Medical geologists during the Heroic Age of Antarctic exploration

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Abstract: Although the Heroic Age of Antarctic exploration is best remembered for races to the South Pole, the majority of expeditions at the time had scientific aims with geology as one of the important sciences to be studied. Almost all the expeditions carried a doctor, who was usually expected to contribute to the science of the expedition and was often appointed more for his non-medical skills than his medical ones. On the *Scotia* expedition, Dr J. Harvey Pirie was appointed as doctor, bacteriologist and geologist, and on the *Discovery* expedition, Dr Reginald Koettlitz was appointed as botanist, but had earlier spent three years as geologist in the Arctic. Ernest Gourdon, the geologist on both French expeditions, was a medical student at the time (although some sources speak of him a being medically qualified) and he obtained doctorates in both geology and medicine for his work in the Antarctic. Perhaps the most important geological discovery of the era was made by Dr Edward Wilson who was a zoologist and artist rather than a geologist, but had a wide interest in natural history. This paper describes these doctors and their contribution to geology on these expeditions.

The Heroic Age of Antarctic exploration (1895–1922) is best remembered for the exploits of Scott, Shackleton and Amundsen in trying to reach the South Pole (and for two of them, succeeding). However, more importantly, it was a time of significant scientific discovery. At the start of the Heroic Age the Antarctic was virtually unknown, but during this period there were at least 18 expeditions to the region. Only a tiny proportion of the continent is not covered by ice and snow, but geology was one of the main sciences of interest and was a major scientific justification for Scott's *Discovery* expedition (Larson 2011, p. 213). Before this expedition (1901–1904), *The Antarctic Manual for the use of the Expedition of 1901* (Murray 1901), was produced, giving advice on the Antarctic and the science to be conducted. The chapter on geology said that 'There can be no question as the geological interest attaching to the regions around the South Pole. Apart from the usual subjects of geological enquiry . . . there are two geological problems . . . that are of especial importance. One of these is the climate of these regions in past times, the other the distribution of sea and land in the Southern Hemisphere at former periods' (Blanford 1901, p. 176). Information on the temperature would be obtained from fossils of animals and plants and 'the discovery of coal in particular would be of great scientific interest' (Blanford 1901, p. 176). In addition, the geology of the area might 'throw light upon the old question why the great continents terminate to the Southward in points' (Blanford 1901, pp. 176–177). It went on to say that there was growing evidence that Antarctica had been joined with the other continents and that 'should any traces of the Glossopteris flora be found . . . the hypothesis above suggested will be strongly supported' (Blanford 1901, p. 177). In addition, there were instructions about how to record information (Judd 1901), and advice on how to collect samples (Fletcher 1901). This chapter mentions the possibility of finding meteorites. The geologists were also expected to study glaciology and this topic was also covered in the manual (Gregory & Bonney 1901). Similar (though shorter) instructions were issued before the second French expedition (de Lapparent 1907; Lacroix 1907).

For the less scientifically minded, there were hopes that the new continent might provide gold and other economically viable minerals. Thus, at interview, Ernest Shackleton asked Raymond Priestley 'would you know gold if you saw it?' (Huntford 2000*a*, p. 194). All the scientific expeditions took a geologist and most expeditions took at least one doctor and, as it was anticipated that medical work would be light, the doctors were expected to have additional responsibilities, usually in science. A number of doctors were very inexperienced, going to the Antarctic within months of qualifying, and this implies that they were selected more for their non-medical skills and attributes than their medical ones.

Several of the doctors acted as geologists on expeditions and perhaps the most important geological discovery of the era was made by a doctor who was a keen naturalist and with knowledge of Antarctic science in general but without any formal geological training. My aim in this paper is to describe the medical involvement in the geology of the early Antarctic exploration.

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Dr James Harvey Pirie

William Spiers Bruce, the leader of the Scottish (*Scotia*) expedition (1902–1904) advertised for a doctor and bacteriologist (Anon. 1902) and appointed Dr James Harvey Pirie (1879–1965; Fig. 1). Before he qualified in medicine in Edinburgh in 1902, Pirie had obtained a science degree and, as a student, had worked with the ocean-floor samples from the *Challenger* expedition (1872–1876). He was given further training in field work by the Geographical Survey of Scotland (Rudmose Brown *et al.* 1906) and was appointed as geologist, in addition to his duties as doctor and bacteriologist. In practice, he devoted himself more to geology, being described even in his bacteriology report, as 'surgeon and geologist' and writing that 'extensive bacteriological investigations did not come into the programme of work undertaken on the Scotia' (Pirie 1912, p. 137). He investigated the geology of the Falklands (Pirie 1903), the deep sea deposits (Pirie 1905*a*, 1913*a*), the South Orkneys (Pirie 1905*b*, 1913*b*) and Gough Island (Pirie 1906). He also contributed to the zoology (Pirie 1908).

