked, or whose resources we have used. We trust that they will accept this general acknowledgement of their help for a complete list would only antagonise our editors.

Among those who services deserve special mention are:

at the Sedgwick Museum, Cambridge, Professor H. Whittington, David Price and the late A. G. 'Bertie' Brighton, who contributed details of material and the Cowper Reed reminiscences;

Isles Strachan, Department of Geology, Birmingham University, who kindly investigated the Lapworth papers and provided confirmation of material in the BMNH;

Ian Rolfe of the Royal Scottish Museum, Edinburgh for his encouragement and interest in the project over the years, and who, together with Bill Baird, provided information on Robert Gray and obtained illustrations of the George Street house; the use of this print with the permission of the Office of Ancient Monuments is also gratefully acknowledged;

Daniella Shippey, Edinburgh, who carried out various aspects of the genealogical research into the Gray and Anderson families on our behalf and has been awaiting this paper to satisfy the interest that aroused;

Dr J. A. Gibson (Scottish Natural History Library) for discussing the value of Robert Gray's contribution to Scottish ornithology; and finally,

Mr Ilgars Steins, ROM, Toronto for preparing the Girvan locality map.

The usual generous assistance provided by the staff of various units in the British Museum (Natural History) deserves more than customary recognition. We are particularly indebted to those in the Palaeontology Library, who allowed us access to the Gray family Archive held there; to friends in the Photographic Studio, who contended with assorted whims over possible illustrations, and produced admirable results from poor beginnings; while our fellow invertebrate palaeontologists, answered our Gray-related questions and assisted with their own literature resources and field knowledge. From these Dick Jefferies, is owed a greater debt, for he willingly commented on a later version of the manuscript and augmented our knowledge of the bizarre groups collected by Mrs Gray on which he is the acknowledged specialist; and equally the involvement of Sam Morris with the work of each of us requires similar recognition. Finally, we must express our thanks to Rex Banks, Editor of the Historical Series, who was prepared to accommodate the paper from the first and quietly ensured its realisation and to the Keeper of Palaeontology, Dr L. R. M. Cocks, without whose permission the project could not have even begun, for his contribution and approval.

10. FOOTNOTES

1. INTRODUCTION

1. Letter from Alice Gray to Dr Bather (14 July 1932) concerning a biography of her mother:
Mr Balsillie required an account of her life rather than an appreciation of her work. The family [therefore] were the most appropriate people to write such a notice.
2. **Wilfred Norman Edwards** (1890–1956). The first palaeobotanist to be appointed by BMNH (1913). His career was interrupted by both World Wars, but in the interval Edwards organised the extensive collection of fossil plant remains and gained an encyclopaedic knowledge of such forms and their literature.
W. N. Edwards was appointed Deputy-Keeper in 1931 and had succeeded Dr W. D. Lang as Keeper in 1938—virtually the time his correspondence with Alice Gray began. His plans for the reconstruction of the Museum's exhibition galleries were thwarted by the 2nd World War and he was made responsible for the evacuation of all the collections. After 1945, he then had to arrange for their return and the repair of the damage suffered by the buildings.
Other refs. see: *Jl. Soc. Biblphy. Nat. Hist.* 3: 231–237; Stearn (1981: 241–2).
3. It is thought that financial reasons were partly the cause in the case of the first; and the Second World War prevented completion of the later attempt as Edwards was made responsible for the evacuation of the Museum's collections in 1941–42.
4. see W. N. Edwards / Alice Gray Correspondence:
WNE letters dated—14/11/38; 31/5/40; 19/8/41; 7/9/41.
AG letters—21/11/38; 21/5/40; 2/6/40; 15/6/41; 24/8/41.

2. BIOGRAPHY

5. See letter from Alice Gray 14 July 1932 for reference to Mr Balsillie. [MSS (c.1938) in Gray Correspondence, Palaeontology Library, BMNH].
6. *Pinnacopora andersoni*, Nicholson & Etheridge, 1880: 273, pl. 17, fig. 6, from Woodland Point named in 1880 'after the late Mr Thomas Anderson of Girvan, who was well known to Scotch geologists as having made extensive collections of the fossils of the Girvan area.'
7. **Robert Gray** (1826–1887). For biographical references see *DNB*, 23: 19; *Proc. Roy. Soc. Edinburgh.*, 15: 1–5; *Proc. nat. hist. Soc., Glasgow*, 2 (N.S.) 1888: xxii–xxiii.

8. Lectures to Ladies—Session 1869: Introductory Lectures to the classes of English Literature & Physical Geography given in the Corporation Rooms, Glasgow by John Nichol, BA and John Young, MD. James MacLehose, Glasgow, 1869.
9. 59, George Street. This property is situated in the centre of the city in a street that was once said 'to have no rival in the world' as its breadth (115 ft.), space and magnificent vista was considered to be 'unparalleled'. During the 18th, 19th and early 20th centuries it was considered to be a prime residential area and also contained the offices and principal premises of Scotland's insurance and banking businesses. (see James Grant, 1880–3: p. 139 in *Old and New Edinburgh: Its History, its People, and its places*. Cassell & Co. Ltd., Edinburgh, Vol. 2 384 pp.

A letter of Alice Gray (10 October 1938) mentions that it was one of the original houses and probably dated from 1790. The first use of this as an address occurs on Mrs Gray's first letter to Bather dated 5 October 1892. The solicitors of Miss Edith M. H. Gray sold the house sometime during 1945; the Geol. Survey were able to gain access in March 1945 to pack the remaining fossil material. The house is now occupied by the Dunfermline Building Society (59a) and by T. & T. Clark, Publishers and the premises have obviously been considerably altered to permit present usage.

10. The 1891 census return records Mary and Alice as artists, Elizabeth as a daily governess, Edith as a teacher of music, and Robert as an electrical engineer's apprentice; there was also one resident general domestic servant, Edinburgh-born aged 22.

3. THE GRAY COLLECTION

11. Robert Gray (letter 17 September 1865). Balclatchie, 100 yds below Penwhapple bridge (Mrs Gray has been there daily for months); Craighead quarry long exhausted; Penkill the spot opened first by myself.
12. Davidson (12 September 1879) records a letter from Mrs Gray that offers a few brachiopods that she had collected from Doularg Barr, a locality that she had not previously examined.
13. Number of localities listed in Lapworth = 23; by Mrs Gray = 32; and by Nicholson & Etheridge = 40, but only 19 of these were included in the lists of the two others.
14. These are in the Map Room of the Palaeontology Library in a large folio labelled 'Maps of Girvan District Showing the Localities at which Mrs Robert Gray Collected Fossils'; Maps with annotations by Alice Gray, 1937.

Include Ayrshire sheets of the 6" Ord. Survey, 1910 Edition: L SW; L NW; L NE; LV NE; LV SW & SE; LVI NW; LVI SW; LVI SE; LVI NE; LXII NW; LXVI NW.

15. Penkill. This is the locality that was alleged to have been 'Lapworth's mistake'. The locality map prepared by Alice Gray bears a note:

The rock showed on the E. bank of the Penkill Burn at this spot, where the burn is little larger than a field drain. For many years locality invisible because grass and soil have covered over the small fragment of rock that could once be seen.

16. One of the earliest references to Mrs Gray's material in Davidson's Notebooks occurs under his entry for *Lingula ramsayi*: 'among a large number of examples collected by Mrs Gray'. Another is found under *Triplesia Grayi*: 'Mrs Gray considers this an uncommon species'.
17. Constant Prevost (1787–1856), the first Professor of Geology at the Sorbonne, 1831; his Lyellian approach to geology placed him in an unorthodox position within French geology; he was also among the first to stress the ecological significance of fossils.
see *Dict. Sci. Biogr.* 11: 1974: 133–4.
18. Leopold von Buch, German geologist (1774–1853), involved in all aspects of geology; he published the first geological map of Germany and was also responsible for distinguishing ammonites from nautiloids.
see *Dict. Sci. Biogr.* 2, 1970: 552–7.
19. —Yet, there is little evidence that such national fervour influenced Mrs Gray, although on one occasion (1 December 1910) she did comment to Dr Bather:

Pardon me for saying that I would prefer to see . . . your investigations on British specimens rather than on Foreign!

— but that was solely due to her self-interest in getting her own material dealt with.

20. There are twenty-eight notebooks containing records of Davidson's correspondence between 1 January 1847 and 19 May 1884 in the Archive & MSS collections of the Palaeontology Library, BMNH.
see List with dates in Appendix 1 p. 241. Dr C. H. Brunton and R. J. Cleevely intend to compile and publish an Index to these in the near future.
21. Alice Gray (31 March 1938) distinguished the contribution of the two Youngs:
Professor John Young (1835–1902). Geological Survey of Scotland 1861–66; Professor of Natural History at Glasgow University 1866–1902; Keeper of the Hunterian Museum. In 1864, when crossing Girvan Water, he broke his knee after slipping on a boulder and as a result remained slightly lame throughout his life.
Mr John Young (1823–1900). Assistant Keeper of Hunterian Museum 1859 to 1899. For biographical notices of both see p 210–12 & p 183–87 in MacNair & Mort (1908) *History of the Geological Society of Glasgow*.
22. For biographical references see: *Proc. Geol. Assoc., London*, **50** 1939: 235–286, bibliogr., portr, pls. 19 & 20; *Obit. Not. Proc. Roy. Soc., London.*, Ser. **B 92**, 1921: xxxi–xl and others given in Cleevely, 1983: 179.
23. Lapworth letters re Sale of Gray Collection: 12 April 1914; 10 June 1914.
24. Letters concerning missing graptolites: Mrs Gray: 9 February 1917; 20 September 1919. C. Lapworth: 20 November 1898; 29 November 1899; 12 February 1917; 24 September 1919; 5 November 1919. Prof. Boulton: 12 October 1921; 8 November 1921.
25. H. A. Nicholson & R. Etheridge (1878–1880). *A Monograph of the Silurian Fossils of the Girvan District in Ayrshire, with special reference to those contained in the 'Gray Collection'*. see Bibliography.
26. Benton (1979) listed all the species described in their monograph, but some of the species of *grayi* listed in the work had been named earlier by other workers in recognition of John Gray of Hagley Hall, nr. Stourbridge, who had made extensive collections from the Wenlock Limestone.
27. **Henry Woodward** (1832–1921). Keeper of Geology 1880–1901; his chief contribution was on Fossil Crustacea; for biographical refs. see Cleevely (1983: 316–17).
28. **T. Rupert Jones** (1819–1911). Palaeontologist who specialized in Entomostraca and Foraminifera; *Q. Jl. geol. Soc.*, Lond. **68**, 1912: lviii–lxi; list of other biographical refs. in Cleevely (1983: 166); a letter to Bather from W. R. Billings of Ottawa (26 June 1891) refers to that 'testy old Palaeontologist T. Rupert Jones!'.
29. See letters from Reed to FAB re study of trilobites in BMNH FR Cowper Reed Correspondence file: 21 August 1901; and Mrs Gray to FAB 11 April 1904.
30. See BMNH Correspondence Archive, F. R. C. Reed file: 35 letters from Reed between 17/12/1892 to 15/3/1920 & 17 letters from Bather in reply 22/7/1904 to 15/12/1925.
31. **John Walter Gregory** (27 January 1864–2 June 1932), FRS, FGS. An able and versatile geologist and palaeontologist, who joined the staff of the BMNH with Bather in 1887. Developed a keen interest in exploration following his immediate involvement in Museum expeditions (1887) and effectively became an explorer-geologist visiting most parts of the world. Resigned from BMNH when appointed to the Chair of Geology in Melbourne in 1901, but returned to UK in 1904 when given the same position at the new Glasgow University. *Obit. Not. Fell. Roy. Soc.*, **1**, 1932: 53–59.
32. In his review of Schuchert's revision of the Palaeozoic Stellerioidea, Bather (1915: 425) commented that 'this book is not what Prof. Schuchert intended when he began' and reflected

