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reconstructing the missing geological report.**

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## **The Scottish National Antarctic Expedition, 1902-1904: reconstructing the missing geological report.**

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**ABSTRACT:** The Scottish National Antarctic Expedition (1902-1904) made the first topographical survey and scientific investigation of Laurie Island, one of the South Orkney Islands, and completed an extensive oceanographical research programme in the Scotia and Weddell Seas. When the expedition returned to Scotland the leader, William Speirs Bruce, embarked on an ambitious attempt to publish the expedition's scientific results in a series of high-quality reports. Sadly, by the time it came to Volume Eight (Geology) his funds were exhausted and the series was abandoned. Nevertheless, many of the contributions that had been intended for that volume were produced; some were published elsewhere whilst unpublished proofs and archive notes survive for others. From these various sources the volume as planned by Bruce can be reconstructed. The key contributor was J. H. H. Pirie, a medical doctor and primarily the expedition's surgeon. Despite his limited relevant experience his geological observations were commendable, with the notable exception of an important palaeontological misidentification that was inexplicably supported by eminent British experts. The archive material illuminates the background to Pirie's contributions and the ways in which his unpublished work came to be preserved.

**KEY WORDS:** South Orkney Islands – Falkland Islands – S.Y. *Scotia* – William Speirs Bruce – James Hunter Harvey Pirie.

### INTRODUCTION

The 1902-1904 Scottish National Antarctic Expedition (SNAE) led by William Speirs Bruce (1867-1921) sailed aboard the Steam Yacht *Scotia* on 2<sup>nd</sup> November 1902 from

the Firth of Clyde, bound for the South Orkney Islands (Figure 1). There, on Laurie Island, a base was established for the 1903 austral winter, with *Scotia* making exploratory voyages thence into the southern reaches of the Weddell Sea. The expedition was controversial from the outset, being seen by the British Antarctic establishment as an unwelcome competitor for the ‘official’ British Antarctic (*Discovery*) Expedition (1901-1904) led by Robert Falcon Scott. Further controversy was then engendered by Bruce’s transfer of the SNAE facilities established in the South Orkney Islands to the Government of Argentina, which has operated the site ever since as the *Orcadas* Antarctic base. The transfer had inevitable repercussions for British-Argentine territorial rivalry in the region, with the best assessment of these probably still that by Christie (1951, see especially 266-267). These circumstances and the lack of any formal recognition of the expedition’s achievements – bitterly resented by Bruce – have been subsequently discussed extensively elsewhere (Bernstein 1985; Speak 1992, 2003; Swinney 2007; Dudeney & Sheail 2014) and will not be revisited. Instead, this paper traces the intended geological content of Volume Eight in the post-expedition, *Scotia* scientific report series, publication of which was abandoned at a late stage.

The SNAE had a wide scientific remit but Bruce was particularly prescient in appreciating the value of long-term weather records from the Antarctic region for an understanding of global climate patterns, so much so that he additionally arranged for the Laurie Island data to be complemented by a parallel series of observations made in the Falkland Islands. His subsequent arrangement with the Government of Argentina was driven by his determination, in the absence of any British commitment, to ensure the continuity of the meteorological recording that he had initiated at Laurie Island. The SNAE meteorological results were included in the first of the expedition’s scientific reports to be published – Volume 2, 1907: *Report of the Scientific Results of the Voyage of S. Y. Scotia during the years 1902, 1903 and 1904: Physics (meteorology, geomagnetism and tidal observations)*.

## BRUCE’S ORIGINAL CONCEPTION OF VOLUME 8

Once back in Scotland, Bruce devoted much time and effort to preparation of the scientific reports and six volumes (Two to Seven) were published between 1907 and

1920 (Figure 2). Volume One was to have been based on the ship's log as maintained by Bruce, and although *The Log of the 'Scotia' Expedition* was ready for publication by 1911 it did not appear until 1992 in an edition edited by Peter Speak: it will be cited herein as Bruce (1992) despite the apparent anachronism. The six volumes that were completed covered aspects of physics (Volume Two, 1907), botany (Volume Three, 1912) and zoology (Volumes Four to Seven, 1908-1920).

Bruce's intentions for additional volumes are made clear in a typed document held within the Bruce Archive, Edinburgh University Library Centre for Research Collections: "Synopsis of volumes of report of scientific results" (Gen. 1646, 34/30: Swinney 2001) dated (by an unknown hand) at "about 1913". Five additional volumes are listed:

Vol. 8. Geology – a typed note reads "In the press" but this is amended to "Nearly ready" in Bruce's handwriting.