On his return he wrote up his geological results while continuing his medical career at the Edinburgh Royal Infirmary and other Edinburgh hospitals, specializing in pathology and bacteriology. In 1913 he joined the Colonial Medical Service in Kenya and in 1918 moved to the South African Institute for Medical Research, where he spent the rest of his career, ending as director. He had a distinguished career in medicine and bacteriology and is famous for being one of the discoverers of the Listeria family of bacteria which he named in honour of Lord Lister. I am not aware that he continued with geology. He retired in 1940 and died in 1965. His life has been briefly described elsewhere (Bernstein 1983).

Interestingly, William Bruce, the leader of the expedition, had also been an Edinburgh medical student (although he never qualified as a doctor) and had also worked on the results of the *Challenger* expedition (mainly the biological results), as well as doing a course on geology while a medical student (Swinney 2002).

Dr Reginald Koettlitz

On the *Discovery* expedition, the senior medical officer was Reginald Koettlitz (Fig. 2). He was born in 1860, in Ostend, of a Belgian father and English mother, but shortly afterwards his parents moved to England and he was educated at Dover College and later became a medical student at Guys Hospital. He qualified MRCS (Eng) in 1884 and LRCP (Edin) in 1886, and became a general practitioner in Butterknowle, a coal-mining village in Co. Durham. While there, he was a medical officer to local collieries, where he developed an interest in geology and made a collection of fossils from the coal-bearing strata (Bergman 1979). This interest is demonstrated by his membership of the Palaeontological Society (Anon. 1893).

Fig. 1. Dr Harvey Pirie (reproduced by kind permission of Glasgow Digital Library based at Strathclyde University).

Fig. 2. Dr Reginald Koettlitz (reproduced by kind permission of Royal Geographical Society and IBG).

Scott says, 'After qualifying he had settled down in the quietest of country practices where he remained for eight years and might have remained until the present time but for a sudden impulse to volunteer his services as a doctor to the Jackson–Harmsworth expedition' (Scott 1929, p. 49). Perhaps he answered the invitation in the *British Medical Journal* on 16 June 1894: 'May I ask you to allow me to make public through your columns the fact that we are now receiving applications for the post of surgeon to this expedition? Perhaps I may add that we should much prefer a man who has seen service in cold climates, and had a fair experience of roughing it. His age should not exceed forty' (Montefiore 1894, p. 1321).

This was a three-year expedition (1894–1897) to Franz Josef Land in the Arctic led by Frederick Jackson and financed by the newspaper proprietor, Alfred Harmsworth (Jackson *et al*. 1898; Jackson 1899). Also on this expedition were Albert Armitage who, later, was Scott's second in command on the *Discovery* expedition, and William Bruce, who led the Scottish expedition to the Antarctic. Koettlitz was the expedition's doctor and geologist, and published details of the geology of the area (Koettlitz 1898). His specimens were later examined by professional geologists, who felt that he 'had accomplished geological work which was among the most important of the results achieved by the expedition' (Newton & Teall 1898, p. 652).

The expedition also met Nansen on his return from his attempt to reach the North Pole, and Nansen and Koettlitz studied and discussed the geology of the area together (Nansen 1897), with Koettlitz's name being mentioned many times in the geological reports on Nansen's expedition (Nansen 1900). The two seem to have struck up a real friendship and corresponded regularly until Koettlitz's death.

In 1898 Koettlitz joined the Weld Blundell expedition to Somaliland and Abyssinia (Blundell 1900; Blundell & Koettlitz 1900) on which he acted as geologist and also as anthropologist. In 1901 he married and in the same year was appointed as the senior surgeon to the *Discovery* expedition. Sir Clements Markham wrote: 'On the strong recommendation of Mr. Harmsworth, who furnished me with the details of his medical career, I selected Dr. Reginald Koettlitz as surgeon . . . [he] therefore has considerable Arctic experience. He is anxious to do his best, zealous and painstaking and will, I believe be a success' (Markham 1986 pp. 15–16). Yelverton, in a book on the expedition, says that Harmsworth's financial support to the expedition was subject to Koettlitz (and Armitage) participating (Yelverton 2000, p. 53).