- something of his own feelings with 'Congratulations . . . on having **at last** got this laborious and valuable piece of work *into the world!*'.
33. It may have been quite coincidental that Professor Schuchert mentioned the difficulties of identifying cystids when he wrote to Mrs Gray on 31 March 1911—but this was the period of the Gray/Bather/Reed controversy. Schuchert's complaint that his museum duties interfered with his research and that as a result, instead of a monograph, he had had only sufficient time to prepare descriptions of the genera and their species, ought to have provided some support for Bather's position.
34. **W. K. Spencer** see *Biogr. Mem. Fell. Roy. Soc., Lond.* **2**, 1956: 291–9; and Cleavelly, 1983: 273.
35. **Wheelton Hind** FGS (1860–21 June 1920). Eminent medical practitioner, who lived at Stoke-on-Trent, Staffs. His research un-ravelled the succession of Carboniferous rocks in North Staffs. and produced the standard monograph on the *British Carboniferous Lamellibranchia* (1896–1905). *Q.Jl. geol. Soc., Lond.* **73**, 1917: lvii–xlix; **77**, 1921: lxviii–lxix.
36. **T. H. Withers**. BMNH: Boy Attendant, 1898; Assistant, 1925; Curator, Fossil Cirripedia 1925–44. *Proc. Geol. Soc. Lond.*, No. 1515, 1954: cxliii–cxliv.
37. Withers declined to deal with further machaeridian specimens offered by Alice Gray (14 May 1934) since he had to devote all his time to the preparation of a *Catalogue of Cretaceous Cirripedia*.
38. For some reason, Bather always appears to have been ultra critical of J. R. Gregory's nomenclature and frequently expressed these views in print beginning with a letter (1897: 381), see also a paper on *Eocidaris* (1909). This antipathy towards Gregory may have been due to his sudden emigration to Australia in 1901, having spent much of his tenure at the BMNH on field-work, leaving Bather with additional responsibilities. However, it was very probably the result of Gregory's careless scientific work!
39. Dr Bather makes occasional references to seeing Mrs Gray on his visits to Edinburgh; see reference to his son's pleasure at Mrs Gray's interest in 'Rugger' (letters September 1921).

4. BATHER

40. W. D. Lang. 1934. Francis Arthur Bather (1863–1934).
Obit Not. Roy. Soc., London, No. **3**: 303–314;
1934. Dr. F. A. Bather, FRS.
Nature, **133**, (31 March 1934): 485–86
41. In addition of Lang's references, there are indications of Bather's relationship with his staff and other professional colleagues in the various contributions made to the tribute published in the *Museums Journal*, **34**: 41–45.
42. P. E. Raymond, 1935. Memorial of F. A. BATHER. *Proc. Geol. Soc. Amer.* 1934: 173–186, portr., bibliogr.
43. Bert Hansen in his article in the *Dictionary of Scientific Biography* **2**: 507 has emphasized Bather's use of the natural world to his fossil studies.
44. Bibliography: the only published bibliography Raymond (1935) is incomplete; this had been prepared by Withers at Raymond's request. Apparently, Bather had distributed his own list in 1915, but did not extend this further. My own [RJC] list comprises **258** publications: 18 of which were reviews and only 7 of which dealt with Gray material. It is worth noting that Bather did not publish anything at all in 1921, the year he was dealing with the acquisition of Mrs Gray's material.

On Echinodermata	= 43	Stratigraphy	= 9
Crinoids	= 67	Museology/Techniques etc.	= 42
Edrioasteroids	= 10	Taxonomy/Nomenclature	= 19
Cystoids	= 7		—
	—		70
	127		—
		Obituaries	= 8
Other Phylla (mainly Palaeozoic)		Bibliography	= 7
	= 46		—
	—		15
	173		—
	—		—

45. Although Bather made frequent mention of his involvement in producing a Catalogue of the Cystoids & Crinoids for the BM material, this was never completed. The only evidence for this work is a series of printed/mss index cards now dispersed throughout the main reference collections of these groups in the Dept. of Palaeontology.
46. Aware of his reduced vigour, and knowing the customary slow rate of progress within the Museum, Bather felt that he would be able to achieve very little in his remaining four years before retirement.
47. Bather's involvement in local affairs is reported in his obituary published in the *Wimbledon Borough News*, 23 March 1934.
48. See Letters from Margaret Grant dated 9 January 1935 & 12 January 1935. She refers to 'that Lonely Intelligence' and also to the fact that he was known to them as 'the Dominic'.

5. BATHER/GRAY CORRESPONDENCE

49. Her daughter Alice, on the other hand, understood that Bather's museum duties prevented him from attending to their queries; see her letter of 22nd Feb. 1925.
50. Bather (16 January 1899) 'Your two specimens arrived safely ... but there was **no light** available for their examination till this morning.'
Stearn (1981: 213) quoted Riley's account of conditions at the BMNH in 1911, which mentioned that Electricity had been installed in the office studies in 1906.
51. A. S. Woodward, *History of the Collections in the BMNH*, p. ii of the Preface and the MSS. Annual Report on Bather's work for 1904 indicate that he was involved in its compilation during this period. The correspondence file with FRC Reed also shows that he was also engaged in dealing with material from Burma (at least 16 letters).
52. Starfish Bed. 'encouragement to preserve every fragment' Bather letter (4 October 1907)
53. It must be realised that 'cystids' for Bather at that time would have included forms that would now no longer be called cystids, or cystoids, and have since been referred to chordates (see discussion of Jefferies p. 218).
54. This expression '*in fear & trembling*' occurs in another letter (20 January 1897) written a few years earlier by Mary Kingsley to Albert Günther, a former Keeper of Zoology at the BMNH, when she submitted an advance copy of her book *Travels in West Africa* seeking a positive verdict for its publication.
55. Bather (1908: 76) referred to another aspect of this problem:
I am constantly favoured by correspondents with specimens for which they desire a name. Unfortunately, ... it is impossible to name them without spending more time in their preparation than we ... can spare! I ... point out ... that it is our duty ... to name and arrange the specimens already in the museum. Consequently, unless our correspondents give us all possible help in the preliminary preparation of their specimens, they cannot hope for very satisfactory replies.
As one of the more enlightened palaeontologists of his time, Bather went on to vent his exasperation at those who 'seem only anxious to load science with a new species and a new name ... they do not trouble about the lessons the fossil can teach!'
56. This is a reference to the monograph *Stammesgeschichte der Pelmatozoen. Erster Band. Thecoidea und Cystoidea*. 1899: x = 442 pp., 18 pls. published in Berlin by Otto Jaekel as part of his synthesis of existing knowledge of fossil Crinoidea.
Jaekel, a vertebrate palaeontologist, became Professor at Berlin (1890–1903), Vienna (1903), Greifswald (1904–28 and Pekin (1928). The 1899 work on the Cystoids is one of his most significant contributions to palaeontology. Apparently, Jaekel's work was either extremely thorough and of high quality, or else hastily put together, not particularly clear, superficial and of little real value. Although even these cursory papers have value, for in one he set up the Class Carpoidea (pers. commun. Dr R. P. S. Jefferies).
57. Part of Bather's reply to the Geological Society when presented with their Lyell Medal, *Proc. Geol. Soc.*, Lond. **67** (1911): xlv.

58. On the basis of their correspondence between 1892–1925, Bather and Reed maintained a friendly working relationship, assisting one another with identifications, providing material for research and collaborating in the preparation of papers.
59. In addition to the details provided by Stearn, Dr Bather makes several references to the situation in his correspondence, eg. see letters in Gray Correspondence of January 1918.
60. This is presumed to be a reference to the specimen of *Archaeopteryx lithographica* Meyer found in the Upper Jurassic Lithographic Limestone of a quarry near Pappenheim in Bavaria. It was purchased by the Museum from Dr Karl Häberlein in 1862 together with other material in his collection. As an 'intermediate' between reptiles and birds this fossil has been the subject of repeated investigation, and has recently been the subject of a wholly unjustified accusation of 'fakery'.
- An exhibition at the BMNH during 1987–88 demonstrated the scientific evidence for its authenticity, showing that its essentially reptilian skeleton had several avian features as well as the distinct impressions of feathers. (see Ostrom, J. H., 1984 *In: Proceedings of the International Archaeopteryx Conference*, Eichstatt, 1984: pp 9–19).
61. Air-raids: FRC Reed in a letter to Bather (15 September 1917) asked that some figured cystids belonging to the Geological Survey of India should be insured with Lloyds for £250 against the 'risk of air-craft' whilst they are at the BMNH; he explains that he always takes out insurance against fire & now air-craft when he borrows other people's fossils. After being told by the Director (26 September) that no funds were available for such a course, Bather eventually returned the specimens (26 November) to the relative safety of Cambridge.