Vol. 9. Invertebrates

Vol. 10. Cartography and Geography including Bathymetry

Vol. 11. Ocean Physics.

Vol. 12. Summary

The geology volume was clearly close to completion and Bruce's typescript goes on to list the content (estimated at 150 pages with 33 Plates) and authorship as follows, verbatim:

1. Deep Sea Deposits. Pirie
2. Glaciology of the South Orkneys. Pirie
3. Geology of the South Orkneys. Pirie
4. Geology of Gough Island. Pirie.
5. Notes on the petrology of GI. Campbell
6. Geology of the Falkland Islands. Pirie
7. Fossils of the Falkland Islands. Newton
8. Geological notes on South Georgia. Ferguson

In a typed bibliography (undated) of "[w]orks to which reference has been made in the article entitled *Andantarctic Archipelago*", also held by Edinburgh University Library Centre for Research Collections (Gen. 1646, 26/27: Swinney 2001) Bruce optimistically dates item six above as 1914, with the amended title "Geological Notes

on the Neighbourhood of Port Stanley”. Gough Island, to the south-east of Tristan da Cunha, was visited during the return voyage to Scotland.

#### THE PRINCIPAL AUTHOR: JAMES HUNTER HARVEY PIRIE

The key author was clearly J. H. H. Pirie (1878?-1965), the SNAE’s geologist and surgeon (generally known as Harvey Pirie) for whom brief (and sometimes contradictory) biographical details have been published by Bernstein (1983), Guly (2013) and Plug (2014). Born in Aberdeenshire, Pirie initially studied science, including geology, at Edinburgh University, then, after a break for service (prematurely terminated by a bout of typhoid) in the Boer War, he resumed his studies and graduated with a medical degree in 1902. Prior to departure for the Antarctic, he received some additional informal training in geological field work from Geological Survey personnel (Brown *et al.* 1906, p. 20).

Once in the South Orkney Islands (Figure 3), Pirie’s pioneering field descriptions of the lithologies, fabrics and structures seen were commendably competent given his limited relevant experience, the sparse exposure much obscured by ice and scree, and the ubiquitous tectonic disruption. He also contributed widely beyond his specialism, notably to the topographical survey work and the maintenance of the zoological log that became Volume Four (part one) of the *Scotia* report series. His more professional scientific concern was bacteriology and although his results were sparse he published a short report in Volume Three (Botany) of the report series.

After the return of the SNAE to Scotland, Pirie was elected a Fellow of the Royal Society of Edinburgh in 1908. He practised medicine in Edinburgh until 1913 when he joined the Colonial Medical Service and moved first to Kenya and then to the South African Institute for Medical Research, retiring from a senior position there in 1940 after a distinguished career of bacteriological research. Pirie died in South Africa on 27 September 1965. A surprisingly inaccurate obituary was published by the Royal Society of Edinburgh (Mason 1966) and demonstrates the extent to which memories of the SNAE had faded, even in Scotland, by inexplicably assigning Pirie to the “Mawson Antarctic Expedition”. Douglas Mawson was a member of Shackleton’s British Antarctic (*Nimrod*) Expedition, 1907-1909, and later led the Australasian

Antarctic Expedition, 1911-1913, and the British, Australian and New Zealand Antarctic Research Expedition, 1929-1931.

For any assessment of Pirie's contribution his field notebook and specimen log, and the surviving SNAE geological specimens, all now held by the National Museum of Scotland (NMS) are crucial. The notebook and log form part of the NMS library's W. S. Bruce archive: box 8, files 97 and 98; the notebook contains geographical and glaciological notes in addition to geological observations. There are 16 rock specimens from the South Orkney Islands with the NMS collection numbers 1954.2.18-29 and 1954.2.70-73; 17 rock specimens from Gough Island are numbered 1954.1.1-17; 41 Devonian fossil specimens from the Falkland Islands are numbered 1954.3.30-70.

#### PUBLISHED MATERIAL AVAILABLE FOR INCLUSION IN VOLUME 8

The example of the zoology volumes in the *Scotia* report series shows that the production costs had been mitigated by initial publication of many of the individual scientific papers in the *Transactions of the Royal Society of Edinburgh* between 1906 and 1912. Reprints were then included in the SNAE report series, which had the same page size as the *Transactions*, thus reducing the typesetting expenses. Two of Pirie's contributions could have followed the same route into Volume Eight: Pirie (1913a) on the deep-sea deposits sampled during the expedition's oceanographic surveys, and Pirie (1913b) on the glaciology of the South Orkney Islands. These were substantial papers correlating with items one and two on Bruce's list of intended content. A shorter paper (Pirie 1905) had been published previously in the *Proceedings of the Royal Society of Edinburgh* and had dealt with some aspects of the geology and palaeontology of the South Orkney Islands. Unfortunately, it presented a crucial palaeontological misidentification which came to overshadow Pirie's other contributions. However, this paper was not intended for inclusion in Volume Eight for which, as item three on Bruce's list, Pirie wrote a longer, expanded account which had reached proof stage by 1913 and will be discussed in more detail below.