Koettlitz's interest in geology is demonstrated by his choosing the president of the Geological Society and the director of the Geological Survey of Great Britain as two of his three referees for the *Discovery* expedition, and their references show that, although an amateur, he was a competent geologist. Sir Archibald Geikie, the director of Geological Survey of Great Britain wrote:

> Dear Dr Koettlitz,
>
> In response to your request I gladly state that your work in Franz Joseph Land proved you to be thoroughly competent to carry on geological exploration . . .
>
> I feel sure that geological exploration in the Antarctic regions could not be placed in more capable hands than yours.
>
> To your scientific fitness you add the very great advantage of having been already inured to polar exploration.
>
> Hence I do not think it would be possible to find any one better qualified than you are to take a geological part in Antarctic research. (Geikie 1900).

Jethro Teall, President of the Geological Society, said that he and Koettlitz had differed in their opinion as to the origin of the basalts that Koettlitz found in Franz Josef Land, but that Koettlitz was proved correct. He went on to say: 'I mention this because it proves that you are much more than a collector of specimens. . . . I feel confident that, if selected, you will be able to render important assistance so far as geology is concerned' (Teall 1900).

However Scott had already appointed Hartley Ferrar, a recent geology graduate, as the expedition geologist and so Koettlitz was appointed as a botanist to study phytoplankton and he also did some bacteriology. However it is clear that Koettlitz maintained an interest in geology. Yelverton describes a sledging expedition 'to probe the southern route to the interior of Victoria Land and allow Koettlitz to study the geology and ice formations' (Yelverton 2000, p. 162), and the geological reports of the expedition (Ferrar & Prior 1907) make a number of references to specimens collected by him.

After the expedition Koettlitz became disillusioned as he was excluded from the writing up of the scientific reports and emigrated to South Africa, where he worked as a general practitioner until he died in 1916. A biography of Dr Koettlitz has recently been published (Jones 2011) and I have described his life in more detail elsewhere (Guly 2012*a*).

Dr Edward Wilson

The assistant surgeon on the *Discovery* expedition was Edward Wilson (Fig. 3). Born in 1872, he qualified in 1899, but only practised for a few months before having to give up as a result of illness. Despite failing his medical, he was appointed, at Scott's insistence, to act as zoologist and artist.

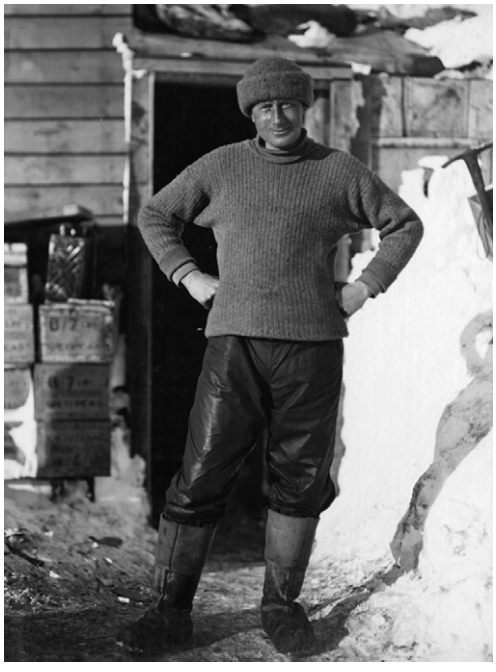

Fig. 3. Dr Edward Wilson (reproduced by kind permission of Royal Geographical Society and IBG).

Although the scientists on all the expeditions had their specific areas of expertise, they were (and scientists still are) expected to have an interest in 'Antarctic science' in general. This is partly because many of the disciplines are inter-dependent but, perhaps more importantly, because the logistics of Antarctic exploration mean that a single-handed scientist in one discipline needs to be able to offer support to (and receive support from) another single-handed researcher in a different discipline. Wilson had a wide interest in all natural history and it is clear that this included geology. As a schoolboy he collected fossils and his diary of the expedition (Wilson 1966) makes a number of references to the subject. The geology reports (Ferrar & Prior 1907) mention his name as a collector of specimens.