6. ACQUISITION

62. Donations of 1867, 1868 & 1869 recorded in Hunterian Museum register GU Catalogue A numbers 30–89; other donations made in 1870, 1872 and 1873.
63. Smith-Woodward had annotated her previous letter with the comment 'Trustees . . . will not consider it until after the war—so time to think over proposal'.
64. The basis of Dr. Bather's calculation as to the value of material in the Gray Collection was as follows:
- | | |
|------------------------------------|-----------|
| Type material of New species | at £1 |
| Type specimens of New Varieties | @ 0–10–0 |
| Figured specimens | @ 0– 5–0 |
| Specimens selected as Gray Coll'n | @ 2–0 |
| according to the character | @ 1–6 |
| of the group | @ 1–0 |
| Duplicate/or Un-examined specimens | @ 1–0 |
| | or @ 0–6d |
65. One wonders how much money the Grays would have spent travelling to Girvan over the years and in staying with relatives in the area?
66. This refers to W. Lewis Abbott material from the Ightham Fissure pres'd by Sir H. Howarth to British Museum.
67. The Gray's kept a detailed record of the despatch of each consignment and the cost of carriage, which was used to settle their account. 68 boxes were despatched to the BMNH according to their records. This book was presented to the BMNH by Alice Gray (2 June 1940) and is now kept with the Gray Mss in the Palaeontology Library. In this context, it should be noted that the BMNH paid for the carriage of all the material it acquired in 1920's, 1937 and 1945. The costs for the despatch of other material sent by the Gray family to various specialists over many years must also have amounted to a reasonable sum.
68. 1st payment of £850 received on 15 July 1920; 2nd payment of £518 (incl. carriage) on 10 March 1921; 3rd payment of £800 on 8 July 1921; final amount of £100 on 9 March 1922; with various amount for carriage ending with that on 24 March 1922.

69. W. K. Spencer apparently had seen all the starfish & echinoderm material; F. R. C. Reed had been sent any trilobites and brachiopods that members of the family thought were new; & Archie Lamont had looked over the gastropods.
70. Lang arranged (22 April 1937) for R. H. Spires and an assistant Mr Covington, to visit Edinburgh and pack the collection; Alice Gray (4 May 1937) wrote: '... packing completed with minimal inconvenience. Mr. Spires most kind & considerate'.
71. Sedgwick Museum, Cambridge. Donations made by Mrs Robert Grey: Trilobites in 1907; Brachiopods & Rostroconchs in 1908; Machaeridians in 1909; Hyolithids and Machaeridians in 1910. The BMNH presented duplicates of the algae *Mastopora fava* (Salter) in 1941.
72. Amongst the material presented in 1937 was at least one specimen mentioned by Reed much earlier—the only illaenid *librigena* from the Stinchar Limestone, Minuntion (Reed, 1904). This is of significance in extending the type series beyond that of the original purchase. [R. Tripp]
73. Letter from Davidson & Syme, Edinburgh (2 December 1944) to W. N. Edwards in E. H. Gray file.

7. GIRVAN FAUNA

74. Bluck (1985) considered the relationships of the Girvan sequence to the probable accretionary prism of the Southern Uplands in his examination of the tectonic history of the Caledonides in a wider context. *Scott J. Geol.* **21**: 437–464.
75. James Nichol (1844) *Guide to the Geology of Scotland*, Edinburgh. see p. 261 for list of seven species: 1 sponge, 3 brachiopods, 1 pteropod.
76. An anecdote told in a letter (To Fanny Hicks, 21 August 1848) concerning Sedgwick's visit in 1848, indicates that many of these specimens were gathered by a young girl, who had first shown them the quarry near Girvan, at a cost of 1d each, see Clark & McKenny Hughes, 1890 *The Life and Letters of the Rev'd. Adam Sedgwick*, Vol. 2: 145.
77. F. W. M'Coy.
1851. On some New Silurian Mollusca. Pt. 1. *Ann. Mag. nat. Hist.* **7**: 45–63. *Orthoceras politum* (M'Coy) from Glenwhapple; *Bellerophon subdecussatus* (M'Coy) from Mulloch; *Trochus Moorei* (M'Coy) from Dalquharran.
On some New Silurian Mollusca. Pt. 2. *Ann. Mag. nat. Hist.* **7**: 387–409. *Hemithyris angustifrons* (M'Coy)—Mulloch Hill; *H. nasuta* (M'Coy)—Craighead Quarry; *Orthisina scotica* (M'Coy)—Craighead; *Holopella cincta* (M'Coy)—Mulloch.
1852. On New lower Palaeozoic Mollusca. *Ann. Mag. nat. Hist.* **10**: 189–195 *Murchisonia cancellata* (M'Coy)—Mulloch; *M. simplex* (M'Coy)—Craighead; *Eccliomphalus scotica* (M'Coy)—Mulloch.
78. Sedgwick, A. & M'Coy, F. W. 1855. *A Synopsis of the Classification of the British Palaeozoic Rocks*, with a systematic description of the British Palaeozoic Fossils in the Geological Museum of the University of Cambridge.
79. J. W. Salter (1820–1869). Britain's leading Palaeozoic palaeontologist during his lifetime and a specialist on trilobites. He began his natural history career as an apprentice to James de Carle Sowerby—[and also married his daughter]. Salter also assisted both Murchison and Sedgwick and later trained the young Robert Etheridge.
Difficulties over his position and status, partly arising from family matters, his health and involvement with religion, led to his resignation from his position at the Geological Survey. (See Secord, J. A., 1985 *Spec. Publ. Soc. Hist. Nat. Hist.* **3**: 61–75)
80. Salter, J. W. 1855. List of some of the Silurian Fossils of Ayrshire. pp. 170–178 [17 brachiopods; 1 bivalve; 13 gastropods; 6 Cephalopoda] with Murchison, R. I. 'On the Silurian Rocks of the South of Scotland'. *Quart. Jl. geol. Soc.*, Lond. **7**: 139–169.
81. Of the earlier workers [= describers], it would appear that only Nicholson and Etheridge had ever visited the Girvan District to make their own collections and observations. Virtually all

post-1950 publications have been written by geologists with a good field knowledge of the area and its formations.

82. Rough estimates of the Total number of Girvan species at each phase are: 1st 'exploratory' phase = 40, [7; 34; 37 species]; 2nd 'accumulative/acquisitive' phase = 560 [see list in Peach & Horne]; 3rd 'interpretative' phase = c. 700.
83. To explain the presence of both internal and external moulds in many of these specimens, Goldring & Stephenson (1972) have suggested that several of the Girvan 'echinoderms' were sediment-eaters and that the distortion of the moulds was compatible with measurements made on the modern *Echinocardium cordatum* showing that 30% of its test is occupied by gut contents.
84. *Glyptocrinus globularis* N. & E. 1881.
85. Ramsbottom recorded the following species from the Girvan district: *A. thraivensis*, *A. drummockensis*, *C. heterobranchia*, *C. gracilis*, *D. granditubus*, *P. scoticus*, *Protaxocrinus girvanensis*, *M. cirrifer*, *X. multiramus*, *X. sp.*, *A. elevatus*, *D. craigheadensis*, *D. globularis*.
86. The term 'calcichordate' is now thought to be inappropriate (see Jefferies *et al* 1987: 432).
87. Letter 14 June 1912.
88. See p. 224 for an account of Mrs Gray's strong feelings for her cystids.
89. Girvan Rostroconch molluscs have been figured in Pojeta & Runnegar (1976: 54); no British author has dealt with the monoplacophorans from Girvan, although Hind and Reed did describe *Tryblidium* species as bivalves.
90. In his review of Ordovician pelecypods [= bivalves], Pojeta (1971) has explained that another reason is the mistaken belief that adequate material is not available, since the majority of Ordovician specimens are in the form of poorly preserved moulds and casts, which are only found on exposed limestone and sandstone surfaces. His review also provides other information on the motives and results of earlier workers on Palaeozoic bivalves.
91. Extract from Biography by Alice Gray [see Gray Correspondence, Vol. 1, 'letter' No. 23]:

The letter from my mother to Professor Lapworth (20 November 1898) and his reply (29 November 1898), are of importance because they show that the 'Starfish Bed' known to-day [c. 1938] is not the Starfish Bed described by him on p. 619 of the 'Girvan Succession'. I think I am correct in stating that Professor Lapworth did not visit the Girvan District after my mother found her 'Starfish Bed' and that he never saw her 'Starfish Bed'.

It ought, perhaps, to be placed on record that we, as a family, searched in vain for Professor Lapworth's Starfish Bed in 'an old quarry'; also that the owner of South Threave Farm at the time, Mr Paterson, did not know of any old quarry, on either his own property or on neighbouring land, answering to the description ... although he knew Prof. Lapworth and saw him occasionally when ... working ... the ... geology of the Girvan District.

Alice Gray also expressed doubts over any suggestion that nearby overgrown depressions could once have been Lapworth's 'quarry' for the family had frequently worked in that neighbourhood and would have found the site.
92. Reed's monograph on the Girvan trilobites (1903-6, 1914) and Bather's work on the Cystoids deal mainly with Starfish Bed material; Cocks (1978) in his review of Davidson's brachiopods records more than 30 species from the Bed; and Jefferies (1986: 192)) referred to the two species of cornutes that have frequently been preserved as the 'youngest cornutes known'.

8. CONCLUSIONS

93. The Edinburgh Census return for 1891 records 1 domestic servant in the household; in the census returns for 1851 and 1861 her father's household at Girvan included several servants, but only one in each census was listed as a house servant, the others were also farm labourers, or dairymaids.
94. Mrs Gray in a letter to Davidson (2nd Nov. 1876):

... from what I hear from our Scotch geologists, it still seems an open question whether the position, or sequence of the Girvan Beds is really determined.

95. Letter to 'Rosie' dated 13 November 1921 in the Royal Scottish Museum, Edinburgh; apparently in answer to a reference concerning certain books, probably by Mrs Asquith in the light of the following comment.
Mrs Gray wrote: 'We are all sick of Mrs Asquith!' and went on to mention a clever burlesque in *Punch* of one of her books published under the heading 'A brilliant Little Innocent Abroad'.
96. Mrs Gray's reply to the suggestion of Dr Traquair c. 1878–80 (see p. 4 of Alice Gray's Mss biography of her mother)
97. See letters to Bather dated 23 November & 17 December 1910 re borrowing Jaekel's work on cystideans; and Bather's letter 31/7/1900 advising her to refer to Lankester's *Treatise on Zoology*.
98. Her visits to Prague and BMNH referred to in Bather correspondence (24 July 1907).
99. Bather's letter (22 June 1919) is in response to Mrs Gray's questions as to the function of some unusual crinoid ossicles that she had found at Craighead.
100. 30 October 1876, puzzled over the difference in ornamentation shown by a large *Lingula* occurring at Balclatchie from others found at Craighead.
101. *Orthis calligramma* Dalman (see her letter of 11 February 1882); the material has since been recognised as *Orthambonites playfairi* (Reed), *Hesperorthis craigensis* (Reed) and *Dolerorthis* ? sp.
Among other examples is *Strophomena corrugatella* Davidson which included several unrelated brachiopods that had independently developed strongly wrinkled ornament; these are now described as: *Gunnarella corrugatella* Davidson, *Gunnarella undulata* (M'Coy); *Rafinesquina* sp., *Palaeostrophomena kilbuckhoensis* (Davidson); *Ptychoglyptus* ? sp., *Leptostrophia jamesoni* (Reed).
102. The old gutta percha rubbers used to produce casts of the Girvan fossils for Bather and Spencer have been replaced by silicone and latex rubbers, which are far more fluid and flexible, allowing more of the finer details of ornament to be reproduced. It is also hoped that such materials will provide more permanent replicas.
103. See the recent work of Jefferies on cornutes; Donovan on crinoids; and Paul on cystoids.
104. **Walter R. Billings** (?–1920). An amateur fossil collector in Canada, who was particularly interested in crinoids. He worked in the Chief Architects Office, Ottawa and was able to obtain material from various new fossil sites as they were discovered during excavations. He corresponded with Bather about fossil echinoderms from 1890 to 1916; lent most of his better specimens for description; provided the 'gossip of a superficial amateur' (see letter 14 May 1897) and acted as a reporter, mediator and link for Bather with specialists throughout North America. Biogr. reference in *Geol. Mag.* 57, 1920: 287–288. The file 'WR Billings' in the BMNH Correspondence Archive has 56 letters from him with 13 draft replies from Bather.
105. The correspondence with Dr Bather contains many references to: 'my fossil', 'my cystids', 'my crinoids' etc.
106. described by Alice Gray in a letter to L. F. Bairstow (10 October 1938)
107. Davidson's quotation in the *Geologist*, Vol. II, 1859: 461.
108. Alice Gray's letter (16 October 1937) indicates that this may have been unfortunate and the wrong person commemorated, as the specimen had been found by her sister Agnes Gray!