Pirie's (1913a) paper on the deep-sea deposits includes the first mention of an important discovery amongst the ice-rafted rock fragments dredged-up during

sampling. In the list of lithologies recovered at ‘Station 313’, to the south-east of Laurie Island, he includes “one piece of fossiliferous limestone with specimens of *Archaeocyathinae*” (Pirie 1913a, p. 659); a later discussion (p. 682) considers the regional implications as follows:

“... pieces of limestone one of which is of particular interest, containing several species of that peculiar fossil form *Archaeocyathina*. This find, although not *in-situ*, points to the probable occurrence of Cambrian rocks on this side of the Antarctic similar to those in which these fossils were found on the Shackleton Expedition [1907-1909] in Victoria Land.”

The archaeocyaths do not appear to have been recognised at the time of their collection in March, 1903. Had they been identified then, the SNAE could have claimed the first record of this important Antarctic palaeofauna: indeed, the specimen was arguably the expedition’s most important geological discovery (Stone 2017a). As it was, a full description was not published in *Transactions of the Royal Society of Edinburgh* for another seven years (Gordon 1920), by which time Volume Eight had been abandoned. The specimen is now represented by 160 thin sections held by The Natural History Museum, London, with the registered numbers S 10301 to S 10460.

Meanwhile, three other short papers arising from the expedition’s work had been published in the *Proceedings of the Royal Physical Society of Edinburgh*: Pirie (1906) on the geology of Gough Island, Campbell (1906) on the petrology of rocks from Gough Island, and Newton (1906) on some fossils from the Falkland Islands. Gough Island had been visited briefly during *Scotia*’s return voyage from the Weddell Sea, whilst the Falkland Island fossils had been gifted to the SNAE when it passed through Port Stanley (Bruce 1992, p. 206): Campbell was a geologist based at the University of Edinburgh; Newton was a palaeontologist with the Geological Survey. The Royal Physical Society was a separate organisation from the Royal Society of Edinburgh and there is no precedent for articles originally published in its journal being reprinted in the SNAE report series. The smaller page size might also have been an obstacle but, nevertheless, Bruce must have been hopeful of their inclusion and they correlate, respectively, with items four, five and seven on his list of intended content.

In addition to the scientific papers directly describing the SNAE work and collections, Bruce solicited additional contributions that he thought complementary.

So, for example, in Volume Four of the Scotia report series, covering vertebrate zoology, T. E. Salvesen (1914) described “The Whale Fisheries of the Falkland Islands and Dependencies”. At the time of publication, the Salvesen Company had whaling stations on South Georgia and on New Island in the Falklands, and it was a Salvesen initiative that encouraged Bruce to incorporate an account of the geology of South Georgia into the *Scotia* report despite the SNAE not having visited that island.

The Salvesen company established their South Georgia whaling base, Leith Harbour, in 1909 and soon thereafter employed a Glasgow-based mineral prospector, David Ferguson, to assess the economic potential of the island’s geology. Ferguson worked on South Georgia in 1912 as described by Stone and Faithfull (2013), and on his return compared notes with Pirie. He also benefitted from the collaboration of mentors at Glasgow University, Professor J. W. Gregory and Dr G. W. Tyrrell, with whom he jointly published the South Georgia results. Correspondence between Bruce and Ferguson now held by the Scott Polar Research Institute (SPRI MS 101/39/14 dated 6 September 1913) confirms the meeting between Pirie and Ferguson and shows that the proposal to include Ferguson’s work in the Scotia report originated with Bruce. The intention was then confirmed by a footnote in Ferguson *et al.* (1914, p. 53) which promised that “[a] more detailed account of the geology of South Georgia, and of its rocks and fossils, will appear in one of the volumes on the results of the *Scotia* Expedition, which are now being published by Dr W. S. Bruce.”