Edward Wilson also went on Scott's second (*Terra Nova*) expedition (1910–1913) as a zoologist and artist. Between the expeditions he had done no further medicine, but after writing up his Antarctic research, he worked as a wildlife artist and as a researcher of parasitic disease in grouse. There were two geologists with the main party (and another with the Northern party), but Wilson was the chief of scientific staff, overseeing the whole scientific programme, and he continued to take an interest in geology. Griffith Taylor, one of the geologists, makes several references to Wilson's interest, for example, 'Every evening before sleeping, Scott, Wilson, Debenham, [the other geologist] and I had some sort of a scientific discussion, usually on a local geological problem – such as the origin of Castle Rock – for many such confronted us' (Taylor 1916, p. 201).

Wilson also accompanied Scott to the South Pole. While Scott clearly hoped to be the first to reach the Pole, the journey also had scientific aims. Wilson's notebook records the features of glaciology and geology that he hoped to observe: 'Is the Beardsmore [glacier] scarped? How many tributaries enter at Grade? Angle of slope if possible. Dip of any bedding. Are there any parasitic cones or recent volcanic on glaciated shoulder. Note Dykes or Sills. In the Moraines – how far apart are the rocks. Normal granite and Gneisses need not be collected, only notes made. Axis of folding of gneiss wanted. Sample of dolerite wanted. Note the intrusions of Granites etc. into Beacon Sandstone. The important things are the Beacon Sandstone, Limestone and Coal beds. Get samples *in situ*. Make stratigraphical notes if possible . . .' (Wilson 2011). However, as is well known, they had been beaten by Amundsen. On the way back they stopped at Mount Buckley and, in Wilson's words: 'After lunch we all geologised until supper . . . masses of limestone in the moraine – and dolerite crags in various places. Coal seams at all heights in the sandstone cliffs and lumps of weathered coal with fossils, vegetable. Had a regular field day and got some splendid things in the short time' (Wilson 1972, p. 241). Scott was more specific, saying 'Wilson got great find of vegetable impression in piece of limestone' and 'Bill [Wilson] has got a specimen of limestone with archeo-cyathus' (Scott 2005, pp. 392–393). (This also indicates Captain Scott's knowledge of, and interest in, the expedition's science.) As is well known, Scott and his colleagues all perished on the return journey and Scott has been criticized for delaying for this science and for carrying 30 lb of rock specimens on the sledge when they were racing against time. The most severe critic has been Huntford, who wrote:

> They had dragged those thirty pounds of rock to show themselves martyrs to Science; a pathetic little gesture to salvage something from defeat at the pole and the wreck of their hopes. Half the weight in seal meat would have saved them. A pint of paraffin or a tin of pemmican would have been worth more to them than the most valuable stone in the world. And, in the end, the specimens meant almost nothing. Shackleton had done most of the work and by the time Scott's results were published, they had been overtaken by events (Huntford 2000*b*, p. 539).

Huntford's views on Scott have been very influential, but many feel that he set out to deliberately

denigrate Scott and that this particular paragraph 'is the judgment of a non-scientist bent on creating a sensation by debunking a legend' (Fogg 1992, p. 252).

This is not the place to discuss Huntford's general views on Scott, but in this case he was definitely wrong. For the plant impression that Wilson found proved to be Glossopteris and, as described above, this was powerful evidence that Antarctica had been joined to the other Southern continents to form Gondwana. Griffith Taylor said that 'these specimens ... have also a greater scientific value than any hitherto obtained in the Antarctic' (Taylor 1916, pp. 444–445) and a more recent perspective says that the specimens contained 'the first Glossopteris material to be recorded from Antarctica, establishing the age of the coal-bearing rocks of Victoria Land as late Palaeozoic and linking them with similar formations in other land masses in the Southern hemisphere. Wilson and Scott did make a significant contribution by not jettisoning them' (Fogg 1992, p. 252). Wilson's life has been described in at least three biographies (Seaver 1933; Wilson & Elder 2000; Williams 2008).

