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Local geological heroes and characters: a selection

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Introduction

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This special issue of the Proceedings of the Geological Society of Glasgow largely comprises a set of extended abstracts arising from a one-day symposium held on 23 February 2008 as part of the celebrations of the Society's 150th Anniversary. The abstracts have been augmented by photographs of the 'heroes and characters', mostly from the Society's archive held at Glasgow University Library.

The meeting was hosted by Glasgow University's Department of Adult and Continuing Education (DACE). This was highly appropriate as DACE, along with the Glasgow Geological Society, has a long and proud tradition of making geology accessible to the wider public. The origins of the Society lie firmly in the movement for adult education during the early 19th Century expansion of Glasgow as a centre of industry and commerce (Macnair & Mort 1908, Macgregor 1958). They reflect the widespread urge for self-improvement and the desire to contribute to the understanding of how the world works.

Throughout the past 150 years, the Society has played a significant role in communicating our rapidly changing subject both to the scientific community and to the interested general public through scientific publications, lectures and field excursions. The half-century since the 100th Anniversary have seen the production of several field guides, the establishment of the Scottish Journal of Geology published jointly with our sister society in Edinburgh and, latterly, the development of the RIGS [Regionally Important Geological (and Geomorphological) Sites] movement to which the Society is making an increasingly significant contribution.

The idea for the 150th Anniversary symposium was prompted by a suggestion from the Geological Society of London that we consider holding a meeting to honour Sir Edward Bailey as part of the Local Heroes programme celebrating their 200th Anniversary in 2007. Circumstances meant that we were too late to join that series of events, but our symposium did indeed celebrate Sir Edward and was broadened to include an eclectic array of other geological 'heroes and characters' associated with Glasgow. Inevitably, this group of geologists, whose lives and works were scrutinised at the meeting and are described herein, are but a selection of the countless individuals, professional and amateur, who could have been discussed at the symposium.

The list of those who have had the privilege of being President of the Society (Table 1) is replete with individuals whose outstanding research, inspiration of subsequent generations or downright eccentricity make them more than worthy of celebration by the Society. These include the earliest presidents who epitomise the Victorian thirst for knowledge of the world about them, unconstrained by whatever formal qualifications a person may have or profession or trade they might follow. Although an almost unbroken succession of professional geologists has followed them in the role of president, even in recent times, the late Alex Herriot has demonstrated that an 'amateur' can still make a very significant contribution to the science. The roll call of presidents not included in our symposium includes stalwarts of the Geological Survey such as Sir Archibald Geikie, Ben Peach and J. E. Richey and a succession of distinguished academics. These include Charles Lapworth, whose work on graptolite biostratigraphy is still revered internationally, Arthur Trueman, pioneer of the use of numerical methods in palaeontology and Lord Kelvin who was President for 21 years and whose life was widely celebrated in 2007, the centenary of his death. The list of presidents is only the tip of the iceberg of Glasgow geologists whose scientific contributions and/or eccentricities are still the stuff of legend and reminiscence. There is therefore plenty of scope for future symposia.

The heroes and characters discussed at the symposium clearly demonstrate that science advances by a multitude of routes ranging from straightforward hard work to serendipitous discovery or the flash of inspiration. The indirect role played by those who awaken and nurture an interest in geology in others who then go on to make a contribution to the subject should also be acknowledged. As in any other walk of life, geologists encompass a wide range of personalities from the self-effacing to the incorrigible self-publicist, the meticulous worker to the theorist ready to dash off another article at the drop of an observation. Either way, science advances as does the technology used to undertake scientific research, and even work by some of the 'greats' of their day may no longer bear detailed scrutiny. Moreover, it must always be borne in mind that scientists are very much people of their time in terms of the way in which they see the world. Only one 'heroine' was celebrated at the meeting, Ethel Currie, who, as well as her contributions to the Hunterian Museum, was also the first of only three female presidents of the Society in its 150-year history. The celebrations of the Society's 200th anniversary will surely note a significant increase in this number. Between now and then the science will doubtless continue to grow as will the list of heroes and characters worthy of future celebration.

Acknowledgements

I am very grateful to Mike Keen, former President of the Society, and Helen McWhirr of DACE for their help in organising the symposium, Alec McKinnon who opened the meeting with a welcome on behalf of DACE, members of Society and the DACE staff for their assistance on the day and Maggie Donnelly for her editing of the final version of these Proceedings.

References

MACGREGOR, M. 1958. The Geological Society of Glasgow: 1858 – 1958. *Transactions of the Geological Society of Glasgow,* **23,** 134 – 152.

MACNAIR, P. & MORT, F. (eds). 1908. *History of the Geological Society of Glasgow, 1858 – 1908 with biographical notices of prominent members*. Geological Society of Glasgow, Glasgow.

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Table 1. List of Presidents of the Geological Society of Glasgow.

Date of Election	Session	President
1858	1	James P. Fraser FRSE
1860	3	John Scouler MD, LLD
1864	7	James Smith FRS, FGS
1867	10	Professor John Young MD
1872	15	Sir William Thomson FRS [Lord Kelvin]
1893	36	Sir Archibald Geikie FRS
1899	42	Professor Charles Lapworth FRS
1902	45	Ramsay H. Traquair LLD, FRS
1905	48	Benjamin N. Peach LLD, FRS
1908	51	Professor John Walter Gregory DSc, FRS
1911	54	John Horne LLD, FRS
1914	57	Professor John Walter Gregory DSc, FRS
1917	60	Robert Kidston LLD, FRS
1920	63	Professor Peter Macnair FRSE
1923	66	George Walter Tyrrell ARCSc, PhD
1926	69	Murray Macgregor DSc, FRSE
1929	72	James Ernest Richey MC, ScD, FRS, FRSE
1932	75	Sir Edward Battersby Bailey MC, DSc, LLD, FRS, FRSE
1935	78	James L.Begg FRSE
1938	81	Professor Arthur E. Trueman DSc
1941	84	John Weir DSc, FRSE
1944	87	Benjamin H. Barrett MA, BSc
1947	90	John Graham Comrie Anderson MA, DSc, FRS, FRSE
1949	92	Professor T. Neville George DSc, FRS, FRSE
1952	95	Ethel D. Currie DSc, FRSE, FGS, FMA
1955	98	Professor T. Neville George DSc, FRS, FRSE
1958	101	William R. Flett BSc, FRSE
1961	104	James Phemister MA, DSc, FRSE, FMSA
1964	107	Edward M. Patterson PhD
1967	110	Adam C. McLean PhD
1970	113	Doug Weedon PhD
1973	116	W.D. Ian Rolfe PhD, FRSE
1976	119	Alex Herriot MICE, MCIWM
1979	122	James G. MacDonald PhD, MBE
1982	125	W. Edward Tremlett PhD
1985	128	Judith Lawson PhD
1988	131	Michael C. Keen PhD
1991	134	Allan J. Hall PhD
1994	137	James G. MacDonald PhD, MBE
1997	140	Janey E. MacDougall BSc
2000	143	Colin J.R. Braithwaite PhD
2003	146	Christopher J. Burton PhD
2006	149	Alan W. Owen PhD

Extended abstracts in the order as presented at the symposium.

E. B. Bailey – the complete field geologist

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Porthcawl, Bridgend; formerly British Geological Survey & University of Leeds.

Except for eight years in Glasgow and three during World War I, Bailey was an officer in the Geological Survey, for most of that time in Scotland.

In 1901 Geikie retired as Director of the Survey and John Horne became Assistant Director, Scotland. Horne had been frustrated by Geikie's restriction on publishing and he swore that "if ever power came into his hands he would treat others as he himself had longed to be treated……and he kept his promise" (Bailey 1952), so for the first nine years from Bailey joining in 1902 he worked in the Lowlands and the Highlands on official business, mapping everything from the Precambrian to Quaternary, and while he contributed to the Carboniferous he would have been excused if he thought of it as less profound than his Highland work. This he pursued in his leisure time as well as officially, and during those years he revelled in the freedom allowed him by Horne to publish.

However, in 1911 Flett became Assistant Director, Scotland, and a great change came over the Survey. All publication other than in Memoirs was vetoed, including Bailey's leisure-time work, and these restrictions carried on after the war during which Bailey served with distinction, losing an eye and damaging an arm while winning an MC. Indeed when Flett became Director in 1920 he kept Bailey in the Lowlands for four years. What was worse, he banned staff from even seeing existing field maps while at the same time allowing the general public access. There is more than a suspicion that this ban was aimed at Bailey – who had married the sister of Flett's wife. There is even a tale, possibly apocryphal, that Flett sent Bailey back to one of the Inner Isles to map in a dyke which had been missed out – excusable in country where dykes are hardly scarce on the ground. Bailey had had enough. He wrote: "It was obvious that I must look elsewhere for scientific opportunity and I applied for the Chair of Geology at Glasgow" (Bailey 1952).

In his seventies, and retired as Director of the Survey, Bailey lived near the Scottish Office of the Survey and there spent a good deal of time, during which he wrote the second edition of the Glencoe Memoir. He was always available to pass on his expertise to young men. For instance, taking home a borehole core of lava mixed up with sediment and assuming it to be a lava flowed into sediment, he pointed out the reverse, namely that the lava came first and the sediment filled in the crevices. It was then that I realised too that he was colour blind in his one remaining eye, because he would go round with a microscope in one hand and say "I can see that this mineral is pleochroic, but can you tell me what are the colours?"