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- * — 1875a. Notes on the Genera of extinct Fossil shells, *Bellerophon* and *Porcellia*; their classification amongst the Mollusca, and their distribution in the Silurian and Carboniferous. *ibid.*: 16.
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- * — 1876a. Specimens exhibited 3 October 1871. Notes on a series of fossils from the Silurian rocks of the Girvan Valley. *Proceedings of the Glasgow Natural History Society* 2: 166. [general remarks on Gray Coll'n.]
- * — 1876b. Specimens exhibited 30 January 1872. Notes on a series of trilobites of Caradoc age from the Silurian of the Girvan Valley. *ibid.*: 179–180.
- * — 1876c. Specimens exhibited 26 March 1872. Note on a series of graptolites from the Silurian strata of the Girvan Valley. *ibid.*: 182–3.
- * — 1876d. Specimens exhibited 29 April 1873. Record of Crinoid remains from the Silurian of the Girvan district. *ibid.*: 216.
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- * — 1876. Specimens exhibited 28 October 1873. Note on *Stenotheca* Salter, a Silurian Fossil from the Girvan district. *ibid.*, (2): 223.

APPENDIX 1

Letters between Mrs Gray and Thomas Davidson recorded in the Davidson's Letterbooks between 1847–1884

Letterbooks in Palaeontology Library Archives, British Museum (Natural History)

Period from 1st January 1847 to 19th May 1884

1. 1 January	1847 to 11 May	1848	15. 4 November	1864 to 27 March	1867
2. 11 May	1848 to 31 December	1849	16. 27 March	1867 to 20 April	1868
3. 2 January	1850 to 31 December	1850	17. 23 April	1868 to 16 April	1869
4. 2 January	1851 to 23 July	1852	18. 19 June	1869 to 3 June	1871
5. 23 July	1852 to 15 August	1853	19. 9 June	1871 to 10 April	1872
6. 15 August	1853 to 17 November	1854	20. 10 April	1872 to 18 June	1873
7. 17 November	1854 to 7 December	1855	21. 24 June	1873 to 31 August	1874
8. 10 December	1855 to 19 September	1856	22. 2 September	1874 to 29 January	1877
9. 19 September	1856 to 10 October	1857	23. 29 January	1877 to 31 May	1878
10. 11 November	1857 to 20 August	1859	24. 1 June	1878 to 4 October	1879
11. 20 August	1859 to 24 October	1860	25. 6 October	1879 to 21 November	1880
12. 27 October	1860 to 31 July	1862	26. 23 November	1880 to 29 November	1881
13. 7 August	1862 to 30 September	1863	27. 29 November	1881 to 3 July	1883
14. 2 October	1863 to 4 November	1865	28. 4 July	1883 to 19 May	1884

* These Letterbooks were bequeathed to the British Museum (Natural History) in 1886 with the Davidson's Library and Archive see Cleevely (1983: 96); Cocks (1978: 4).

Chronological summary of entries relating to Mrs Gray

DATE		FROM	DAVIDSON'S NOTE
25 January	1865	Mr J. Young	
5 March		Mr J. Young	
22 July		Robert Gray	
29 July		Robert Gray	
29 August		Robert Gray	
9 September		Robert Gray	
13 September		.....	Rec'd. Box of Silurian Brachiopods
17 September		Robert Gray	
16 October		.....	Ret'd. Mr Gray's box to Mr Young
21 October		Mr Young	writes he paid 3/- carriage for box
No letters recorded from the Grays after November 1865 and during 1866			
1 December	1866	Mr Young	but no reference to Grays
23 August	1867	Mr Young	
28 August		Mr Young	
29 August		.....	Ret'd. 4 Girvan brachs. from Hunterian
1 September		Mr Young	
18 September		Robert Gray	
7 October		Mrs Gray	<i>Triplesia</i>
15 October		Mr Young	
22 October		Mrs Gray	' <i>Triplesia</i> ' & <i>Discina perrugata</i>
		Dr. Young	
1 November		Robert Gray	
4 November		.....	Rec'd box—'some good things'
8 November		Robert Gray	Sent fossil / Ret'd. same day
11 December		Mr Young	Selected material from Gray Coll'n.
19 July	1868	Mrs Gray	Sends 3 species / Ret'd. same day
15 September		Mr Young	Ref. to Mr & Mrs Gray collecting
9 December	1869	Mrs Gray	Sent box of summer's collecting
15 February	1870	.....	Ret'd. Mrs Gray's specimens
23 March		Mrs Gray	Rec'd. box back
23 November		Mrs Gray	Sent box of summer's collection; Keep good specmns. of <i>Stroph. Grayi</i>
13 December		Mrs Gray	<i>Lept. Grayi</i>
13 June	1871	Mrs Gray	Rec'd. box back
27 June		Davidson visited Robert Gray @ St. Vincent Str Branch, City of Glasgow Bank.	
Nothing further during 1871, 1872, 1873			
22 April	1874	.....	Ret'd. box of Ayrshire Brachiopods
8 November		Mrs Gray	
1 September	1875	Mrs Gray	Sends <i>Siphonotreta</i> & ' <i>Lingula</i> '
7 September		.....	Rec'd. <i>Siphonotreta</i> & ' <i>Lingula</i> '
23 January	1876	.....	Ret'd. <i>Siphonotreta</i> & <i>Lingula</i>
24 August		Mr Etheridge	Mrs Gray has some more Girvan fossils
16 October		Mr Young	Brit. Assoc. <i>Western Scottish Fossils</i>
20 October		Mr Young	? draw Mrs Gray's <i>Lingula</i>
30 October		Mrs Gray	Sends 5 <i>Siphonotreta</i>
2 November		Mrs Gray	Sends 4 <i>Lingula</i>
26 November		Mr Young	

DATE		FROM	DAVIDSON'S NOTE
17 January	1877	Mrs Gray	? re her specimens
22 January		.....	Ret'd. Mrs Gray's specimens
29 January		Mrs Gray	Rec'd. specimens; asks for paper ?
23 February	Davidson	send copies of paper	
5 April		Mrs Gray	Asks Davidson to determine brachs.
25 July	1878	Davidson visited Mrs Gray @ 13, Inverleith Road	
29 August		Mrs Gray	Sent 4 Brachiopods
23 September		.....	Ret'd. 4 specimens to Mrs Gray
12 September	1879	Mrs Gray	Asks Davidson to determine specimens from Doularg Barr; reports successful collecting season.
10 October		Mrs Gray	Sent fossils from Doularg
5 November		.....	Ret'd. all specimens to Mrs Gray
9 November		Mrs Gray	Rec'd. all specimens safely
4 June	1881	Mr Young	Mrs Gray has gone to Ayrshire
7 November		Mrs Gray	<i>Triplesia grayi</i> ; Nicholson's grant
19 November		Mrs Gray	<i>Atrypa incerta</i> ; Girvan brachs.
		.....	Davidson Rec'd. box safe.
22 November		Mr R. Etheridge	Mrs Gray has given him her <i>Lingula</i> & <i>Discina</i> specimens
28 November		.....	Davidson ret'd. <i>Triplesia</i> specimens.
29 November		Mr R. Etheridge	Will forward Mrs Gray's specimens to Davidson
2 December		Mrs Gray	Rec'd. specimens safely
6 February	1882	Mrs Gray	
11 February		Mrs Gray	Sent box of <i>Rhynchonella</i>
		Davidson commenced his examination of Gray coll'n.	
20 February		.....	Rec'd. box from Mrs Gray; 'very fine series'
24 February		C. Lapworth	re Girvan succession & Mrs Gray's coll'n.
27 February		C. Lapworth	
2 March		Mrs Gray	Send material horizon by horizon
13 March		Mrs Gray	Sent parcel: Whitehouse Bay fossils
14 March		Mr Young	
15 March		C. Lapworth	
20 March		Mrs Gray	Rec'd. box safe; preparing next
1 April		.....	Ret'd. 3rd lot of Girvan fossils
8 April		Mrs Gray	Rec'd. 3rd lot safe; prep'n. of 5th
12 April		.....	Ret'd. 4th lot of Girvan fossils
15 April		.....	Rec'd. 5th lot; 'large & very fine series'
17 April		Mrs Gray	Rec'd. [4th] lot safe; two more to send
27 April		Mrs Gray	Sent 6th lot; large No. of specimens
8 May		Mrs Gray	Prep'n of 7th lot; Penkill material
17 May			Note
22 May		Davidson entry: 'I finished . . . Mrs Gray's collection'	
24 May		.....	Ret'd. 7th lot of Girvan Brachiopoda
25 May		C. Lapworth	Rec'd. 'magnificent table'
26 May		Mrs Gray	Rec'd. list
14 June		Mrs Gray	
15 June		C. Lapworth	
30 June		Mrs Gray	Sends <i>M. cymbula</i>
10 July		.....	Ret'd. <i>Merista cymbula</i>
13 July		Mrs Gray	Sends 3 <i>Leptaena</i>
18 July		Mrs Gray	Rec'd. 3 <i>Leptaena</i> back
10 August (Girvan)		Mrs Gray	
10 September		Mrs Gray	Removed to Bank of Scotland House
28 September		.....	Davidson sends Pl. proofs

DATE		FROM	DAVIDSON'S NOTE
21 October		Mrs Gray	Sends parcel of summer's specimens
26 October		Mrs Gray	Sends box of this year's fossils
28 October		Mr Young	
3 November		Mrs Gray	Promises Ayrshire locality information
6 November		Mrs Gray	Preparing locality list
13 November		C. Lapworth	
14 November		Mrs Gray	Locality list + Lapworth's comments
15 November		Mrs Gray	re mistake in list
25 November		Mrs Gray	Rec'd. box of fossils safely back
25 March	1883	Mrs Gray	Appr'n. for his work on her coll'n.; Nicholson & Etheridge have given up; she needs someone for rest, especially Mollusca.