Ferguson subsequently returned to the South Atlantic region for the 1913-1914 austral summer, again prospecting on behalf of the Salvesen company (Stone and Faithfull 2013) and wrote to Bruce from the Falkland Islands (SPRI MS 101/39/17 dated 15 November 1913) proposing a delay whilst additional South Georgia specimens were acquired. It is not clear whether any account was ever prepared specifically for the *Scotia* report, but a series of papers was published by Ferguson (1915), Gregory (1915) and Tyrrell (1915) in the *Transactions of the Royal Society of Edinburgh*; all three were recorded as having been received by the Society on 2 March 1914. These papers do not incorporate discussion of the additional material sought by Ferguson, but following previous practice, might well have been utilised by Bruce had Volume Eight come to fruition; they would have jointly correlated with item eight on his original content list.

## PIRIE'S UNPUBLISHED WORK

The above account leaves only one of Bruce's planned inclusions for Volume Eight unpublished in any form: item six, Geology of the Falkland Islands, to have been authored by Pirie. Additionally, item three, Geology of the South Orkneys, whilst partially covered by Pirie's (1905) paper in *Proceedings of the Royal Society of Edinburgh* is more properly represented by the unpublished proof from 1913.

### **The geology of the South Orkney Islands**

A modern geological map of the South Orkney Islands has been compiled by Flowerdew *et al.* (2011); nothing was known of the geology at the time of the SNAE visit. The largest component of the archipelago Coronation Island (Figure 1) is mostly composed of metamorphic rocks developed in Late Triassic and/or Early Jurassic times largely from sedimentary rocks equivalent to those forming the Permian to Triassic, Greywacke Shale Formation of Laurie Island. The metamorphic transition is seen on smaller islands between Coronation and Laurie islands where it is overlain by Jurassic and Cretaceous conglomerates.

For the unpublished proof, Geology of the South Orkneys (Pirie 1913c), Trendall (1953, bibliography) recorded three extant copies, held by The Scott Polar Research Institute (SPRI), Cambridge, the Falkland Islands Dependencies Scientific Bureau, London, and privately by R. J. Adie. Two of these copies have been traced, one held in the SPRI archive (Reference number MS 1719;D) and one, the Falkland Islands Dependencies copy, now in the British Antarctic Survey (BAS) library reprints collection, also in Cambridge; both copies were made from an original galley proof held by Adie. He died in South Africa on 14 May 2006 and the whereabouts of his proof are unknown. The SPRI copy comprises ten pages of text. The BAS copy is of the same ten pages of text but also includes a page of illustrations (two geological cross-sections and four fossil sketches) entitled 'Plate II' and a sketch map of the South Orkneys showing the locations of the cross-sections on Laurie Island. Neither the cross-sections nor the fossil sketches are particularly informative. The sections (Figure 4) show only the disposition of the mostly steeply dipping strata in those areas

in which it was well exposed and belie the true complexity. The detail has been more recently described by Dalziel (1984, see particularly figure 22) as markedly heterogeneous, with steeply inclined strata commonly overturned and widely associated with tight folding. The fossil sketches are of indistinct, Mesozoic plant impressions wrongly identified as Lower Palaeozoic crustaceans; the clearest example is reproduced in Figure 4. In the proof text there are, in total, references to 14 plates, some with two figures, but there are no captions and apart from the map (to have been Plate I) and the surviving 'Plate II' the intended illustrations have not been identified.

On the SPRI copy of the proof, a note dated 11 January 1951 gives something of its history. The note confirms that the copy was made from a galley proof stamped "Neill & Co. Ltd Printers Edinburgh. First Proof" and dated 6 August 1913; the copy was passed to SPRI from the Falkland Islands Dependencies Scientific Bureau. The original galley proof had been given to Adie by Pirie on 28 September 1950 and was the only copy known to have survived. Given the date of the hand-over, it may well have occurred in South Africa. Pirie spent most of his post-SNAE career at the South African Institute for Medical Research in Johannesburg. Adie was a South African geologist who worked in Antarctica, between 1947 and early 1950 with the Falkland Islands Dependencies Survey (FIDS, rebranded as BAS in 1962), then worked in the Falkland Islands until May 1950. He would surely have made a visit home between then and commencing work on his Antarctic data at St John's College, Cambridge, later in the year. His close association with FIDS would have facilitated copies of Pirie's proof being deposited with that organisation, which he would later rejoin, in 1956, as Chief Geologist, eventually to become Deputy Director of BAS in 1973.