Early in 1953 I was approached by John Simpson, my District Geologist, saying that Bailey wanted to do some field work in Skye, but that his wife, Lady Bailey, was not prepared to let him go on his own, what with his one eye and damaged arm to say nothing of his age which was then 72. I was to keep an eye on Bailey for a week or ten days while he checked up on the Creag Strollamus gabbros. These rocks had attracted a good deal of interest at the time because of a paper by Basil King (King 1953) which alleged that the gabbros were "granitised" or "gabbrotised" Tertiary basalts, and since the granitisation controversy was in full flood at the time I was very interested. I was promised £25 from the Clough Fund for the purpose.

When we got to Skye we knocked doors trying to persuade someone to take us in. Eventually we succeeded and the following day were soaked to the skin. Next morning we put on our wet clothes ("it is alright if they are warm and wet Francis") and proceeded to Scalpay. There we ascended a stream about 1200 ft high and on reaching the top, where it opened out into a small tarn, Bailey took off his four garments and plunged in. He then got out and put his clothes on and walked off with the wet seeping through his shorts. It was early in March.

I realised gradually that Bailey was much more concerned with something that King had written about the Kishorn Thrust than about the gabbros. He didn't tell me much – perhaps because I was a mere coalfield geologist but I was fascinated by his field techniques. He hardly ever hammered away at outcrops, always preferring to get down on his hands and knees to examine the rocks. In the second of two papers appearing in the *Geological Magazine* (Bailey 1954) he did note that "the nature and situation of the Broadford dolerite (or gabbro) is considered to be an irregular sheet penetrating the Durness Limestone". I do not recall that we saw much if anything of the gabbro so when we returned to Edinburgh and Bailey sat down to write his paper (he had the remarkable facility of sitting down with a pile of foolscap and a pencil and writing directly for the typist – no drafts) I felt that I hadn't contributed enough to be a part author. Bailey was annoyed at my declining his genuinely generous offer. I handed back the Clough Fund.

It is somewhat ironic that Bailey wrote one of Flett's obituaries. It goes to show that you should always be kind to your subordinates; you never know who is going to write your obituary.

References

BAILEY, E. B. 1952. *Geological Survey of Great Britain.* London: T. Murby & Co.

BAILEY, E. B. 1954. Contact of Tertiary Lavas with Torridonian near Broadford, Skye. *Geological Magazine,* **91,** 105 – 115.

KING, B. C. 1953. Structure and Igneous Activity in the Creag Strollamus Area of Skye. *Transactions of the Royal Society of Edinburgh,* **62,** 257 – 402.

Excursion to Devon Valley, April 1903, led by Benjamin Peach, showing Sir Edward Bailey, aged 22 years, in the background.

E. B. Bailey in the Grampian Highlands: cauldron subsidence, nappes and slides

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Edward Bailey joined the Geological Survey in Scotland in 1902, immediately after graduating from Cambridge and, after a brief introduction to Dalradian geology in Argyll, he joined an experienced team that had already been working in the Lochaber and Appin area for seven years. His own mapping area lay between the Grey Corries and Kinlochleven and he soon became involved in establishing the stratigraphy of the highly varied Dalradian sequence, and unravelling the structure throughout the whole region. But his first major contribution was to suggest to his colleagues that the inlier of volcanic rocks at Glen Coe, which had been mapped largely by H.B. Maufe, was the result of 'cauldron subsidence' – the foundering of the volcanic edifice into an underlying magma chamber along a subcircular ring-fracture. Their seminal paper (Clough et al. 1909) became a model for countless volcanic studies for the next 80 years or so.

His Dalradian studies soon led to the notion that the strata were disposed in a stacked series of large Alpine-style recumbent nappes, something that up to this time had been suggested but not clearly demonstrated. The limbs of many of the nappes seemed to lack large sections of the established stratigraphy, which he explained by the presence of large-scale low-angled extensional dislocations, termed 'lags'. He recognised that these were in marked contrast to the compressional 'thrusts' that by then were well known, from relatively recent work in the NW Highlands for example. He regarded thrusts and lags as two distinct types of ductile dislocations, which he termed 'fold-faults' or 'slides'.

Despite having established the Dalradian succession in the Lochaber area and having identified most of the major folds, he freely admitted that he could not decide upon the way-up of the succession. He was also baffled by the number of quartzite outcrops in the Kinlochleven area; was there just one quartzite, repeated by folding, or were there three separate quartzites? In his early publications (Bailey 1910, Bailey and Maufe 1916) he tentatively decided upon an order of succession and just one quartzite. He later re-affirmed this more definitely (Bailey 1922). However, in 1924 Bailey acted as guide for a visit to the Ballachulish area by Thorolf Vogt of the University of Trondheim. Vogt was accompanied by two postgraduate students from the University of Wisconsin, Olav Rove and Sherwood Buckstaff, who had learned and practised the use of sedimentary structure in Precambrian terranes as undergraduates. They very soon pointed out that Bailey's succession was the wrong way-up and that there were in fact three separate quartzites in the Kinlochleven area. It seems that Bailey was not finally convinced of this until, in 1927, he and Vogt were both invited to join a Princeton University summer school that traversed Canada by rail. Thereafter he embraced the new ideas with all the zeal of a new convert and, with great aplomb, completely reversed his Lochaber order of succession, whilst introducing us to the terms 'antiform', 'synform' and the hideous verb 'to young' (Bailey 1930, 1934). Printed one-inch-scale Geological Survey maps had to be modified but, to this day, there are still original six-inch-scale maps in the archive that have the wrong way-up succession and misidentified quartzites. Linked papers were published consecutively in the *Geological Magazine* of 1930 by Bailey, Vogt and by the leader of the Princeton trip, Thomas Tanton of the Canadian Geological Survey, himself a Wisconsin graduate. The University of Wisconsin claim that it was that event that led to sedimentary structures becoming widely used to interpret metamorphosed sequences throughout Europe, just as they had been doing for decades (Dott Jr 2001).

On completion of the survey in the Western Grampian Highlands, Bailey's official work then took him to the Inner Hebrides and Ayrshire, but over the next twenty years or so he spent much of his free time and holidays extending his investigations of Dalradian stratigraphy and structure over a wide swathe of ground between Islay and Braemar. His published accounts of this work in the *Quarterly Journal of the Geological Society of London* and the *Transactions of the Royal Society of Edinburgh* are all accompanied by beautifully coloured maps and are among his best-known work. So, few people today are aware that his 'official' Geological Survey mapping in the Grampian Highlands was restricted to the ground around Kinlochleven and a few smaller areas along the west coast of Argyll. The majority of his 'additional' mapping was accomplished in characteristic 'broad-brush' style and at great speed. In addition to breaking new ground, he also re-interpreted ground that had already been mapped by his Survey colleagues. This practise met with disapproval from his superiors, most notably Sir John Flett, the Survey Director, who was also Bailey's brother-in-law (they were married to sisters). The expenditure of one's own time and energy on non-Survey activities was no doubt frowned upon unofficially, and at that time the publication of such work was not supported as a matter of policy. Various restrictions were imposed, including a ban on consulting field maps from areas other than one's own (even though these were made available to the general public). The mounting scientific frustration eventually led to Bailey applying for, and gaining, the Chair of Geology in Glasgow, which he took up in January 1930.

In Glasgow he was free to study what he felt were the most interesting and rewarding parts of the Dalradian terrane and to publish his views without official hindrance. He later wrote, 'my scientific life had been saved' (Bailey, 1952). After seven years he returned to the Geological Survey, this time as Director, but with an agreement that he would be free to continue his own research and to increase rather than restrict the scientific opportunities of his staff. But within two years, war had broken out in Europe and he had to spend most of his directorship steering the Survey through strategic wartime activities.

He retired from the Survey in 1945, with a knighthood, in order to pursue newly emerging geological opportunities overseas. He maintained an active interest in the Dalradian throughout his retirement, contributing critical and incisive discussion to virtually every paper read to the Geological Society on the subject for the next twenty years. He built up a fearsome reputation but, reading through those discussions today, what becomes apparent is the way in which the most strident criticism was frequently tempered by praise for another aspect of the same work and, as throughout his career, he always seemed to bend over backwards to acknowledge the contributions of other people to his own work. His final word on the Dalradian was to put matters straight in the second edition of the Ben Nevis and Glen Coe memoir, published under his name in 1960, fifty-five years after he first started work in the area.

His legacy lies in the names and overall geometry of most of the major structures of the western and central Grampian Highlands which, despite numerous re-interpretations of their age and relationship to each other, remain very much as he first described them 80 years ago.

References

BAILEY, E. B. 1910. Recumbent folds in the schists of the Scottish Highlands. *Quarterly Journal of the Geological Society of London*, **66,** 586 – 620.

BAILEY, E. B. 1922. The structure of the South-west Highlands of Scotland. *Quarterly Journal of the Geological Society of London*, **78,** 82 – 127.

BAILEY, E. B. 1930. New light on sedimentation and tectonics. *Geological Magazine,* **67,** 77 – 92.