Nothing further until:

3 September (Girvan)		Mrs Gray	Apologies for not sending duplicates
28 November		Mrs Gray	Promise of a series of Duplicates
25 January	1884	Mrs Gray	Sends box with a few duplicates
			promise of more after Autumn visit
26 January		.....	Rec'd. a small selection of Girvan Sil. fossils

Apparently nothing further for there are no other entries re Mrs Gray in the remaining volumes of Davidson's letterbooks.

APPENDIX 2

Mrs Gray Correspondence in Palaeontology Library Archives, British Museum (Natural History)

Summary of contents

LETTERS FROM			LETTERS TO		
	Vol. 1	Vol. 2		Vol. 1	Vol. 2
Mrs Elizabeth Gray	86	90	Mrs Elizabeth Gray	81	65
F. A. Bather	65	41	F. A. Bather	79	52
Smith-Woodward	—	12	Dr. Smith-Woodward	3	39
Charles Lapworth	3	4	Charles Lapworth	2	2
Robert Etheridge	2	—	Henry Woodward	1	—
Prof. T. Rupert Jones	2	—	Prof. Fritsch	1	—
J. R. Gregory	2	2	Dr Schöndorf	1	—
F. R. C. Reed	1	—	F. R. C. Reed	1	—
Thomas Davidson	1	—	Dr Wheelton Hind	—	1
J. Barrande	1	—			
J. F. Blake	1	—			
J. Horne	1	—			
Dr Perner	1	—			
Charles Schuchert	1	4			
W. K. Spencer	1	1			
W. S. Boulton	—	2			
G. F. Herbert Smith	—	1			
Frank H. McLearn	—	1			
Darcy W. Thompson	—	1			
T. H. Withers	—	1			

LETTERS FROM

	Vol. 1	Vol. 2
F. A. BATHER TO:		
Mrs Gray	63	38
Smith-Woodward	—	2
Fritsch	1	—
Schöndorf	1	—
	—	—
	65	40

LETTERS TO

	Vol. 1	Vol. 2
MRS ELIZABETH GRAY TO:		
Dr F. A. Bather	79	51
Smith-Woodward	3	36
Charles Lapworth	2	2
Henry Woodward	1	—
F. R. C. Reed	1	—
Wheelton Hind	—	1
	—	—
	86	90

Mrs Elizabeth Gray Correspondence Vol. 1, 1874–1914

	DATE	WRITER	TO
No. 1		Mrs Gray	Dr Charles Lapworth
No. 2	24 November 1874	R. Etheridge	Rbt. Gray
No. 3	23 May 1876	J. Barrande	Mrs Gray
No. 4	18 January 1877	T. Davidson	Mrs Gray
No. 5	24 August 1878	J. F. Blake	Mrs Gray
No. 6	8 January 1881	R. Etheridge	Mrs Gray
No. GL/H*	6 December 1884	Mrs Gray	[Dr Henry Woodward]
No. 7	26 August 1885	T. Rupert Jones	Mrs Gray
No. 8	3 October 1892	F. A. Bather	Mrs Gray
No. 9	5 October 1892	Mrs Gray	Dr F. A. Bather
No. 10	18 October 1892	Mrs Gray	Dr F. A. Bather
No. 11	20 October 1892	F. A. Bather	Mrs Gray
No. 12	26 October 1892	Mrs Gray	Dr F. A. Bather
No. 13	29 October 1892	F. A. Bather	Mrs Gray
No. 14	5 June 1893	T. Rupert Jones	Mrs Gray
No. 15	20 August 1894	Mrs Gray	Dr Bather
No. 16	21 August 1894	F. A. Bather	Mrs Gray
No. 17	27 August 1894	F. A. Bather	Mrs Gray
No. 18	11 October 1895	T. Rupert Jones	Mrs Gray
No. 19	17 February 1896	Mrs Gray	Dr Bather
No. 20	18 February 1896	F. A. Bather	Mrs Gray
No. 21	20 November 1898	Mrs Gray	Charles Lapworth
No. 22	29 November 1898	Charles Lapworth	Mrs Gray
No. 23	? date c. 1938	Alice Gray	Dr Bather
No. 24	11 June 1899	Mrs Gray	Dr Bather
No. 25	16 January 1899	F. A. Bather	Mrs Gray
No. 26	28 June 1899	Mrs Gray	Dr Bather
No. 27	29 June 1899	F. A. Bather	Mrs Gray
No. 28	19 December 1899	J. W. Gregory	Mrs Gray
No. 29	22 December 1899	J. W. Gregory	Mrs Gray
No. 30	9 March 1900	F. A. Bather	Mrs Gray
No. 31	12 March 1900	Mrs Gray	Dr Bather
No. 32	14 March 1900	F. A. Bather	Mrs Gray
No. 33	30 July 1900	Mrs Gray	Dr Bather
No. 34	31 July 1900	F. A. Bather	Mrs Gray
No. 35	19 January 1901	Mrs Gray	Dr Bather
No. 36	22 January 1901	F. A. Bather	Mrs Gray
No. 39	2 July 1901	F. A. Bather	Mrs Gray
No. 37	19 June 1902	Mrs Gray	Dr Bather
No. 38	26 June 1902	Mrs Gray	Dr Bather

	DATE	WRITER	TO
No.40	5 July 1903	Mrs Gray	Dr Bather
No.41	18 August 1903	Mrs Gray	Dr Bather
No.42	19 August 1903	F. A. Bather	Mrs Gray
No.43	2 September 1903	F. A. Bather	Mrs Gray
No.44	3 September 1903	Mrs Gray	Dr Bather
No.45	10 April 1904	Mrs Gray	Dr Bather
No.46	11 April 1904	F. A. Bather	Mrs Gray
No.47	14 April 1904	Mrs Gray	Dr Bather
No.48	16 April 1904	F. A. Bather	Mrs Gray
No.49	25 June 1906	Mrs Gray	Dr Bather
No.50	26 June 1906	F. A. Bather	Mrs Gray
No.51	4 July 1906	Mrs Gray	Dr Bather
No.52	24 July 1907	Mrs Gray	Dr Bather
No.53	26 July 1907	F. A. Bather	Mrs Gray
No.54		F. A. Bather	Prof Dr. Anton Fritsch
No.55	27 August 1907	Mrs Gray	Dr Bather
No.56	2 October 1907	Mrs Gray	Dr Bather
No.57	4 October 1907	F. A. Bather	Mrs Gray
No.58	31 October 1907	Mrs Gray	Dr Bather
No.59	1 November 1907	F. A. Bather	Mrs Gray
No.60	4 November 1907	Mrs Gray	Dr Bather
No.61	6 November 1907	F. A. Bather	Mrs Gray
No.62	7 November 1907	Mrs Gray	Dr Bather
No.63	2 December 1907	Mrs Gray	Dr Bather
No.64	3 December 1907	F. A. Bather	Mrs Gray
No.65	9 January 1908	J. Horne	Mrs Gray
No.66	4 May 1908	Mrs Gray	Dr Bather
No.67	6 May 1908	F. A. Bather	Mrs Gray
No.68	29 November 1908	Mrs Gray	Dr Bather
No.69	1 December 1908	F. A. Bather	Mrs Gray
No.70	5 December 1908	Mrs Gray	Dr Bather
No.71	? December 1908	F. A. Bather	Dr. F. Schondorf
No.72	23 February 1909	F. R. C. Reed	Mrs Gray
No.73	8 December 1909	Mrs Gray	Dr Bather
No.74	15 December 1909	F. A. Bather	Mrs Gray
No.75	20 December 1909	Mrs Gray	Dr Bather
No.83	8 July 1910	Dr Perner	Mrs Gray
No.76	23 November 1910	Mrs Gray	Dr Bather
No.77	25 November 1910	F. A. Bather	Mrs Gray
No.78	1 December 1910	Mrs Gray	Dr Bather
No.79	17 December 1910	Miss Mary Gray	Mr Bather
No.80	17 December 1910	F. A. Bather	Miss M. Gray
No.81	29 December 1910	Mrs Gray	Dr Bather
No.82	2 January 1911	F. A. Bather	Mrs Gray
No.84	5 January 1911	Mrs Gray	Dr Bather
No.85	21 January 1911	Mrs Gray	Dr Bather
No.86	23 January 1911	F. A. Bather	Mrs Gray
No.87	28 January 1911	Mrs Gray	Dr Bather
No.88	5 February 1911	Mrs Gray	Dr Bather
No.89	6 February 1911	F. A. Bather	Mrs Gray
No.90	6 February 1911	F. A. Bather	Mrs Gray
No.91	7 February 1911	Mrs Gray	Dr Bather
No.92	10 February 1911	Mrs Gray	Dr Bather
No.93	13 February 1911	F. A. Bather	Mrs Gray
No.94	14 February 1911	Mrs Gray	Dr Bather