Dr Ernest Gourdon

Dr Jean-Baptiste Charcot led two French expeditions to the Antarctic – the *Français* (1903–195) (Charcot 2004) and the *Pourquoi Pas?* (1908–1910; Charcot 1978) expeditions. The geologist and glaciologist on both was Ernest Gourdon. He was born in 1875 and graduated in physics, physical geography and petrology in 1899 in Paris. Deciding that teaching was not for him, he enrolled on a medical degree later the same year, also in Paris. He was not the original choice of geologist for the *Français*, but presumably he had maintained an interest in geology and must have been well regarded as, when the original geologist left the ship when it reached Brazil, Charcot telegraphed the French Museum of Natural History to ask them to send him a replacement and they recommended Gourdon, who immediately sailed to Buenos Aires to join the expedition. He took a full part in both expeditions and acted as leader of the *Pourquoi Pas?* expedition when Charcot was ill. Although he was only a medical student, his medical knowledge was utilized as when one of the expedition members on the *Français* developed heart problems, Charcot wrote: 'Faced with the gravity of his condition I felt that I had to consult with Turquet [the medically qualified zoologist] and Gourdon, and acquaint them with my fears as well as with details of the regime to which I proposed to submit our colleague' (Charcot 2004, p. 135). On the *Pourquoi Pas?* he gave the anaesthetic when an injured whaler needed his fingers amputating (Charcot 1978, pp. 45 and 48) and was involved in the decision-making on a sailor with a severe foot injury (Charcot 1978, p. 261).

He wrote up the geological and glaciological results of the expeditions, obtaining a doctorate of science in 1908 for the geology he did on the *Français*. (Gourdon 1908). He published separately on the geology of Grahamland (the Antarctic peninsula), the South Shetlands and Jenny Island.

His medical studies were clearly much interrupted by these expeditions to the Antarctic and the writing up of his results, and by expeditions to the Arctic, with Charcot on the *Pourquoi Pas?* in 1912 and 1913. He eventually qualified as a doctor in 1913 with a thesis on the medical aspects of the *Français* expedition (Gourdon 1913) in which, in particular, he described the cardiac problems that affected several members of the expedition, which I believe were due to beri-beri (Guly 2012*b*). During the First World War he was a fighting soldier in the infantry and artillery, initially in the ranks, but later obtaining a commission. After the war he became a radiologist in Cannes but accompanied Charcot on a further expedition to the Arctic on the *Pourquoi Pas?* in 1928 and had planned to join the fateful expedition in 1936 when the *Pourquoi Pas?* was shipwrecked and Charcot drowned, but he arrived too late. He died in 1955. I have found no evidence of further geological publications.

Dr Leslie Whetter

The final Antarctic doctor whose name is linked with geology probably had no specific interest in the subject other than a general interest in Antarctic science, and he (almost literally) stumbled across the find with which he is associated. Dr Leslie Whetter was one of three doctors on Douglas Mawson's Australian Antarctic expedition (1911–1914). On this expedition he was one of three people in a sledging party that found a black object, about five by three inches, half buried in the snow. This they immediately recognized as a meteorite, the first to be found in the Antarctic, and it took until 1961 before the next one was found.

Conclusion

As it is expected that medical work on expeditions will be light, expeditions prefer to select a doctor who can also contribute to the scientific aims of the expedition, and so the doctors going to the Antarctic would not have been typical of doctors of the time. However medical education was broader than

it now is, with many medical schools teaching geology as part of natural sciences. I have noted above that William Bruce did a course on geology while an Edinburgh medical student, and in 1894 the Medical Faculty of Kings College, London, offered two exhibitions of £20 and £30 per year for 'proficiency in any four of the following subjects: Mathematics, Mechanics, Physics, Chemistry, Botany, Geology, Mineralogy and Zoology' (Anon. 1894). Spa and mineral waters played a large role in therapeutics, and geology (as it related to water supply and drainage) was an essential component of higher qualifications in public health (Anon. 1908). Botany was also taught, as many medicines at the time were derived from plants, but there were other reasons why natural sciences were emphasized, as explained to students entering Sheffield Medical School:

> the interest aroused in botany and zoology at this period of their lives, has been such as to give many medical men pleasant and valuable hobbies for their holidays and spare hours, and . . . has also contributed to that mental equilibrium so necessary for that who have to deal with the great questions of life and death in their future practice . . . Collateral subjects, such as geology and palaeontology, almost necessarily find some who are led on to take interest in them. (Howse 1902)

Perhaps only a minority would take such an interest, but for those who did, their medical education gave them a grounding in natural science that does not happen today and which fitted them perfectly for Antarctic exploration.

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