BAILEY, E. B. 1934. West Highland tectonics: Loch Leven to Glen Roy. *Quarterly Journal of the Geological Society of London,* **90,** 462 – 523.
BAILEY, E. B. 1952. *Geological Survey of Great Britain.* London: T. Murby & Co.
BAILEY, E. B. 1960. The geology of Ben Nevis and Glen Coe and the surrounding country (2nd edition). *Memoir of the Geological Survey, Scotland,* Sheet 53 (Scotland). London: HMSO.
BAILEY, E. B. & MAUFE, H. B. 1916. The geology of Ben Nevis and Glen Coe and the surrounding country (1st edition). *Memoir of the Geological Survey of Great Britain,* Sheet 53 (Scotland). London: HMSO.
CLOUGH, C. T., MAUFE, H. B. & BAILEY, E. B. 1909. The cauldron subsidence of Glen Coe and the associated igneous phenomena. *Quarterly Journal of the Geological Society of London,* **65,** 611 – 678.
DOTT, R. H. Jr. 2001. Wisconsin roots of the modern revolution in structural geology. *Bulletin of the Geological Society of America,* **113,** 996 – 1009.
TANTON, T. L. 1930. Determination of age-relations in folded rocks. *Geological Magazine,* **67,** 73 – 76.
VOGT, T. 1930. On the chronological order of deposition of the Highland schists. *Geological Magazine,* **67,** 68 -73.

E.B. Bailey and the Palaeogene Staffa Formation of SW Mull: Lava trees and daisy wheels

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It may safely be maintained that Mull includes the most complicated igneous centre as yet accorded detailed examination anywhere in the world.

So reported E. B. Bailey in his introduction to the ground-breaking 'Mull Memoir', published in 1924, within which the surveyors of the British Geological Survey provided a highly innovative account of the Palaeogene extrusive and shallow intrusive units that dominate the Inner Hebridean island of Mull. Bailey was the senior author of the memoir and was responsible for integrating the myriad of observations made by luminaries such as C.T. Clough and J.E. Richey. Bailey's contribution to the field survey itself, involved the lavas in SW and eastern Mull. It is the south-western sequence that forms the focus of this presentation. Figure 1 illustrates the broad stratigraphic and structural relationships of the oldest lava-dominated sequence, exposed in SW Mull on the Ross of Mull and the Ardmeanach Peninsula, the so-called Staffa Formation.

The Staffa Formation comprises a complex, laterally variable succession of lavas facies, hyaloclastites and other breccias, together with various interflow sedimentary rocks. The sedimentary rocks and associated palaeo-surfaces, in as much as they represent significant periods of hiatus in the volcanism, enable us to subdivide the Formation into a number of allostratigraphical units termed genetic sequences. Each sequence is essentially a couplet comprising a basal sedimentary unit and an upper volcanic unit. In detail, some sequences may comprise more than one laterally restricted sub-couplet. There are systematic patterns in both the distribution and thickness of the sedimentary and volcanic lithofacies that make up these major units. The individual sequences appear to show a strong structural control of thickness, distribution and lithofacies, which can be linked to palaeo-topographic effects, especially their position within pre-existing Palaeogene fault-controlled valley systems or active, syn-volcanic graben formation. Two main grabens are recognised: Beinn an Aoinidh and Carraig Mhor. The intervening Carsaig Platform acted as a barrier between these two main depositional channels, with lavas and sediments fed either south-eastwards along the axes of the grabens, or from input points adjacent to the grabens.

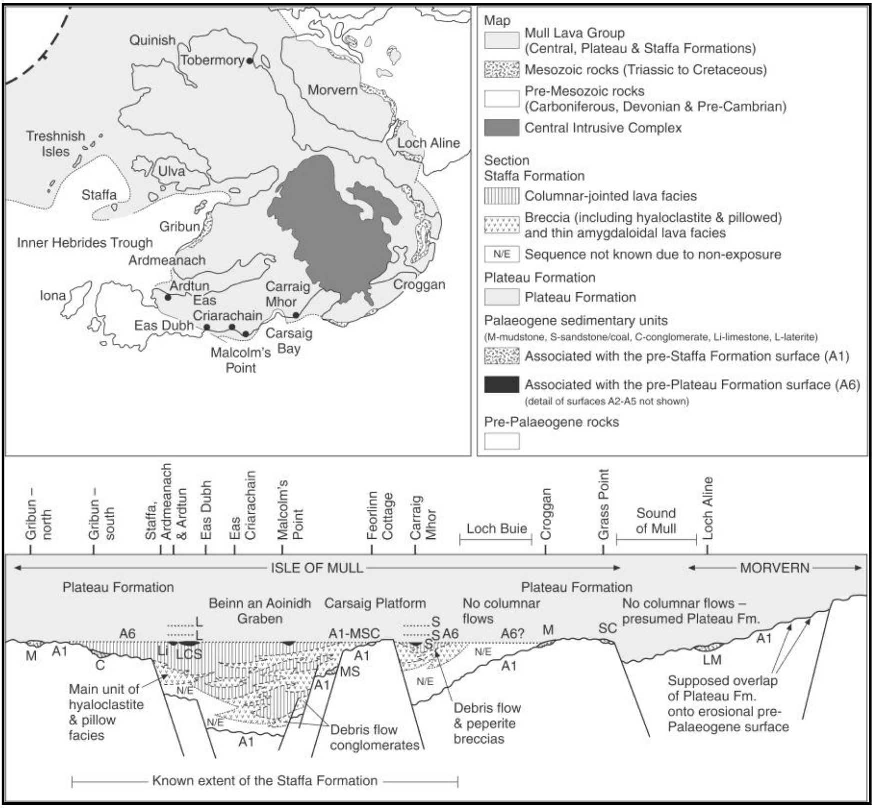

Figure 1: Simplified geological map and schematic cross-section illustrating the broad stratigraphic and structural relationships of the Staffa Formation and the overlying Plateau Formation (from Bell & Williamson 2002).

The presence and significant role played by the contemporaneous drainage system and topography during the evolution of the Staffa Formation is demonstrated by the number and variety of intercalated sedimentary units and the nature and facies of the volcanic products. The clearest example of the latter is the close association of hyaloclastite breccias and the emplacement of thick, impounded lava flows exhibiting classical two-tiered columnar jointing (Figure 2). These flows comprise classic colonnade-entablature couplets, with the colonnade comprising large regular columns in the basal portion of a flow, formed as a consequence of controlled cooling and volume reduction aided by heat loss through the lava's (commonly water-saturated or submerged) substrate. The upper portion of such flows, referred to as the entablature, comprises less-regular columns, typically with a much reduced spacing between the joint surfaces and attributed to cooling aided by the ingress of water from the contemporaneous land surface. Classic examples include the Fingal's Cave Flow on Staffa (Figure 2) and the Macculloch's Tree Flow on the westward-facing coast of the Ardmeanach Peninsula.

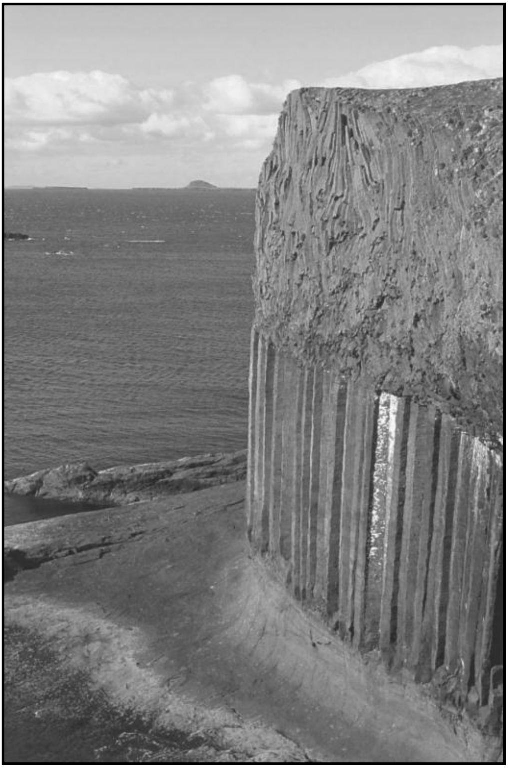

Figure 2: The Great Face, Staffa, comprising the classic colonnade-entablature couplet of the Fingal's Cave Flow. The flow is at least 35 m thick, as its top is not preserved. The substrate comprises stratified basaltic agglomerates and volcaniclastic breccias and sandstones. Locally, the base of the flow is a pillowed facies, attesting to the (water) flooded nature of the landscape during eruption of this and other flows of the Staffa Formation. Note the regular geometry of the colonnade relative to the considerably more 'chaotic' nature of the overlying entablature. A remarkably planar surface separates the contrasting portions of the flow.

Palaeontological data, especially palynological analysis, allows further detailed ecological characterisation of the sedimentary units and palaeo-surfaces and the development of a model for the early landscape evolution of the volcano, involving high energy fluvial systems, lakes, swamps and significant tracts of ground populated by mature forests. Perhaps the most famous examples of fossils preserved within the Staffa Formation lavas and sedimentary units, respectively, are the Fossil Tree of Burg (commonly referred to as Macculloch's Tree in honour of John Macculloch who first described it in 1819) (Macculloch 1819) and the Ardtun Leaf Beds (Gardner 1887, Boulter & Kvacek 1989).