	DATE	WRITER	TO
No.95	15 February 1911	F. A. Bather	Mrs Gray
No.96	19 February 1911	Mrs Gray	Dr Bather
No.97	20 February 1911	Mrs Gray	Dr Bather
No.98	23 February 1911	F. A. Bather	Mrs Gray
No.99	25 February 1911	Mrs Gray	Dr Bather
No.100	February 1911	Mrs Gray	Mr Reed
No.101	7 March 1911	Mrs Gray	Dr Bather
No.102	7 March 1911	Mrs Gray	Dr Bather
No.103	7 March 1911	Mrs Gray	Dr Bather
No.104	9 March 1911	F. A. Bather	Mrs Gray
No.105	31 March 1911	Charles Schuchert	Mrs Gray
No.106	8 April 1911	F. A. Bather	Mrs Gray
No.107	13 April 1911	Mrs Gray	Dr Bather
No.108	17 April 1911	F. A. Bather	Mrs Gray
No.109	29 April 1911	Mrs Gray	Dr Bather
No.110	15 May 1911	W. K. Spencer	Mrs Gray
No.111	30 October 1911	Mrs Gray	Dr Bather
No.112	30 October 1911	Mrs Gray	Dr Bather
No.113	31 October 1911	F. A. Bather	Mrs Gray
No.114	7 November 1911	F. A. Bather	Mrs Gray
No.115	8 November 1911	Mrs Gray	Dr Bather
No.115a	9 November 1911	F. A. Bather	Mrs Gray
No.116	18 May 1912	Mrs Gray	Dr Bather
No.117	27 May 1912	F. A. Bather	Mrs Gray
No.118	29 May 1912	Mrs Gray	Dr Bather
No.119	31 May 1912	F. A. Bather	Mrs Gray
No.120	14 June 1912	F. A. Bather	Mrs Gray
No.121	17 June 1912	Mrs Gray	Dr Bather
No.122	9 November 1912	Mrs Gray	Dr Bather
No.123	11 November 1912	F. A. Bather	Mrs Gray
No.124	16 November 1912	Mrs Gray	Dr Bather
No.125	19 November 1912	F. A. Bather	Mrs Gray
No.126	28 November 1912	Mrs Gray	Dr Bather
No.127	6 December 1912	F. A. Bather	Mrs Gray
No.128	6 December 1912	Mrs Gray	Dr Bather
No.129	14 January 1913	F. A. Bather	Mrs Gray
No.130	19 January 1913	Mrs Gray	Dr Bather
No.131	21 January 1913	F. A. Bather	Mrs Gray
No.132	23 January 1913	Mrs Gray	Dr Bather
No.133	24 January 1913	F. A. Bather	Mrs Gray
No.134	30 January 1913	Mrs Gray	Dr Bather
No.135	1 February 1913	F. A. Bather	Mrs Gray
No.136	12 February 1913	F. A. Bather	Mrs Gray
No.137	19 February 1913	F. A. Bather	Mrs Gray
No.138	18 March 1913	Mrs Gray	Dr Bather
No.139	19 March 1913	F. A. Bather	Mrs Gray
No.140	27 March 1913	Mrs Gray	Dr Bather
No.141	27 August 1913	Mrs Gray	Dr Bather
No.142	29 August 1913	F. A. Bather	Mrs Gray
No.143	3 December 1913	Mrs Gray	Dr Bather
No.144	4 December 1913	F. A. Bather	Mrs Gray
No.145	12 February 1914	Mrs Gray	Dr Bather
No.146	14 February 1914	F. A. Bather	Mrs Gray
No.148	16 February 1914	Mrs Gray	Dr Bather
No.147	3 March 1914	Mrs Gray	Dr Bather

	DATE	WRITER	TO
No.149	4 March 1914	F. A. Bather	Mrs Gray
No.150	12 March 1914	Mrs Gray	Dr Bather
No.151	13 March 1914	F. A. Bather	Mrs Gray
No.152	17 March 1914	Mrs Gray	Dr Bather
No.153	19 March 1914	F. A. Bather	Mrs Gray
No.154	12 April 1914	Charles Lapworth	Mrs Gray
No.155	20 May 1914	Mrs Gray	Dr Smith Woodward
No.156	10 June 1914	Charles Lapworth	Mrs Gray
No.157	12 June 1914	Mrs Gray	Dr Smith Woodward
No.158	27 July 1914	Mrs Gray	Dr Bather
No.159	29 July 1914	Mrs Gray	Dr Smith Woodward
No.160	9 October 1914	Mrs Gray	Dr Bather
No.161	10 October 1914	F. A. Bather	Mrs Gray
No.162	13 October 1914	Mrs Gray	Dr Bather
No.163	15 October 1914	F. A. Bather	Mrs Gray
No.164	19 October 1914	Mrs Gray	Dr Bather
No.165	14 December 1914	Mrs Gray	Dr Bather
No.166	18 December 1914	F. A. Bather	Mrs Gray
No.167	20 December 1914	Mrs Gray	Dr Bather

* GL/H = GENERAL LIBRARY Handwriting collection

Mrs Elizabeth Gray Correspondence Vol. 2, 1915-1923

	DATE	WRITER	TO
No. 1	12 January 1915	F. A. Bather	Mrs Gray
No. 2	12 January 1915	F. A. Bather	Mrs Gray
No. 3	14 January 1915	Mrs Elizabeth Gray	Dr Bather
No. 4	21 January 1915	Mrs Elizabeth Gray	Dr Smith Woodward
No. 5	30 June 1915	Mrs Elizabeth Gray	Dr Bather
No. 6	4 February 1915	F. A. Bather	Mrs Gray
No. 7	5 February 1915	Mrs Elizabeth Gray	Dr Smith Woodward
No. 8	9 February 1915	Mrs Elizabeth Gray	Dr Bather
No. 9	28 July 1915	Mrs Elizabeth Gray	Dr Bather
No.10	30 July 1915	F. A. Bather	Mrs Gray
No.11	2 August 1915	Mrs Elizabeth Gray	Dr Bather
No.12	5 August 1915	F. A. Bather	Mrs Gray
No.13	11 August 1915	Mrs Elizabeth Gray	Dr Bather
No.14	21 August 1915	F. A. Bather	Mrs Gray
No.15	16 October 1915	F. A. Bather	Mrs Gray
No.16	20 October 1915	Mrs Elizabeth Gray	Dr Bather
No.17	21 October 1915	F. A. Bather	Mrs Gray
No.18	25 October 1915	Mrs Elizabeth Gray	Dr Bather
No.19	26 October 1915	F. A. Bather	Mrs Gray
No.20	6 November 1915	F. A. Bather	Mrs Gray
No.21	8 November 1915	Mrs Elizabeth Gray	Dr Bather
No.22	9 November 1915	Mrs Elizabeth Gray	Dr Bather
No.23	10 November 1915	F. A. Bather	Mrs Gray
No.24	13 November 1915	Mrs Elizabeth Gray	Dr Bather
No.25	16 November 1915	Mrs Elizabeth Gray	Dr Bather
No.26	17 November 1915	T. H. Withers	Mrs Gray
No.27	28 November 1915	Charles Schuchert	Mrs Robert Gray
No.28	13 December 1915	Mrs Elizabeth Gray	Dr Bather
No.29	13 January 1916	Charles Schuchert	Mrs Elizabeth Gray

	DATE	WRITER	TO
No.30	20 January 1916	Mrs Elizabeth Gray	Dr Bather
No.31	22 January 1916	F. A. Bather	Mrs Gray
No.32	31 January 1916	Mrs Elizabeth Gray	Dr Bather
No.33	4 February 1916	F. A. Bather	Mrs Gray
No.34	6 February 1916	Mrs Elizabeth Gray	Dr Bather
No.35	10 February 1916	F. A. Bather	Mrs Gray
No.36	14 February 1916	Mrs E. Gray	Dr Bather
No.37	21 June 1916	Charles Schuchert	Mrs Gray
No.38	6 December 1916	Mrs Elizabeth Gray	Dr Bather
No.39	7 December 1916	F. A. Bather	Mrs Gray
No.40	10 December 1916	Mrs Elizabeth Gray	Dr Bather
No.41	31 January 1917	Frank H. McLearn	Mrs Elizabeth Gray
No.42	9 February 1917	Mrs Elizabeth Gray	Dr Lapworth
No.43	12 February 1917	Chas. Lapworth	Mrs Gray
No.44	16 April 1917	Charles Schuchert	Mrs Gray
No.45	20 November 1917	Chas. Lapworth	Mrs Gray
No.46	7 January 1918	Mrs Elizabeth Gray	Dr Bather
No.47	11 December 1917	W. K. Spencer	Mrs Gray
No.48	10 January 1918	F. A. Bather	Mrs Gray
No.49	24 January 1918	Mrs Elizabeth Gray	Dr Bather
No.50	25 October 1918	Mrs Elizabeth Gray	Dr Bather
No.51	26 October 1918	F. A. Bather	Mrs Gray
No.52	16 December 1918	Mrs Elizabeth Gray	Dr Bather
No.52a	21 December 1918	F. A. Bather	Mrs Gray
No.53	21 December 1918	Mrs Elizabeth Gray	Dr Woodward
No.54	1 January 1919	A. Smith Woodward	Mrs Gray
No.55	9 January 1919	Mrs Elizabeth Gray	Dr Woodward
No.56	13 January 1919	A. Smith Woodward	Mrs Gray
No.57	22 January 1919	Mrs Elizabeth Gray	Dr Woodward
No.58	10 February 1919	F. A. Bather	Mrs Robert Gray
No.59	4 March 1919	Mrs Elizabeth Gray	Dr Bather
No.60	19 June 1919	Mrs Elizabeth Gray	Dr Bather
No.61	22 June 1919	F. A. Bather	Mrs Gray
No.62	24 September 1919	Chas. Lapworth	Mrs Gray
No.63	20 September 1919	Mrs Elizabeth Gray	Dr Lapworth
No.64	5 November 1919	Charles Lapworth	Mrs Gray
No.65	13 January 1920	Mrs Elizabeth Gray	Dr Bather
No.66	16 January 1920	F. A. Bather	Mrs Gray
No.67	9 February 1920	F. A. Bather	Mrs Gray
No.68	10 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.69	14 February 1920	A. Smith Woodward	Mrs Gray
No.70	12 February 1920	Mrs Elizabeth Gray	Dr Bather
No.71	21 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.72	25 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.73	26 February 1920	A. Smith Woodward	Mrs Gray
No.74	27 February 1920	F. A. Bather	Dr Woodward
No.75	2 March 1920	A. Smith Woodward	Mrs Gray
No.76	6 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.77	8 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.78	8 March 1920	A. Smith Woodward	Mrs Gray
No.79	10 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.80	22 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.81	24 March 1920	A. Smith Woodward	Mrs Gray
No.82	25 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.83	29 March 1920	A. Smith Woodward	Mrs Gray