In general, Pirie's (1913c) unpublished proof follows the pattern of his 1905 paper but with more detail of the geological variations in the tectonised greywacke-shale succession seen across Laurie Island and in its offshore islets. He also wrote a short account of raised beaches and other evidence for changes in sea level. His field misidentification of obscure plant impression (of Triassic age: Dalziel *et al.* 1981) as much older graptolites (of Ordovician or Silurian age) had been erroneously confirmed by eminent British palaeontologists: Ben Peach of the Geological Survey and Gertrude Elles of the Sedgwick Museum, University of Cambridge (identifications based on NMS specimen 1954.2.29). The misjudgement arose from

the familiarity of all concerned with the superficially similar rocks of Ordovician and Silurian age in the Southern Uplands of Scotland, which circumstances - and their aftermath - have been reviewed by Stone (2017a). For Pirie's 1905 paper, Peach had written a contribution on the 'graptolite' (crediting Elles with its identification as a form of *Pleurograptus*) and additionally identifying other, equally obscure plant impressions as the traces of phyllocarid crustaceans. In the 1913 proof, this contribution was repeated verbatim, but Peach additionally provided small sketches of finely ridged areas in the fossiliferous specimens that he mistakenly interpreted as phyllocarid impressions (Figure 4). These sketches cannot be readily matched with the surviving specimens, but the closest resemblance is seen on specimen 1954.2.28, described by Peach as *Discinocaris* sp.

For the 1913 proof, Pirie was also able to include some comments on the geology of Coronation Island. His own observations there had been restricted to a very brief visit to a single locality but were subsequently supplemented by the examination of a small number of specimens from other parts of the island that Ferguson had obtained in 1912 through Salvesen contacts in the South Georgia whaling industry. The lithologies were described as broadly similar to those of Laurie Island but with an elevated metamorphic grade and a more intense tectonic fabric.

The Ordovician or Silurian age for the Laurie Islands strata that Pirie's fossil discoveries had implied, supported by the opinions of Elles and Peach, was accepted until the much younger, Triassic age was established by Dalziel *et al.* (1981). Before that happened, the older age had appeared to be supported by another 'graptolite' found by an Argentine expedition and reported by Cordini (1955). However, from the same fossil assemblage Cordini also described plant material, presaging the revision of the strata's age but creating a contradictory palaeontological association: a Lower Palaeozoic fauna with an Upper Palaeozoic or younger flora. Cordini was undoubtedly influenced by the apparently authoritative graptolite and phyllocarid identifications made by the British experts, and his 'graptolite', like Pirie's, was most probably plant material. Despite this, the location close to Cape Dundas (Figure 4), from which both Pirie's and Cordini's fossils were recovered, is still known as Graptolite Island (60°43'South, 44°27'West).

One additional – and almost certainly spurious – observation on the palaeontology of Laurie Island was passed to Bruce in 1913, but there is no evidence to suggest that Pirie’s opinion was sought as to its veracity. Amongst the material held in the University of Edinburgh Library’s Centre for Research Collection (Gen.1647, 45/11: Swinney 2001) is a letter to Bruce from R. C. Mossman, the *Scotia* expedition’s meteorologist who had remained behind for a second winter on the South Orkney Islands and subsequently joined the *Oficina Meteorológica Argentina*. Writing from Buenos Aires on 17 April 1913, Mossman passed on a report detailing the discovery of a ‘fossil tree’ close to the original site of the SNAE’s base in Scotia Bay (Figure 4). The report claims that “[t]he tree trunk has a diameter of about 3 metres and lies horizontally in a mountain of weather[ed] slate.” Two small photographs purporting to show the tree accompany the letter, but their subject is ambiguous. The location given lies within a zone of intense deformation at the head of Scotia Bay (the Orcadas Shear Zone of Dalziel 1984) so perhaps what was seen was a tectonic artefact such as an isolated fold hinge. The putative tree trunk does not feature in any of the more recent scientific literature. It would have been very hard to reconcile with the geological interpretations that Pirie had, by 1913, already taken forward to proof stage so was most probably dismissed by Bruce as an indeterminate curiosity with no palaeontological value.

### **The geology of the Falkland Islands**

During the progress of the SNAE, *Scotia* visited the Falkland Islands three times, but as Pirie was a member of the team left on Laurie Island for the 1903-1904 austral summer (Figure 3) he only saw the Falklands once, on the way south early in 1903. He examined the rocks and landscape around Stanley and although no formal report was prepared, his notebook documenting his observations survives within the Bruce archive held by NMS. He records collecting six rock specimens, quartzite and “graphitic schist” (most probably cleaved carbonaceous mudstone) but they are not present amongst the SNAE geological specimens now held by the museum.