The so-called 'lava trees' of Mull, exemplified by Macculloch's Tree, but comprising examples as far afield as the Quinish Peninsula in NW Mull and at Malcolm's Point on the south coast of the Ross of Mull, dramatically modified the local cooling of the entombing flows, causing the cooling joints to deflect from their typically vertical disposition and become horizontal. When seen in plan view, the jointing pattern is fancifully reminiscent of a 'daisy wheel' albeit on a somewhat larger scale (Figure 3).

The thin mudstones and siltstones inter-bedded with conglomerates on the coast north of Ardtun on the Ross of Mull contain spectacular leaf imprints, together with various other plant and animal remains, which permit precise age dating and palaeoenvironmental interpretations of the lava field.

Although some 84 years have passed since the Mull Memoir was published, the observations and interpretations of Bailey and his colleagues remain remarkably fresh and insightful. Indeed, anyone interested in the evolution of the Mull Volcano is well advised to take a copy of the memoir and accompanying geological map, together with an open mind and a firm appreciation of the talented geologists in whose footsteps they tread!

Figure 3: A typical 'daisy wheel' within the Macculloch's Tree Flow at Carraig a' Mhinisteir, comprising a central vertical pipe (interpreted as the mould of the original vertical 'lava tree' (*ca*. 4 m across), surrounded by columnar-jointed lava, with the joints oriented orthogonal to the (once) vertical tree. Note people for scale.

References

BAILEY, E. B., CLOUGH, C. T., WRIGHT, W. B., RICHEY, J. E. & WILSON, G. V. 1924. Tertiary and post-Tertiary geology of Mull, Loch Aline and Oban. *Memoir of the Geological Survey, Scotland,* (a description of parts of sheets 43, 44, 51, 52). London: HMSO.

BELL, B. R. & WILLIAMSON, I. T. 2002. Tertiary Igneous Activity. In: *The Geology of Scotland* (4th Edition). *Ed:* N. Trewin. Geological Society of London.

BOULTER, M. C. & KVACEK, Z. 1989. The Palaeocene flora of the Isle of Mull. *Special Papers in Palaeontology,* **42.** The Palaeontological Association. 149 pages.

GARDNER, J. S. 1887. On the Leaf Beds and Gravels of Ardtun, Carsaig &c., in Mull. With notes by Grenville A. J. Cole. *Quarterly Journal of the Geological Society of London,* **43,** 270 – 300.

MACCULLOCH, J. 1819. *A description of the western islands of Scotland, including the Isle of Man: comprising an account of their geological structure with remarks on their agriculture, scenery, and antiquities.* Edinburgh : London : Archibald Constable ; Hurst and Robinson.

E. B. Bailey and his work at Ballantrae

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E. B. Bailey, an eccentric, was Professor of Geology at Glasgow from 1930 – 1937 and President of the Geological Society from 1932 – 1935. He came from the Geological Survey and left Glasgow to become its Director. He graduated from Cambridge and was appointed to the Geological Survey of Scotland. He had accompanied many officers of the survey in the mapping of large areas of Scotland and had, in his own time, mapped a great deal more of Scotland himself. After a dispute with Flett, the then Director, he was appointed to the Chair at Glasgow on the retirement of J. W. Gregory. During his time in Glasgow he spent much effort in continuing his examination of the Dalradian rocks. At Ballantrae, towards the end of his career, his eccentricity overtook him, for with W. J. McCallien he became obsessed with the Steinmann Trinity, serpentine, pillow lavas and cherts (earlier papers had already included these rocks in a co-magmatic series called Ophiolite), serpentine magmas and strange ideas on the metamorphic zones beneath the serpentinite. His investigations at Ballantrae were not a great success, and some of these mistakes he characteristically, and very freely, admitted to in later publications.

Scotland played a great part in the early years of the growth of Geology as a discipline, partly because of the great impetus by the work of Hutton and Lyell and their followers, but also, in part, because there was a great deal of variety in the rocks exposed in Scotland. Observations were collected from rocks from the Highlands and Southern Uplands and with the growth of palaeontology and stratigraphy many of these problems were gradually being opened up and some were resolved. These were clearly important times when people began looking at the Earth's surface in a great deal more detail and determining many of the principles we are familiar with today. And so unconformities were regarded as more or less widespread breaks in continuity of sedimentation, orogeny was pulsatory and last felt in the Alpine Orogeny (and we were living in a quiet interlude) and metamorphism was seen as a pervasive, regional event as demonstrated in the Scottish Highlands, rather than a local phenomenon.

With these principles being found and enforced in the south, Ballantrae along with the Lizard Complex were certainly not the best places to start looking and attempting to understand what had taken place in the crust. Here were rocks which broke all the rules with, for example, foliated dykes which cut unfoliated dykes. The rocks at Ballantrae are probably amongst the most confusing group of lithologies in Scotland and as such, were subject to an enormously diverse set of interpretations. The relationships between rocks were put on an entirely different footing when it became apparent, much later, that the serpentine, an altered ultra-basic rock, had a provenance of at least 30 km (and probably > 60 km) into the earth's interior, and to find it juxtaposed with black shale presented an enormous structural problem. When we look back at the interpretation of the rocks at Ballantrae, it is difficult to escape the conclusion that we have come a long way in the understanding of the Earth's crust.

The main problems during the early part of the 20th Century were concerned with the fact that igneous rocks were found in association with both sediments and bands of metamorphic rocks. Metamorphic rocks were normally associated with the Highlands and large scaled movements in the crust, which clearly applied there. But to find similar rocks at Ballantrae in thin slivers presented early workers with a great problem. So it is important to see the work of any geologist in the context of the time in which he lived, and this is particularly the case at Girvan-Ballantrae. We have to be aware at this stage that very little was understood of how lavas and cherts had formed and only a very superficial view of how the serpentinite formed. By the time Peach & Horne (1899) had published their great work on the Silurian rocks of Scotland it was clear that cherts were composed of radiolarians and had been identified as sediments found in deep water. The discovery of radiolarian chert in Scotland was made by Nicholson (1890) and confirmed in detail by Hinde (1890) both of whom favoured a comparison to the deep sea oozes found on the Nicobar Islands and Barbados. Radiolarian cherts were described by Peach & Horne from the coast at Bennane Head, and pillow lavas were likewise interpreted as sub-aqueous extrusive rocks. So the thinking was confined by the knowledge of the time – as is always the case. We need to understand the breadth of knowledge existing at that time in order to evaluate the observations and conclusions drawn by these workers.

E.B. Bailey visited Ballantrae in 1951, 1954 and 1955 along with W.J. McCallien and sometime after he was completing his main work in the Highlands. He had, around this time, been working with McCallien on the Anatolian Thrust and the Ankara Melange in Turkey where they had documented evidence for a 'serpentine lava' (Bailey & McCallien 1953).

Work on the rocks at Ballantrae had begun early with the publications of Nicol (1844) and Murchison (1851). The latter compared the rocks with those exposed in SW England at the Lizard Complex. Geikie (1866) gave a fuller account of the district but assigned the serpentinites to a metamorphic origin. It was Bonney (1878) who, after a study of the serpentinite at Ballantrae suggested that it was indeed an altered olivine rock of igneous origin and at the same time noted the occurrence of lavas and agglomerates which he assigned to the Old Red Sandstone. He was also of the opinion that the serpentinite was indeed intrusive into other rocks. However, Lapworth (1889) demonstrated that the igneous lavas were indeed Arenig in age, but suggested that the intrusion of the serpentine took place after the later Ordovician cover rocks and possibly in Silurian times.

Peach and Horne (1899) produced the great memoir on the Silurian rocks of Scotland where they claimed that the Arenig lavas, black shales and cherts were invaded by serpentines, gabbro and granite. This view was contradicted by Pringle who saw the serpentinite as a Pre-Cambrian basement. Anderson (1936) provided evidence on the shore at Pinbain, where he found a spilite, the margin of which had been apparently replaced by thin slivers of serpentinite, both of which had different textures. He recognised this as a serpentinite lava which had invaded an existing spilite succession. Later Hess (1938) and Tyrrell (1955) pointed out that serpentinite was an altered peridotite and that serpentine may flow upwards through fractures.

Anderson (1936), following Peach & Horne (1899), also pointed out that a zone of metamorphic rocks underlies the northwesterly dipping serpentinite running from Carleton Hill to Loch Lochton. Here the serpentine appears to have been carried on top of a thin metamorphic belt which included an amphibolite. He did not make a great deal of this fact, but drew a map of the contact. Bailey & McCallien (1960) suggested that the heat needed for the metamorphism (to bring the rocks up to amphibolite grade) comes from the "numerous dykes" which intrude the contact. In this context Barrow, many years earlier (1893) had suggested that the numerous granites which intrude the Dalradian rocks were responsible for raising their temperature during metamorphism.

The term 'Steinmann Trinity' was commented on by Teall (in Peach & Horne 1899). It was more formally accepted by Bailey & McCallien (1960). However Staub (1922) referred to the rocks serpentinite, gabbro and spilite as ophiolite and thought they were co-magmatic, so in that sense the work of Bailey & McCallien is already a little out of date. They found Ballantrae a confusing place, often changing their minds over really quite important structure and relationships. They concurred with Anderson (1936) that the serpentinite was intrusive into lava citing an example of the coast at Pinbain and suggested that a serpentinite lava was extruded onto the sea floor. These observations come from a part of the Ballantrae sequence where there is a great deal of faulting and serpentinite has been remobilised along these fractures.