	DATE	WRITER	TO
No.84	31 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.85	5 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.86	9 April 1920	F. A. Bather	Mrs Robert Gray
No.87	22 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.88	22 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.88a		Mrs E. Gray	Dr Woodward
No.88b		Mrs E. Gray	Dr Woodward
No.89	21 May 1920	Mrs Elizabeth Gray	Dr Bather
No.90	27 May 1920	Mrs E. Gray	Dr Bather
No.91	27 May 1920	Mrs Elizabeth Gray	Dr Woodward
No.92	3 June 1920	Mrs Elizabeth Gray	Dr Bather
No.93	15 June 1920	F. A. Bather	Dr Woodward
No.94	16 June 1920	Mrs Elizabeth Gray	Dr Hind
No.95	23 June 1920	F. A. Bather	Mrs Gray
No.96	23 June 1920	Mrs Elizabeth Gray	Dr Bather
No.97	23 June 1920	Mrs Elizabeth Gray	Dr Woodward
No.98	29 June 1920	A. Smith Woodward	Mrs Gray
No.99	6 July 1920	Mrs Elizabeth Gray	Dr Bather
No.100	8 July 1920	Mrs Elizabeth Gray	Dr Woodward
No.101	12 July 1920	Mrs E. Gray	Dr Bather
No.102	15 July 1920	Mrs Elizabeth Gray	Dr Woodward
No.103	20 July 1920	Mrs Elizabeth Gray	Dr Bather
No.104	2 August 1920	Mrs Elizabeth Gray	Dr Bather
No.105	3 September 1920	Mrs E. Gray	Dr Bather
No.105a	8 September 1920	Mrs E. Gray	Dr Bather
No.105b	13 September 1920	Mrs E. Gray	Dr Bather
No.106	21 October 1920	Mrs Elizabeth Gray	Dr Bather
No.107	25 October 1920	F. A. Bather	Mrs Gray
No.108	3 November 1920	Mrs E. Gray	Dr Bather
No.109	4 November 1920	F. A. Bather	Mrs Gray
No.110	29 November 1920	A. Smith Woodward	Mrs Gray
No.111	1 December 1920	Mrs Elizabeth Gray	Dr Woodward
No.112	4 January 1921	Mrs Elizabeth Gray	Dr Woodward
No.113	31 January 1921	Mrs Elizabeth Gray	Dr Woodward
No.114	3 February 1921	G. F. Herbert Smith	Dr A. S. Woodward
No.115	23 February 1921	Darcy W. Thompson	Mrs Gray
No.116	8 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.117	9 March 1921	Mrs Elizabeth Gray	Dr Bather
No.118	10 March 1921	F. A. Bather	Mrs R. Gray
No.119	10 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.120	14 March 1921	Mrs Elizabeth Gray	Dr Bather
No.121	14 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.122	1 June 1921	Mrs Elizabeth Gray	Dr Woodward
No.123	6 June 1921	Mrs Elizabeth Gray	Dr Woodward
No.124	8 July 1921	Mrs Elizabeth Gray	Dr Woodward
No.125	3 September 1921	F. A. Bather	Mrs Gray
No.126	21 September 1921	F. A. Bather	Mrs Gray
No.127	23 September 1921	Mrs Elizabeth Gray	Dr Bather
No.128	8 October 1921	Mrs Elizabeth Gray	Dr Bather
No.129	12 October 1921	W. S. Boulton	Mrs Gray
No.130	17 October 1921	Mrs Elizabeth Gray	Dr Woodward
No.131	18 October 1921	A. Smith Woodward	Mrs Gray
No.132	25 October 1921	Mrs Elizabeth Gray	Dr Woodward
No.133	26 October 1921	A. Smith Woodward	Mrs Gray
No.134	8 November 1921	W. S. Boulton	Mrs 'Bray'

	DATE	WRITER	TO
No.135	21 February 1922	J. W. Gregory	Dr Bather
No.136	9 March 1922	Mrs Elizabeth Gray	Dr Woodward
No.137	10 March 1922	F. A. Bather	Mrs Gray
No.138	13 March 1922	Mrs Elizabeth Gray	Dr Bather
No.139	1 March 1922	J. W. Gregory	Mrs Gray
No.140	24 March 1922	Mrs Elizabeth Gray	Dr Woodward
No.141	17 June 1922	Mrs Elizabeth Gray	Dr Bather
No.142	17 June 1922	F. A. Bather	Mrs Gray
No.143	19 December 1922	Mrs Elizabeth Gray	Dr Bather
No.144	27 December 1922	Mrs Elizabeth Gray	Dr Bather
No.145	23 January 1923	F. A. Bather	Mrs Gray
No.146	23 January 1923	F. A. Bather	Mrs Gray
No.147		F. A. Bather	List of Fossils
No.148	26 January 1923	Mrs Elizabeth Gray	Dr Bather
No.149	29 January 1923	F. A. Bather	Mrs Gray
No.150	22 November 1923	Mrs Elizabeth Gray	Dr Bather
No.151	23 November 1923	F. A. Bather	Mrs Gray
No.152	12 December 1923	Mrs Elizabeth Gray	Dr Bather
No.153	14 December 1923	F. A. Bather	Mrs Gray
No.154	21 December 1923	F. A. Bather	Mrs Gray
No.155	28 December 1923	F. A. Bather	Mrs Gray

APPENDIX 3

List of Alice Gray letters in General File, British Museum (Natural History)

	DATE	WRITER	TO
No. 1	1 March 1924	A. S. Alexander	Miss Alice Gray
No. 2	3 March 1934	Alice Gray	T. H. Withers
No. 3	[7 May 1934]	T. H. Withers	Miss Alice Gray
No. 4	14 May 1934	Alice Gray	Mr Withers
No. 5	24 January 1937	Alice Gray	Dr Lang
No. 6	26 January 1937	W. N. Edwards	Miss Alice Gray
No. 7	29 January 1937	W. D. Lang	Miss Alice Gray
No. 8	7 February 1937	Alice Gray	Dr Lang
No. 9	11 February 1937	W. D. Lang	Miss Alice Gray
No.10	2 April 1937	Alice Gray	Dr Lang
No.11	22 March 1937	Alice Gray	Dr Lang
No.12	23 March 1937	Alice Gray	Dr Lang
No.13	25 March 1937	W. D. Lang	Miss Alice Gray
No.14	28 March 1937	Alice Gray	Dr Lang
No.15	31 March 1937	Alice Gray	Dr Lang
No.16	22 April 1937	W. D. Lang	Miss Alice Gray
No.17	4 May 1937	Alice Gray	Dr Lang
No.18	6 May 1937	Alice Gray	Dr Lang
No.19	11 May 1937	W. N. Edwards	Miss Alice Gray
No.20	25 May 1937	Alice Gray	W. N. Edwards
No.21	29 May 1937	W. N. Edwards	Miss Gray
No.22	29 July 1937	Alice Gray	Dr Lang
No.23	30 July 1937	L. Bairstow	Miss Alice Gray
No.24	16 October 1937	Alice Gray	Mr Bairstow
No.25	19 October 1937	L. Bairstow	Miss Alice Gray

	DATE	WRITER	TO
No.26	29 October 1937	Alice Gray	Mr Bairstow
No.27	29 October 1937	Alice Gray	Dr Lang
No.28	30 October 1937	L. Bairstow	Miss Alice Gray
No.29	5 December 1937	Alice Gray	Dr Lang
No.30	8 December 1937	W. D. Lang	Miss Alice Gray
No.31	10 December 1937	Dr H. H. Muir-Wood	Miss Alice Gray
No.32	12 December 1937	Alice Gray	Dr Muir-Wood
No.33	15 December 1937	Alice Gray	Dr Lang
No.34	17 December 1937	W. N. Edwards	Miss Alice Gray
No.35	13 January 1938	F. R. C. Reed	Miss Gray
No.36	1 February 1938	Alice Gray	Dr Lang
No.37	2 February 1938	F. R. C. Reed	Miss Gray
No.38	3 February 1938	W. D. Lang	Miss Alice Gray
No.39	8 February 1938	W. D. Lang	Miss Alice Gray
No.40	12 February 1938	W. D. Lang	Miss Alice Gray
No.41	14 February 1938	Alice Gray	Dr Lang
No.42	17 February 1938	W. N. Edwards	Miss Alice Gray
No.43	21 February 1938	Alice Gray	Dr Lang
No.44	23 February 1938	W. D. Lang	Miss Alice Gray
No.45	27 February 1938	Alice Gray	Dr Lang
No.46	1 March 1938	W. D. Lang	Miss Alice Gray
No.47	14 March 1938	L. F. Bairstow	Miss Gray
No.48	23 March 1938	L. Bairstow	Miss Alice Gray
No.49	31 March 1938	Alice Gray	Mr Bairstow
No.50	28 April 1938	Leslie Bairstow	Miss Alice Gray
No.51	5 May 1938	Alice Gray	Mr Bairstow
No.52	9 May 1938	Leslie Bairstow	Miss Alice Gray
No.53	24 May 1938	Alice Gray	Dr Lang
No.54	26 May 1938	W. D. Lang	Miss Gray
No.55	27 May 1938	Leslie Bairstow	Miss Alice Gray
No.56	13 August 1938	W. D. Lang	Miss Gray
No.57	16 August 1938	Alice Gray	Dr Lang
No.58	19 August 1938	Alice Gray	Dr Lang
No.59	27 August 1938	W. D. Lang	Miss Gray
No.60	17 September 1938	L. F. Bairstow	Miss Gray
No.61	7 October 1938	L. F. Bairstow	Miss Gray
No.62	31 October 1938	Alice Gray	Dr Lang
No.63	4 November 1938	Alice Gray	Miss Wood
No.64	8 November 1938	H. H. Muir-Wood	Miss Gray
No.65	11 November 1938	Alice Gray	Miss Muir-Wood
No.66	11 November 1938	Alice Gray	Leslie Bairstow
No.67	14 November 1938	W. N. Edwards	Miss Alice Gray
No.68	21 November 1938	Alice Gray	Mr Edwards
No.69	5 December 1938	Alice Gray	Mr Edwards
No.70	6 December 1938	W. N. Edwards	Miss Alice Gray
No.71	21 May 1940	Alice Gray	Mr Edwards
No.72	31 May 1940	W. N. Edwards	Miss Gray
No.73	2 June 1940	Alice Gray	W. N. Edwards
No.74	4 June 1940	W. N. Edwards	Miss Gray
No.75	19 August 1940	Alice Gray	W. N. Edwards
No.76	7 June 1941	W. N. Edwards	Miss Gray
No.77	15 June 1941	Alice Gray	W. N. Edwards
No.78	19 August 1941	W. N. Edwards	Miss [Alice] Gray
No.79	24 August 1941	Alice Gray	W. N. Edwards

Alice Gray—F. A. Bather Correspondence

	DATE	WRITER	TO
No. 1	February 1924	Alice Gray	Dr Bather
No. 2	24 February 1924	Alice Gray	Dr Bather
No. 3	27 February 1924	F. A. Bather	Miss Alice Gray
No. 4	18 March 1924	Alice Gray	Dr Bather
No. 5	19 March 1924	F. A. Bather	Miss Alice Gray
No. 6	22 February 1925	Alice Gray	Dr Bather
No. 7	23 February 1925	F. A. Bather	Miss Alice Gray
No. 8	29 January 1926	Alice Gray	Dr Bather
No. 9	31 August 1926	F. A. Bather	Miss Alice Gray
No.10	12 September 1926	Alice Gray	Dr Bather
No.11	14 September 1926	F. A. Bather	Miss Alice Gray
No.12	14 July 1932	Alice Gray	Dr Bather
No.13	12 December 1932	Alice Gray	Dr Bather
No.14	13 December 1932	F. A. Bather	Miss Alice Gray
No.15	14 March 1933	L. Bairstow	Miss Alice Gray
No.16	19 March 1933	Alice Gray	L. Bairstow