Pirie’s notes on Falkland Islands’ geology have been reviewed by Stone (2017b). Overall, Pirie noted the dominance of hard white quartzite which was widely current-bedded and contained local intercalations of black carbonaceous mudstone; these are

the characteristic lithologies of what is now known as the Port Stanley Formation (Aldiss & Edwards 1999) of Devonian age. The strata were correctly described as moderately dipping to near-vertical and folded about horizontal, east-west hinges. The east-west strike trend then determined the orientation of the coastal inlets and principal hill ridges. And at the coast, Pirie was intrigued by the banks of beach pebbles that cut off low-lying lagoons from the sea in many of the small inlets – a feature that would now be associated with a change in sea level. As with all previous geological visitors, Pirie was intrigued and puzzled by the Falkland Islands ‘stone runs’, now regarded as extensive periglacial blockfields made up of large quartzite boulders.

It was during the third visit of *Scotia* to Port Stanley, and in Pirie’s absence, that Bruce was presented with the collection of Devonian fossils, mostly brachiopods (Newton 1906), by the Governor of the Falkland Islands, Mr (later Sir) William Grey-Wilson. The fossils had originated in Early Devonian strata now designated the Fox Bay Formation (Aldiss & Edwards 1999), but the actual specimens had been scavenged from building rubble brought to Stanley for renovations to the Governor’s house (Bruce 1992, p. 206).

## CONCLUSIONS

Volume Eight of the SNAE’s *Scotia* scientific report series came tantalisingly close to completion. By 1913 only one of the intended contributions, Pirie on the geology of the Falkland Islands, remained unwritten. Pirie’s (1913c) account of the geology of the South Orkney Islands was in proof, whilst all of the other planned contributions had been published in one of the journals of either the Royal Society of Edinburgh or the Royal Physical Society of Edinburgh. Bruce must have felt confident in describing the volume, variously, as ‘In the Press’, ‘Nearly ready’ or ‘1914’. Sadly, his optimism proved unjustified; scant reward for a remarkable achievement in Antarctic exploration (Figure 5).

Bruce had been determined that the *Scotia* scientific reports should be produced to the highest possible standard, but thwarting this ambition was his perennial shortage of funds. He simply could not raise the necessary money to proceed with the publication

of Volume Eight, and so it languished, never formally abandoned but ultimately forgotten. Fortunately, through a combination of published papers and archive material, the SNAE's geological records can still be accessed, and the scope of the intended Volume Eight appreciated. Much credit for that is due to J. H. H. Pirie, who would have been the principal contributor to the volume. Unfortunately, his prolific output of scientific writing, based on pioneering field observation has, until now, been overshadowed by a palaeontological misidentification for which he was not wholly responsible.

## EPILOGUE

There is one curious geological postscript to the aftermath of Pirie's work in the South Orkney Islands. In 1963, R. J. Adie, by then a senior figure in the British Antarctic Survey, attended a scientific symposium in South Africa and visited Pirie in Johannesburg. After that meeting, Adie claimed (in a letter to Pirie dated 18 November 1963, see Appendix 1) that "I have spent some time in going through your 1913 paper on the geology of the South Orkney Islands, and that soon I shall have it in some state for sending to the printer." This must refer to the unpublished 1913 galley proof that Pirie had given to Adie in 1950. What Adie intended is not known, but whatever was planned nothing came of it, and once again Pirie (1913c) remained unpublished.

## ACKNOWLEDGEMENTS

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thanks are also due to Craig Woodward (British Geological Survey, Edinburgh) for preparation of figures 1 and 4. The paper is published by permission of the Executive Director, British Geological Survey (NERC).

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## APPENDIX 1

### **Adie's letter to Pirie, 18 November 1963**

I am grateful to Dr M. R. A. Thomson, formerly of the British Antarctic Survey, for bringing this letter to my attention and kindly providing a copy, as transcribed below.

Dr J. H. Harvey Pirie  
23, Victoria Street,  
Oaklands,  
JOHANNESBURG,  
South Africa.

18<sup>th</sup> November 1963

Dear Dr Harvey Pirie,

I am very sorry not to have written to you before now, but I have been completely inundated by many duties as a result of my absence in South Africa.

You will no doubt remember that when I visited you in early October you mentioned to me that you would like to become a member of the Antarctic Club. Immediately on my return to England I contacted the Secretary of the Club and put your name forward for membership.

I have now had a letter from the Secretary of the Club advising me that you have been unanimously elected to membership of the Antarctic Club and that in your particular case no membership dues are payable. The Secretary has asked specifically to convey to you his regrets at your long delayed election and that he hopes you will have considerable pleasure from wearing the Club tie which is enclosed and which is presented to you with the compliments of the Club.