They also commented on many aspects of the complex, one of which was the rocks at Stockenray. The Stockenray succession has been shown to be a hyalotuff delta and is seen by many workers, including Bailey & McCallien as "one of the most interesting petrological localities in Scotland". The "agglomerate" was not linked to the overlying lava and was "quite possibly in a neck" and escaped spilitisation by being "cooled in volcanic waters which, at the time, excluded the sea".

The Ballantrae Complex has since been subject to a great deal of investigation and it is clearly an ophiolite, a piece of crust of oceanic origin, but one which has suffered a great deal of compression. The serpentinite has been evaluated and has formed at depths well in excess of 60 km; the metamorphic belt now accepted as forming in the zone beneath the serpentines, has a very much reduced assemblage of metamorphic sheets ranging from *ca.* 12 – 15 kb to surface conditions. All of these facts suggest that there have been enormous displacements in the ophiolite sequence (Oliver et al. 2000).

References

ANDERSON, J. G. C. 1936. Age of the Girvan-Ballantrae serpentine. *Geological Magazine,* **73,** 535 – 545.

BAILEY, E. B & McCALLIEN, W. J. 1953. Serpentine lavas, the Ankara melange and the Anatolian thrust. *Transactions of the Royal Society of Edinburgh*, **62,** 403 – 442.

BAILEY, E. B. & McCALLIEN, W. J. 1957. The Ballantrae Serpentine, Ayrshire. *Transactions of the Geological Society of Edinburgh*, **17,** 33 – 53.

BAILEY, E. B. & McCALLIEN, W. J. 1960. Some aspects of the Steinmann Trinity. *Quarterly Journal of the Geological Society of London*, **124,** 365 – 395.

BARROW, G. 1893. On an intrusion of muscovite-biotite gneiss in the South-eastern Highlands of Scotland, and its accompanying metamorphism. *Quarterly Journal of the Geological Society of London,* **49,** 330 – 358.

BONNEY, T.G. 1878. On the serpentines and associated igneous rocks of the Ayrshire coast. *Quarterly Journal of the Geological Society of London,* **34,** 769

GEIKIE, J. 1866. On the metamorphic Silurian rocks of the Carrick, Ayrshire. *Quarterly Journal of the Geological Society of London,* **22,** 513.

HESS, H. H. 1938. A primary peridotite magma. *American Journal of Science,* **35,** 321 – 344.

HIND. G. J. 1890. Notes on Radiolaria from the Lower Palaeozoic rocks (Llandeilo-Caradoc) of the South of Scotland. *Annals of the Magazine of Natural History Series,* **6,** 40

LAPWORTH, C. 1889. On the Ballantrae rocks of the south of Scotland and their place in the Southern Upland succession. *Geological Magazine,* **20,** 59.

MURCHISON, R.I. 1851. On the Silurian rocks of the South of Scotland. *Quarterly Journal of the Geological Society of London,* **7,** 137 – 178.

NICOL, J. 1844. *Guide to the geology of Scotland.* Oliver & Boyd, Edinburgh.

NICHOLSON, H. A. 1890. Recent progress in palaeontology as regards invertebrate animals. *Transactions of the Edinburgh Geological Society,* **6,** 58.

OLIVER, G. J. H., STONE, P. & BLUCK, B. J. 2000. *The Geology of Scotland*. (Ed N. H. Trewin). Geological Society of London.

PEACH, B & HORNE, J. 1899. The Silurian rocks of Britain. Volume 1 Scotland. *Memoirs of the Geological Survey of the United Kingdom.*

STAUB, R. 1922. Über die Verteilung der Serpentine in den alpinen Ophiolithen. *Schweizerische mineralogische und petraphische Mitteilungen,* **2,** 78 -149.

TYRRELL, G. W. 1955. The distribution of igneous rocks in space and time. *Bulletin of the Geological Society of America*, **66,** 405 – 426.

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J. W. Gregory, explorer and polymathic geologist: his influence in Glasgow and on the British rejection of continental drift.

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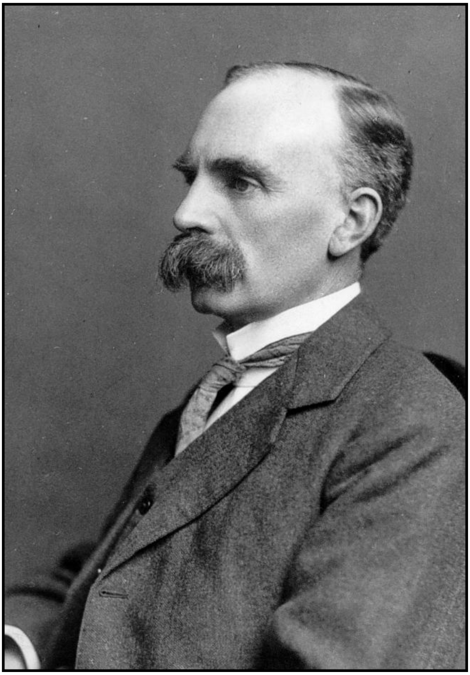
Outline of Gregory's life

The first so-named Professor of Geology in the University of Glasgow, from 1904 to 1929, was John Walter Gregory, born in London in 1864. Previously geology had been taught by the Regius Professors of Natural History since 1807. Gregory's father, John James Gregory (1828 – 1876), was an expert wool merchant who lost nearly everything in the 1865 Overend Gurney Bank collapse, and he died in 1876 when Gregory was 12. This left the family with very little, so that as soon as Gregory left Stepney Grammar School at 14½ he started work, first as a farm worker and then in 1880, aged 16, with a firm of wool merchants that had a very high opinion of his father (Nicholson 1932).



J. W. Gregory

Thus began an incredible life of hard work. He worked as a wool clerk all day and then went straight to evening classes in science, especially geology, eventually at Birkbeck Institution (later College), where he was largely taught by Royal School of Mines staff. He would return home to a hearty meal, prepared by his mother, about midnight, after which he would work at his books or writing for another two or even three hours, before snatching a brief sleep of about four hours. He kept to these long working hours most of his life. He walked everywhere at about 5 mph.

He showed an early interest in Geology and joined the Geologists' Association in 1883. At first he studied without thought of a degree, only matriculating in 1886, by which time he had already published articles on geology. These attracted attention, and he was elected FGS in 1887 and obtained one of two vacant Assistantships at the British Museum (Natural History) [BM(NH)], in an open competition with Oxbridge graduates, although he had not yet even taken his Intermediate BSc exam and would not graduate until 1891 (1st Class Honours in Geology, London) because he took an extra year of advanced biology.

At the BM(NH), or Natural History Museum (NHM) as it is now, he worked first on echinoids, then corals and later bryozoans and all three with amazing output. Over the 12 years he was there he published over 80 papers, almost all single-authored, amounting to well over 1000 pages. In the evenings and holidays, after his official work, he beavered away on other topics, such as mapping in the Cottian Alps, petrological studies on rhyolites and perlitic structures, on basalts and gabbros in Bavaria, and a range of petrological studies including translating and publishing Russian determinative mineralogical tables by F. Loewinson-Lessing (Gregory 1893). He could also read German, French and Italian though he never spoke a foreign language competently. The paper which subsequently earned him his DSc degree was published in 1891 before he got his BSc, being a major study of the Maltese Cainozoic echinoidea and the implications across much of Europe (Gregory 1891).

However, the very first study he did at the NHM (Gregory 1889) was to be extremely important in later moulding his views on continental drift. He studied the very deep water echinoids from the Radiolarian Marls of Barbados, thus confirming their deep water origin. These Eocene Marls were both underlain and overlain by Eocene shallow water rocks. The overlying Eocene shallow water sediments were covered by Oligocene to Miocene shallow water sediments, then a coral reef, all of which had been uplifted and exposed, the Radiolarian Marls now being 350 m above SL. The only explanation seemed to be that right out in the ocean as Barbados is, up and down movement of the ocean floor was possible, a view held by Lyell, but disputed by those who held the permanency of the ocean basins. We now know that Barbados is part of an accretionary prism due to westward subduction under the Caribbean plate and no less than 45 thrusts, giving tectonic breaks, are responsible for the interleaving of deep and shallow water sediments there (Speed 1994). However, this was not known until recently and any judgement of Gregory's views has to be based on what was known in his time.

In 1891 he attended the International Geological Congress in Washington, DC, and then toured the US, crossing the Basin and Range, visiting Yellowstone and the Rockies etc. In 1892 – 3 he was given leave to be the surveyor and geologist to an alleged private expedition to British East Africa (Kenya) intending to return through Ethiopia to British Somaliland, led by a Lieutenant Villiers, with 8 Europeans and a planned 300 African porters and soldiers. Due to disastrous leadership, disease etc, it collapsed after a few weeks and Gregory nearly died from malarial dysentery and fever.

Astonishingly, he resolved to mount his own expedition, at his own cost, despite still being ill and, in fact, with only 40 Africans went from Mombasa to the Rift Valley (the first use of the term) near Lake Baringo and back by Mount Kenya, which he unsuccessfully attempted to climb, covering 1650 miles in 5 months and bringing back enormous collections. He wrote this up in a classic book *The Great Rift Valley* 1896, reprinted in 1968, which dealt with the geology, geomorphology, botany, zoology, entomology, anthropology, etc and which brought him instant fame. He continued to work and publish on Africa all his life.