Summary of all Alice Gray Correspondence [95 letters]

LETTERS FROM		LETTERS TO	
Alice Gray	= 48	Alice Gray	= 47
F. A. Bather	= 6	F. A. Bather	= 8
Dr. W. D. Lang	= 13	Dr. W. D. Lang	= 21
W. N. Edwards	= 11	W. N. Edwards	= 8
L. F. Bairstow	= 11	L. F. Bairstow	= 6
F. R. C. Reed	= 2		
T. H. Withers	= 1	T. H. Withers	= 2
H. H. Muir-Wood	= 2	H. H. Muir-Wood	= 3
A. Alexander	= 1		

APPENDIX 4

List of Gray Localities in the Girvan district

Locality	Ref. source	Zone
Aldons, on the Stinchar River, about 5 miles S. of Girvan	N & E/27	Llandeilo
Ardmillan	Alice Gray	W'59
[a small quarry by the side of the Old Mill Pond is sometimes taken for Ardmillan']		
Ardmillan Brae, about 2.5 miles SW of Girvan	N & E/14	
Ardmillan shore, 2.5 miles S. of Girvan	N & E/40	
Ardwell Shore, about 4 miles SW of Girvan	N & E/17	Llandeilo
Auchensoul, about 5 miles SE of Girvan	N & E/26	
AULDTHORNS	Mrs Gray	
Balcletchie, about 4 miles E of Girvan	N & E/21	Lwr. Ardwell
BALCLETCHIE CONGLOMERATE	Mrs Gray	Lwr. Ardwell
Bargany Pond, Head of burn passing B. Pond, about 6 miles E by N of Girvan	N & E/28	W'59
'Bargany Pond Burn' see under Lauchlan Burn		W'59
Barbae, nearly 3 miles SE of Girvan	See Note Sheet LVI NE	
BENAN CRAG	N & E/23	
BENAN BURN	Mrs Gray	
Blair Farm, Hillside opposite, about 8.5 miles NE of Girvan	Mrs Gray	Llandeilo
Bougang	N & E/29	
Braes, about 1.5 miles E of Girvan	Alice Gray	
	N & E/34	
Camregan Plantation, about 2 miles E of Girvan	N & E/20	Upper Llandoverly
[= Camregan Wood]	Alice Gray	
= quarry on S side of Camregan Hill, c. 800 m SW of Penkill Castle	Howells/19	<i>M. sedgwicki</i>
'Cliff Section'	Mrs Gray	Rawtheyan
[= small cliff above S. bank of Lady Burn, 40m. downstream of Harper's C2 locality]		
		Harper'82

Locality	Ref. source	Zone
Colmonell, on the Stinchar Rd., about 7 miles S. of Girvan	N & E/33	
Craigens, nr. Kirk Hill, about 5.5 miles NE of Girvan	N & E/13	
CRAIGENS [? = 'Red Quarry' of Salter, 1851: 171]		
N side of road below Craigens Hill, 250m from Howells/5	Howells/6	<i>C. vesiculosus</i>
'old quarry close to March dyke separating Craigens Hill from Mulloch Hill'	Alice Gray	
Craighead Quarry, about 3 miles NE of Girvan	N & E/12	Upper Ardwell
Cuddystone Glen, about 1 mile S of Girvan	N & E/36	Upper Llandoverly
Davidson's Farm—see under Drummuck Harper 1982: 7		
DOULARG		
DOW HILL		
Drummuck Burn, about 4 miles NE of Girvan	Mrs Gray	Llandeilo
Drummuck, North bank above Lady Burn, 350m NW of Drummuck Farm	Mrs Gray	Lwr. Ardwell
	N & E/9	Ashgill
	Harper '82/L1	Rawtheyan
		W'59
		W'59
		H'82/L1
		H'82/L1
High Mains, about 6 miles NE of Girvan	N & E/1	
HIGH ROAD Crinoid Bed	Mrs Gray	
(see under Mulloch Hill High Road Quarry)		
Alice Gray's note: 'because the Crinoid bed became exhausted'		
KIRK HILL = Mulloch Hill		
Kirk Hill, nr. High Mains	N & E/2	
Kirk Hill, roadside nr. Old Fort	N & E/6	
Kirk Hill, Quarry on roadside to East of above loc.	N & E/7	
Cutting below summit on N. side of road	Howells/1	<i>C. vesiculosus</i>
Cutting below summit on N. side of road, 130m W of above		
Quarry below summit on N side of road, 120m W of above	Howells/2	<i>C. vesiculosus</i>
small excavation 150m w of above		
Bluff on N. side of road, 300m W of loc. 3	Howells/3	<i>C. vesiculosus</i>
see under Craigens	Howells/4	<i>C. vesiculosus</i>
small excavations 120m SW of summit	Howells/5	<i>C. vesiculosus</i>
see under Mulloch Hill Quarry	Howells/6	
	Howells/7	<i>C. vesiculosus</i>
	Howells/8	

Locality	Ref. source	Zone
see under Ladywell Wood exposure in banks of small stream	Howells/9	
Kittleburn, Quarrel Hill, nr. Auldthorn, about 6 miles NE of Girvan	Howells/10	<i>M. cyphus</i>
	N & E/8	
Knockgardner, Quarry on roadside nr. K., about 10 miles N of Girvan	N & E/30	
in field S of road 400m NE of Knockgardner Farm	Howells/24	? Wenlock
Knockdolian Mountain, nr. Colmonell, Stinchard Rd. S of Girvan	N & E/35	
Knockgerran, about 4.5 miles E of Girvan	N & E/37	
Lady Burn, above Drummuck	N & E/10	
Lady Burn, opposite Threave	N & E/11	
Laggan Burn, SE of Girvan	N & E/16	
Lauchlan Burn [= 'Bargany Pond Burn' of Gray Map] exposures in sides of Lauchlan Burn 1000m SW of summit of Maxwellston Hill	Howells/21	<i>M. sedgwicki</i>
Letterpin, nearly 4 miles S. of Girvan	N & E/25	
Littleburn, SW of High Mains	N & E/3	
MINUTION	Mrs Gray	Llandeilo
MYOCH BURN	Mrs Gray	W'59
MULLOCH HILL now termed Kirk Hill (see Howells, 1972: 3) 'This term used by Mrs Gray, encompasses all the localities immediately below Kirk Hill & those in Ladywell Wood.' locs. 1-9 are differentiated upon the basis of lithology and weathering	Sheet LXII NW Sheet LV SW & SE	L
Mulloch Hill, 4.5 miles NE of Girvan		
Mulloch Hill High Road Quarry	Sheet L NE	L
'... for many years [we] have called this quarry ...' see also her footnote re Lamont's name [= Craighens Quarry of Lamont, 1935] Mulloch Hill Quarry [Rough Neuk Quarry] ['Quarry in Ladywell Wood'] Large disused quarry in Ladywell Wood 120m WSW of derelict Rough Neuk Cottage	N & E/31 Alice Gray	Lwr. Llandoverly Howells
	Howells/3 Alice Gray	<i>C. vesiculosus</i>
	Howells/8	<i>M. cyphus</i>

Locality	Ref. source	Zone
Mulloch Hill in Wood Overgrown outcrop in Ladywell Wood 140m SW of Rough Neuk Cottage	Alice Gray Howells/9	<i>M. cyphus</i>
NEWLANDS small N-S sandstone ridge on E side of small stream 150m due E of Newlands Farm	Mrs Gray Alice Gray Howells/14	Middle Llandoverly <i>M. gregarius</i>
Penkill, 3.5 miles NE of Girvan PENKILL [‘The rock showed on the E. bank of the Penkill Burn at this spot where the burn is little larger than a field drain. For many years the locality has been invisible because the grass and soil have covered over the fragment of rock that could once be seen.’] Exposure in E bank of Penkill Burn 500m SE of Penkill Castle	L Alice Gray	Upper Llandoverly
NB lithology of Gray ‘Penkill’ material different (see Howells p. 4) Penwhapple Burn small exposure in E bank of Penwhapple Burn at confluence of small tributary	Howells/22	<i>M. sedgwicki</i>
Penwhapple Glen, E of Girvan PENWHAPPLE GLEN mistakenly marked (see Howells p. 4) exposure on E bank of Penwhapple Burn 350m W of Penkill Farm	Howells/20 N & E/18 Alice Gray	<i>M. segwicki</i>
Penwhapple Waterfall Piedmont Glen, S. of Girvan Pinnacher, about 2.5 miles S. of Girvan PINMORE	Howells/23 Alice Gray N & E/15 N & E/24 Mrs Gray	<i>M. crispus</i>
Rough Neuk Quarry Rough Neuk, Quarry @ SW pond, about 6 miles NE of Girvan Sauth Hill, about 1.5 miles E of Girvan	N & E/5 N & E/4 N & E/19	

Locality	Ref. source		Zone
SHALLOCH FORGE	L	Mrs Gray N & E/38 N & E/39 Mrs Gray <i>et al</i>	Lwr. Llandovery
Shalloch Mill, sea-shore 1.5 miles S of Girvan			
Shalloch Mill burn S. of Mill			
STARFISH BED, temporary excavations, 650m ENE of South Threave Farmhouse (see discussion pp 219)			
THRAIVE	L	Alice Gray	Rawtheyan
THRAIVE GLEN			
small cliff above S. bank of Lady Burn, 100m S. of South Threave Farmhouse			
'Threave Glen'	L	Mrs Gray Mrs Gray Harper 1982/L17	Ashgillian
Tramitchell, about 3 miles SE of Girvan			
[= 'Tormitchell]			
WHITEHOUSE BAY	L	Alice Gray N & E/22	Llandeilo
WOODLAND POINT			
Section only exposed at low-tide, 430m W of Woodland farm			
	L	Mrs Gray Mrs Gray Howells/18	Ashgill Lwr. Llandovery <i>M. cyphus</i>

L = locality mentioned by Lapworth

N & E = locality listed by Nicholson & Etheridge (1878-80); the numbers are those given in their list p. 7

Mrs Gray = Localities listed by Mrs Gray in the list she provided for Peach & Horne (1899) pp: 686-697

Alice Gray = Localities marked by Alice Gray on set of Maps c.1937

W'59 = Prof A. Williams (1959)

Howells and H'72 = localities listed by Y. Howells (1972)

H'82 = D. T. Harper (1982)



Cleevely, Ronald James, Tripp, Ronald P., and Howells, Y. 1989. "Mrs. Elizabeth Gray (1834-1924): a passion for fossils." *Bulletin of the British Museum (Natural History) Historical Series* 17(2), 167–258. <https://doi.org/10.5962/p.310433>.

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