I am very pleased to be able to tell you that all of the photographs that I took in your garden in Johannesburg have come out most successfully and shortly I shall be sending you one or two prints of them\*.

Also, since my return I have spent some time in going through your 1913 paper on the geology of the South Orkney Islands, and that soon I shall have it in some state for sending to the printer. I am only concerned particularly about one or two points. In the paper a number of plates are mentioned and I should very much like to be able to reproduce together with the paper at least half of these. I understood from you that the negatives of your photographs had been deposited in the Geography Department of Witwatersrand University\* and I wonder whether it would be possible for me to obtain a set of good prints from these so that I can select a certain number to illustrate your most interesting paper. If it is not easy for you to arrange for such prints to be made, I shall be able to contact Dr Plumstead who has already assured me that everything possible will be done to preserve your negatives in the best way.

I am very much looking forward to hearing from you and I shall be writing again to you shortly.

With very kind regards to Mrs. Pirie and yourself.

Yours sincerely,

[Raymond J. Adie]

\*These photographs and negatives have not been traced.

### Figure Captions

1. A location map for the South Orkney Islands, South Georgia and Falkland Islands. The Scotia Sea and Ridge celebrate the Scottish National Antarctic Expedition, as do many place names on and around Laurie Island.
2. An advertising flyer for the *Scotia* scientific reports. Glasgow Digital Library, based at the University of Strathclyde
3. J. H. H. Pirie and fellow members of the team that remained in the South Orkney Islands during the 1903-04 austral summer. Image dated February 1904. From left to right: A. Ross (scientific assistant), W. Cuthbertson (artist), J. H. H. Pirie (geologist and surgeon), W. Martin (seaman and scientific assistant), R. C. Mossman (meteorologist), W. Smith (cook). Glasgow Digital Library, based at the University of Strathclyde.
4. Two geological cross-sections redrawn from 'Plate Two' of Pirie's (1913c) proof with (inset a) the clearest of the fossil sketches provided by B. N. Peach. The locations of the sections are shown on the outline map of Laurie Island but note the mismatch around Cape Valavielle. No scale is provided for the fossil sketch but the subject is likely to be about 1 cm wide. The expedition's base was established at the head of Scotia Bay.
5. S. Y. *Scotia* with expedition members on the ice of the Weddell Sea. Glasgow Digital Library, based at the University of Strathclyde.

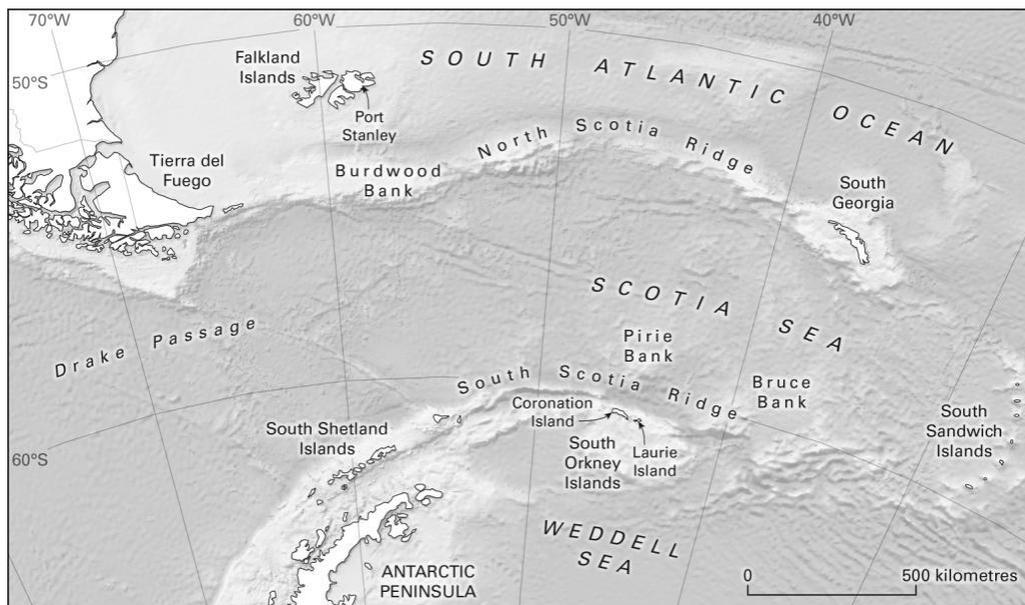


Figure 1. A location map for the South Orkney Islands, South Georgia and Falkland Islands. The Scotia Sea and Ridge celebrate the Scottish National Antarctic Expedition, as do many place names on and around Laurie Island.