Because the rivers run away from the Rift Valley, now called the Gregory Rift in Kenya, he deduced a blister of magma had caused an arch, which collapsed when the observed post-Jurassic volcanic extrusions released the magma. This accords with the modern view of uplift due to an early plume, before volcanism and collapse under tension. He drew the first cross-sections across the Gregory Rift and recognised the role of tension, rather than compression, because of the unfolded nature of the rocks.

He continued to work on corals, echinoids and bryozoans from many different parts of the world, and to work in the Alps in his vacations, but his next major expedition was making the first crossing of Spitsbergen (Svalbard) with Sir Martin Conway in 1896 and the early use of skis. This prompted a series of papers on Arctic geology and the distribution of the oceans and continents. This interest in Polar matters, together with his reputation as an ‘intrepid explorer’ resulted in him being appointed Director of the British Antarctic Expedition in 1900, but when in 1901 it became clear that the Royal Geographical Society regarded this primarily as a race to the South Pole, rather than a purely scientific expedition, he resigned, and Captain Scott became the Head. In 1899 he visited the Caribbean Islands, collecting.

In 1900 he was appointed to the Chair of Geology in Melbourne and started to work and publish on mining geology in Victoria and then Tasmania. He was also asked to be Director of the Geological Survey of Victoria while still holding his Melbourne chair and he did both jobs, the income from the Survey post going entirely to Departmental purchases. He introduced field work in the University course and although Australians were good walkers, nevertheless Gregory could outwalk most of the students and the Melbourne students used to sing:

Here’s to Prof Greg’ry who walks at his ease,
While all his pore students go bung at the knees.

To join Gregory on his way to or from work was to be sure of a burst of vigorous exercise. He was, as Morrison (2003) put it in only slight exaggeration, “not your average ‘Prof’. He was a radical and inspiring teacher, and he put a million volts through the stuffy little imitation Oxford he found in Victoria’s fragile metropolis”. Gregory was elected FRS in 1901.

He led an expedition in the middle of the Austral summer 1901 – 2 around Lake Eyre in central Australia that resulted in an iconic book *The Dead Heart of Australia* (Gregory 1906) which, like the term ‘Rift Valley’ coined a lasting phrase. He published on a wide range of Victorian geology, several geographical textbooks and visited New Zealand and Western Australia, and worked on the Mt Lyell Copper Mine, Tasmania, but resigned the Chair because of his wife’s health, on being appointed to the new Chair of Geology in Glasgow in 1904. He loved Australia, continued to write on it and became a passionate supporter of the ‘Keep Australia White’ campaign.

While in Glasgow he built the First Year course to the largest in the UK – over 400 students. He re-vitalised the geological work in the Hunterian Museum, added thousands of specimens and initiated a series of papers from the Museum which brought wide recognition to the Museum. He visited South Africa, Rhodesia (Zimbabwe), India, Brittany, USA, Canada, Australia and Scandinavia, led expeditions to what is now Libya, and to Angola, and with his son to SE Tibet, revisited Kenya and the Rift Valley. He worked in Bosnia, Burma, Ireland and did much work in Scotland, mainly at the weekends and later with his yacht off the west coast. He was twice President of the Glasgow Geological Society (1908 – 1911 and 1914 – 17), involved with the Royal Philosophical Society of Glasgow, including re-starting the Geographical Section in 1909, was President of the Scottish Ski club, twice President of the Geology Section of the BA and once of the Geographical Section, and President of the Geological Society, 1928 – 30, and was awarded numerous medals and Honorary degrees. He started the Geography Department in Glasgow University, had radical views on education, especially technical education, and spent 1917 – 1919 serving on a Commission aimed at improving the University of Calcutta, then the largest in the world with 26,000 students and examining 288,000 candidates in 854 High Schools. He went all over India, including the Himalayan foothills.

Gregory was a small man, a life-long teetotaller and non-smoker, and absolutely indefatigable, who worked all day at the University and then spent 4 – 6 hours most nights at home in undisturbed writing. Unless he was lecturing, he had a slightly hesitant way of speaking that could mislead you into thinking he was not certain about what he told you, but if you disagreed, an outpouring of facts would assure you that he knew (almost) all there was about the subject, displaying a superb memory for a range of facts. He was a modest, quiet man, who did not easily recount his experiences, immensely popular, beloved by his students and many friends. He lectured and published on an amazingly wide range of geographical, geological, anthropological and even economic, social and racial, matters, almost all single-authored, totalling over 300 papers and over 30 books. He had a strong mission of undertaking studies of use and benefit to mankind. According to Bill Bryson in *A short history of Nearly Everything*, in 1919 Gregory made one of the most important discoveries ever made that helped to elucidate the origins of the human race, in discovering and recognising the human artefacts 65 km from Nairobi that later formed the basis of the famous Leakey hominoid work.

Gregory 'jumped' to conclusions, believing it was better to express an interpretation than sit on the fence. Of course he made some real mistakes, such as his views on the Tetrahedral theory of the Earth, the structure of the Dalradian and its stratigraphy, the supposed formation of many Scottish drumlins by wind erosion, the rejection of eskers as formed from rivers flowing under ice sheets, the supposed plutonic source of artesian well water in Australia, and his belief that the oceans formed by simple subsidence of continental crust. The last view was much influenced by the writings of Gregory's hero, Eduard Suess, author of *The Face of the Earth* volumes. Once formulated, Gregory rarely changed his views, even when new evidence destroyed the original bases for his conclusions. An important characteristic was his ability, which can be directly traced to his upbringing, of being able to totally disagree with another person's scientific conclusions while remaining friendly with them and not taking the matter in a personal way.

Wherever he went he continued writing quite undisturbed by his surroundings. Thus he commonly wrote a book on his longer sea voyages and several papers also. He wrote most of a book on Australia while returning from Australia in 1914 via China, the Trans-Siberian railway and Leningrad. While in the Caribbean he was writing on the deck of a ketch, unperturbed by the breaking waves until one almost washed him and his chair and script overboard.

He retired early at 65 in 1929 in order to complete several books and his massive (each 54 pages) Geological Society of London (GSL) Presidential addresses on the history of the Atlantic and Pacific Oceans (Gregory 1929, 1930) and to lead an expedition to Peru, where he was drowned in 1932 when a canoe overturned in a whirlpool.

Continental Drift

Gregory had seen so many parts of the world, studied and written on such a wide range of Geology, that his opinion on continental drift, especially as President of the Geological Society, was influential among geologists. Surprisingly he never overtly attacked the theory. Indeed, as Marvin (1985) states, his review (Gregory 1925) of the translated 3rd Edition of Wegener's theory seemed at first to be favourable to the theory, but in fact, as brought out supremely in his GSL Presidential addresses (Gregory 1929, 1930), on which most of the following is based, he did not accept the theory, believing that the ocean basins were simply subsided continental crust. It was easier to imagine subsidence of 4 km (faults throwing almost this amount vertically were known on land), than horizontal movement of thousands of kilometres.

Gregory (1923) first revealed his views in a little-known review of the 3rd German Edition (Wegener 1922) which Gregory read in the original. He commented on the attractiveness of explaining the jigsaw-like fitting of the continental shapes and of being able to explain the variations in the past climates of different regions by moving the continents across climatic zones, while keeping the climate of the Earth as a whole in the past more or less constant, an axiom Gregory held unwavering throughout his life. However, he ends by rejecting the theory, for several reasons, the main one being the 'concertina-like' horizontal movements backwards and forwards of the continents required when their history is traced far enough back. No force adequate to do this was known at that time.

Unlike some, Gregory strongly supported close correlations between the rocks and fossils of the same age across both the North and South Atlantic, citing fossil evidence from an amazingly wide range of organisms, which his early years as an NHM palaeontologist gave credence to. But he also pointed out that there were also excellent comparable correlations across the Pacific Ocean, which he detailed, while according to Wegener's theory, the Pacific Ocean would have been 3000 to 5000 km wider before the Atlantic Ocean formed than now. The implication was that biological correlations across oceans did not require the opposite edges of the oceans to have been in close geographical contact, while comparing the flora and fauna of eastern China with western Europe revealed very significant differences, although physically there was continuous land connection between the two regions.

Another strong point that Gregory made about the oceans being underlain by sunken continental crust, was that boring at Funafuti Island, north of Fiji in the Pacific Ocean (now part of Tuvalu), had convinced most that Darwin's theory of the origin of coral atolls and islands was correct. They had formed by growth of shallow water coral reefs on sinking topographic eminences. All over the Pacific Ocean were scattered such coral islands, especially in lines and arcs which Gregory thought were the sunken peaks of mountain chains and up-folds of the crust, now submerged due to sinking of the Pacific Ocean. This seemed to be confirmation of the reality of Pacific Ocean subsidence.