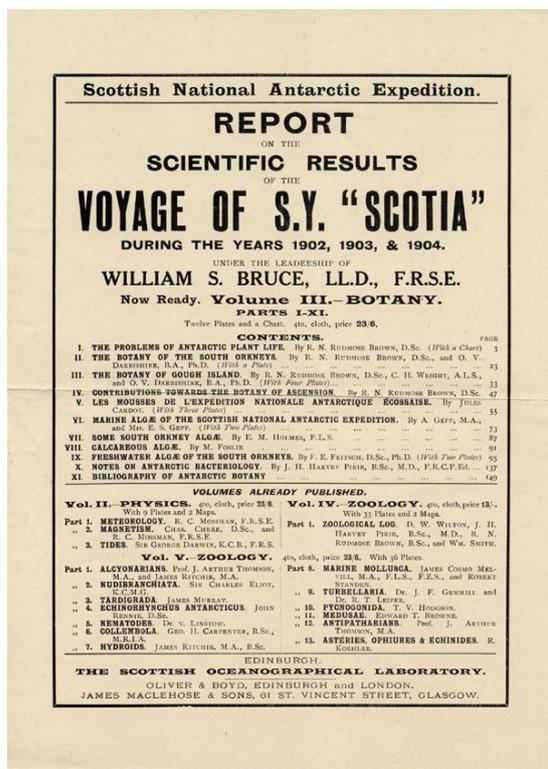


Figure 2. An advertising flyer for the *Scotia* scientific reports. Glasgow Digital Library, based at the University of Strathclyde



Figure 3. J. H. H. Pirie and fellow members of the team that remained in the South Orkney Islands during the 1903-04 austral summer. Image dated February 1904. From left to right: A. Ross (scientific assistant), W. Cuthbertson (artist), J. H. H. Pirie (geologist and surgeon), W. Martin (seaman and scientific assistant), R. C. Mossman (meteorologist), W. Smith (cook). Glasgow Digital Library, based at the University of Strathclyde.

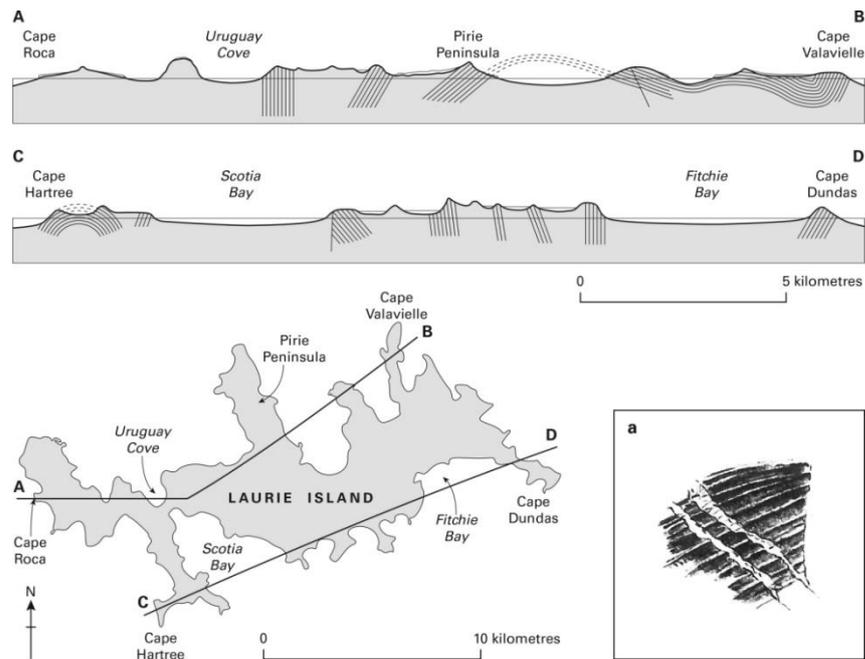


Figure 4. Two geological cross-sections redrawn from ‘Plate Two’ of Pirie’s (1913c) proof with (inset a) the clearest of the fossil sketches provided by B. N. Peach. The locations of the sections are shown on the outline map of Laurie Island but note the mismatch around Cape Valavielle. No scale is provided for the fossil sketch but the subject is likely to be about 1 cm wide. The expedition’s base was established at the head of Scotia Bay.



Figure 5. S. Y. *Scotia* with expedition members on the ice of the Weddell Sea. Glasgow Digital Library, based at the University of Strathclyde.