Although there were objections that isostasy required the oceans to be underlain by denser rocks (now known to be mostly Mid-Ocean Ridge basalt) than the continental crust, Gregory (1930) cavalierly dismissed such proposals writing 'the claim that the Earth's surface is always in full isostatic equilibrium seems to me contradicted by many geological facts. If isostasy be so stated that it is inconsistent with the subsidence of the ocean-floors, so much the worse for that kind of isostasy'. Such a statement by a geologist might seem an outrage to physics but to dispel any such suggestion, Gregory immediately followed with 'Dr Harold Jeffreys, to whose advice on the question I am much indebted, kindly allows me to say that he fully agrees with the foregoing'. Jeffreys (1891 – 1989) FRS, the Cambridge physicist, later knighted, opposed continental drift on the grounds that no force capable of moving continents thousands of kilometres was known. Thus it seemed that Gregory's views were not the rantings of a geologist ignorant of physics.

In view of Gregory's almost unrivalled wide geological experience around the world, and both his broad grasp of palaeontology and his known particular expertise in crinoids, corals and bryozoans, which gave him credence as a genuine palaeontologist, it is not surprising that most – not all, notably Arthur Holmes – British geologists had reservations about continental drift involving thousands of kilometres of movement when a few kilometres of up and down vertical movement would suffice. Nowhere in Gregory's two addresses does he specifically disparage the theory of continental drift; indeed Marvin (1985) states he 'cannot be counted among the outright foes of Wegener's hypothesis'; he simply made an apparently overwhelming case for an alternative interpretation, which if correct, *ipso facto* ruled out continental drift. In a sense this approach was, to the British mind, more persuasive than if he had been hammering out an overt anti-drift message.

However, the subsidence theory left unanswered one very obvious and beguiling fact that Gregory did not attempt to explain; the jigsaw like fitting of the shapes of western Europe and western Africa to the eastern coasts of North and South America, which was as perfectly apparent then, as now. One might have predicted that he would have cited the parallelism of the opposite sides of the Great Rift Valley as an analogous explanation, but no, he specifically ruled that out by emphasising that the processes which produced the Great Rift Valley were entirely different from those that caused oceanic subsidence.

In conclusion, although Gregory's views definitely helped delay British acceptance of continental drift, it must be remembered that Wegener's theory did not involve ocean floor spreading as we now understand it; the Pacific for instance, was not proposed as a spreading ocean.

Acknowledgements

A full account of Gregory's life and geological contributions is in advanced preparation. I thank Mrs Anne Mendell of Texas for supplying much unpublished information.

References

BRYSON, B. 2004. *A Short history of Nearly Everything.* Black Swan, London, 687pp.

GREGORY, J. W. 1889. On *Cystechinus crassus* from the Radiolarian Marls of Barbados. *Quarterly Journal of the Geological Society,* **45,** 640 – 650.

GREGORY, J. W. 1891. The Maltese fossil Echinoidea, and their evidence on the Correlation of the Maltese rocks. *Tranactions of the Royal Society of Edinburgh,* **36,** 585 – 640.

GREGORY, J. W. 1893. *Tables for the Determination of the Rock-forming Minerals by F. Loewinson-Lessing.* Translated from the Russian by J. W. Gregory. London, Macmillan, 55pp.

GREGORY, J. W. 1896. *The Great Rift Valley.* London, John Murray, 422pp. Reprinted in 1968 by The Cass Library of African Studies, Frank Cass & Co. London, 422pp.

GREGORY, J. W. 1906. *The Dead Heart of Australia. A journey around Lake Eyre in the summer of 1901 – 2 with some account of the Lake Eyre Basin and the flowing wells of Central Australia.* John Murray, London. 384 pp.

GREGORY, J. W. 1923. Climatic changes and continental drift. *The Edinburgh Review or Critical Journal,* **238,** 85 – 103.

GREGORY, J. W. 1925. Continental Drift. Review of *The Origin of Continents and Oceans* by Alfred Wegener. Translated from the 3rd German edition by J. G. A. Skerl. *Nature,* **115,** 255 – 257.

GREGORY, J. W. 1929. The Geological history of the Atlantic Ocean. *Quarterly Journal of the Geological Society,* **85,** lxviii – cxxii.

GREGORY, J. W. 1930. The Geological history of the Pacific Ocean. *Quarterly Journal of the Geological Society,* **86,** lxxii – cxxvi.

MARVIN, U. B. 1985. The British reception of Alfred Wegener's Continental Drift Hypothesis. *Earth Sciences History,* **4,** 136 – 159.

MORRISON, I. 2003. *The Baker of Maldon.* Catalogue of a Baillieu Library Exhibition commemorating the centenary of the George McArthur bequest, 1903. University of Melbourne, 10pp.

NICHOLSON, (NEE GREGORY) A. J. 1932. Unpublished mss detailing the early life of John Walter Gregory.

SPEED, R. C. 1994. Barbados and the Lesser Antilles Forearc. In *Caribbean Geology: An introduction.* Kingston, University of West Indies Publishers Association, 79 – 192.

WEGENER, A. 1922. *Die Entstehung der Kontinente und Ozeane.* (3rd Edition), Braunschweig.

The ‘geographical’ work of J. W. Gregory

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> *“[Gregory] represents a type which becomes ever more uncommon among men of science: the man who takes the whole earth and its inhabitants as his province – a master of living knowledge”*
>
> Sir Arthur Keith,
> in the Foreword to Gregory’s (1931) *Race as a Political Factor*

Introduction

John Walter Gregory was born in 1864 and he drowned in 1932. He was immensely productive, publishing more than 300 papers and 30 books. The bulk of these were geological but Gregory also wrote extensively on areas that might be more usually considered, at least in these times, as Geography. He wrote on general geography (e.g., Gregory 1903, 1908), economic geography (Gregory 1906a), and geomorphology (e.g., Gregory 1913a, 1913b, 1926). He even wrote on theoretical geography, judging Livingstone’s exploration superior to his theoretical geography (Gregory 1913c). Gregory was clearly convinced of the value of geology’s sister discipline, dedicating *The Geography of Victoria: Historical, Physical, and Political* (1903) “To E.E.C. who taught me – amongst much else – to realise the educational value of Geography”. As John Lovering (1983) has so neatly expressed it: Gregory was “an exceptional scientist whose greatest achievements straddled the shadow line between geology and geography” (p.101).

This paper surveys briefly the contributions of J. W. Gregory to geography. I make some general comments first, and then examine Gregory’s work in the areas of anthropology and human/cultural geography, including on race, immigration and multi-ethnic societies. Finally I add some brief comments on the ways in which the latter work, which to our 21st Century eyes seems very racist, was probably a product of its times.

Gregory and the human dimension

Gregory seems to have been fascinated by human society. One of his most famous books, *The Great Rift Valley* (Gregory 1896), is probably best known for his coining of the term ‘rift valley’, which is still the term applied to this great landform, and for his recognition that the rift valley is bounded by crustal-scale normal faults. Much of the book is essentially narrative travelogue, however, with extensive tracts on the local people, as well as on flora, fauna and politics. Indeed, the sub-title casts the book as “the narrative of a journey to Mount Kenya and Lake Baringo, with some account of the geology, natural history, anthropology, and future prospects of British East Africa”.

Likewise, during his time in Australia as a University of Melbourne Professor, prior to coming to Glasgow, he led a group (including University students) on a major expedition to Central Australia (Gregory 1906b). The expedition was on camels in summer and the bulk of the party was undergraduate students (five of the party of nine, “exclusive of aboriginal guides” [p.39]). (Incidentally, one cannot escape the thought that current health and safety rules and guidelines would probably prevent a mid-summer expedition into some of the harshest desert country on Earth.). Aborigines are an important part of Gregory’s account of this expedition, being the subject of the second longest chapter in the book. Moreover, Gregory apologises in the Preface for “the fewness of the references in the chapter on the aborigines”, which are “given … more fully in another work” (Gregory 1906b, p.vii).

More focused contributions to human affairs

Probably the most idiosyncratic of Gregory's contribution to what we may call the non-geological, explicitly 'human affairs' literature was *The Story of the Road* (Gregory 1931b). This 300-page book is a wide-ranging and comprehensive survey and history of roads and road-making, from antiquity to the future. The book's Preface indicates that Gregory was invited (presumably by the publisher) to write this book. It may be that his prolific book-writing had turned him into a successful author and publishers sought out topics where there were gaps in the market that they felt he was able to fill. The Preface touches on road policy (road vs. rail), national expenditure on road construction and maintenance, and the importance of roads for public health.

It is in the area of race, migration and inter-racial marriage that Gregory is perhaps at his most controversial when writing on human affairs. He had an abiding interest in racial or ethnic issues, even with respect to scientific method:

> "The rash pursuit of cosmogonies did not suit the British mind, which preferred facts that could be established by observation to the uncertain products of speculation. Mephistopheles, in Goethe's "Faust", speaking as the evil genius of Continental science, sneers at the British love of facts:
>
> 'Are Britons here? They travel far to trace
> Renowned battlefields and waterfalls.' "
>
> (Gregory 1919, p.20)

Gregory's interest in race/ethnicity was certainly evident early in his adult life. The 27-year old Gregory went fossil hunting in North America in 1891, and Sir Arthur Keith noted in the Foreword to *Race as a Political Factor* that Gregory "became as much interested in the racial as in the geological problems of North America. What was the white American to do with his black brother? What was America to do with the immigrant flood which the diverse nations of Europe poured on her shores?" (Gregory 1931a, p.6). In Australia Gregory "had the opportunity of studying primitive humanity living under primitive conditions" (Gregory 1931a, p.7), and "Glasgow gave him opportunities of studying the friction evoked by racial contact and the difficulties which attend the process of amalgamation of diverse nationalities" (Gregory 1931a, p.8). In his mid-40s, Gregory visited North Africa to assess Cyrenaica in Libya for its suitability for Jewish colonization as a possible Jewish homeland, and he visited Angola in 1912 for the same purpose. His interest and perceived expertise in racial and ethnic affairs were clearly well known. His viewpoints and conclusions concerning race and migration were presented in a series of books and pamphlets throughout his career (Gregory 1913c, 1925, 1928, 1931a). A key message of *Race as a Political Factor* concerned "the difficulties and dangers which have arisen in our modern world as the result of the commingling of diverse races of mankind". The conclusion of *Race* is that

> "both from analogy with cross-breeding in animals and plants, and from observations of human cross-breeds, the intermarriage of members of the three primary races of mankind produces in general inferior and unreliable progeny. The segregation of the three races is desirable"
>
> (Gregory 1931, p.70).

Gregory's (1913c) tribute on the occasion of the centenary of David Livingstone betrays the same antipathy to the black African races. He notes that Livingstone made "the most important contribution to the geography of tropical Africa that has ever been made" and goes on to note that this "feat was all the more magnificent as it was achieved by help enlisted from a negro chief" (p.17). Likewise, "Livingstone was … the most influential pioneer in opening tropical Africa to civilising influences" (p.33), and his "death roused Europe to a sense of its responsibilities to Europe and the conviction that we are our black brothers' keepers" (p.37).

Final thoughts

Gregory was intimately involved in 'geographical' research throughout his life. In that regard, he was like many geoscientists of his era, active in both geology and geography. The great W.M. Davis was at various times President of the Geological Society of America and the Association of American Geographers. So pervasive was Davis's influence that his Geographical Cycle (the Cycle of Erosion) was cited in one of the great debates of early 20th Century geology as proof that orogeny must have been episodic throughout geological history (Bishop 2008). T. N. George, one of Gregory's successors in the Glasgow Chair, also published on geomorphology and landscape evolution (e.g., George 1966, 1974). Few geologists, however, were as prolific as Gregory in the area broadly grouped under the heading of human geography, including political geography, cultural geography and economic geography.

Gregory's comments on race, inter-marriage and migration sound patronising and racist to our ears but he praised Livingstone's work in Africa. Livingstone's geographical exploration and research were aimed at finding and developing African lands that would generate income for the indigenous Africans, thereby precluding their having to be sold into slavery. It is true that Gregory (1913c) concluded that "there can be no doubt that the Africans are immeasurably safer and happier today than they were forty years ago" (p.38), but this viewpoint is probably no more than the dominant, even universal, viewpoint of people of Gregory's class and contemporary social milieu. It is noteworthy that Gregory's position at the University of Glasgow was always fully noted in all books, and that his LLD was awarded within three years of the publication of *The Menace of Colour* and in the same year that *Human Migration and the Future* was published. It can be concluded that Gregory was a man of his times and that his views were essentially those of the establishment society. Indeed, there were loud echoes in the mid- to late 20th Century of Gregory's (and the-then society's) views, in events and structures such as the White Australia policy and Enoch Powell's "rivers of blood" speech. In fact, many would probably endorse Gregory's views today.

Gregory's involvement in the search for a homeland for the Jewish state is intriguing, and is explored fully in Professor Bernard Leake's forthcoming biography of Gregory. The provision of a homeland for the Jewish people is entirely consistent with Gregory's advocacy of the separation of races and ethnic groups. The almost-daily news items on the Palestine – Israel conflict in the early 21st Century is a frequent reminder of this most prolific and wide-ranging geologist.

References

BISHOP, P. 2008. Tectonic and Related Landforms. *In* Chorley, R.J. et al. (eds), *The History of the Study of Landforms*. London, The Geological Society, 56 – 105.

GEORGE, T. N. 1966. Geomorphic evolution in Hebridean Scotland. *Scottish Journal of Geology,* **2,** 1 – 34.

GEORGE T. N. 1974. Prologue to a geomorphology of Britain. *Institute of British Geographers Special Publication,* **7,** 113 – 125.

GREGORY, J. W. 1896. *The Great Rift Valley.* London, John Murray (reprinted 1968 in facsimile by Frank Cass and Company, London).

GREGORY, J. W. 1903. *The Geography of Victoria: Historical, Physical, and Political.* Melbourne, Whitcombe and Tombs.
GREGORY, J. W. 1906a. Economic geography and development of Australia. *Geographical Journal.*
GREGORY, J. W. 1906b. *The Dead Heart of Australia.* London, John Murray (reprinted 1997 in facsimile in a limited edition by Corkwood Press, North Adelaide).
GREGORY, J. W. 1908. *Geography: Structural Physical and Comparative.* Glasgow, Blackie and Sons.
GREGORY, J. W. 1913a. *The Nature and Origin of Fiords.* London, John Murray.
GREGORY, J. W. 1913b. The Polmont kame and on the classification of Scottish kames. *Transactions of the Geological Society of Glasgow,* **14**: 199 – 218.
GREGORY, J. W. 1913c. *Livingstone as an Explorer: An Appreciation.* Glasgow, John Maclehose.
GREGORY, J. W. 1919. *Geology of Today.* London, Seeley, Service & Co.
GREGORY, J. W. 1925. *The Menace of Colour.* London, Seeley, Service & Co.
GREGORY, J. W. 1926. Scottish drumlins. *Transactions of the Royal Society of Edinburgh,* **54**, 433 – 440.
GREGORY, J. W. 1928. *Human Migration and the Future.* London, Seeley, Service & Co.
GREGORY, J. W. 1931a. *Race as a Political Factor.* Conway Memorial Lecture. London, Watts and Co.
GREGORY, J. W. 1931b. *The Story of the Road.* London, Alexander Maclehose.
LOVERING, J. F. 1983. Gregory, John Walter (1864 – 1932). *Australian Dictionary of Biography***,** **9**, 100-101; Melbourne, Melbourne University Press.

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T. Neville George and his contribution to the understanding of the Upper Palaeozoic rocks of the British Isles

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T. N. George was a stratigrapher-palaeontologist who was appointed to the Chair of Geology at Glasgow in 1946 after being the Professor of Geology at Swansea for 13 years. He became president of the Geological Society of Glasgow from 1949 – 1952 and from 1955 – 1958. At both Swansea and Glasgow he succeeded Sir Arthur Trueman who, like T. N. George was a stratigrapher, palaeontologist and a geomorphologist. Like most geologists of his time he had a very wide range of interests, publishing on palaeontology, stratigraphy, sedimentology, structure and geomorphology. After working on stratigraphy (together with producing maps) in South Wales and in Ireland he then went on to collate the details for the whole Carboniferous of Britain. Although not directly working in Scotland, he nevertheless published on the Midland Valley Carboniferous, which was somewhat different from the Carboniferous rocks in the south, and on Scotland in general.

It was a time when the theory of evolution was accepted but still being debated and its application to the fossil communities was still going on. Lapworth had demonstrated the great value of graptolites in the division of the Ordovician rocks of Scotland and, partly on this basis, Vaughan (1905) erected a classification of the limestones in the Bristol gorge based on the idea that fossils came into the rocks, and then evolved or disappeared, so that the rocks could be characterized by their fossil content. It was on this ground that he divided the Carboniferous Limestones into series, each of which was typified by an assemblage of fossils. George, a

Professor in a very small Department at Swansea, saw this as a breakthrough and used the scheme to establish the zones in the rocks across the estuary, in Wales. He classified the 'Avonian rocks', first along the North Crop of the South Wales coalfield and then in the Vale of Glamorgan extending that into Gower, and finally the East Crop of the coalfield. In the subdivision of the Lower Carboniferous he created maps which brought out the structure, and this was no better done than in Gower where he produced a detailed zonal map and, as a consequence, a detailed structural map of the region. From a study of the displacement of the Carboniferous zones he showed that tear (lateral) faults were in evidence (George 1940) as indeed he had shown earlier in the Vale of Glamorgan. The Gower map is his classic work.

On being appointed to the Chair at Glasgow he extended the work he had committed himself to in South Wales to Ireland, where some of the geology was done by research students. He continued to use the zonal scheme erected by Vaughan and used a variety of journals to publish in, although there were few around he could use. Like many geologists at the time he confronted a wide variety of problems so, in addition to the mapping and erection of the zones, he also published on the palaeontology, sedimentology and the geomorphology of most of the regions he had mapped. This was essentially the role of geologists of the day – to become either igneous, metamorphic or soft rock, and if you became a soft rock geologist you also became interested in fossils, stratigraphy and geomorphology.

Soon George turned his attention to the wider issues in the Carboniferous rocks which he has specialised in. Here, he synthesised the data on the Lower Carboniferous rocks, using isopachs and facies analysis to demonstrate areas of subsidence, contemporary uplift and sea-level change (George 1958). He illustrated overstep and overlap of the various zones, showing the progressive submergence of the relict blocks from the Caledonian earth movements. In addition he presented maps of the geology of the area prior to the deposition of the overlying beds (the 'floor' to the overstepping series). When he came to the Carboniferous rocks of Scotland, he demonstrated the evidence for the deeply subsiding small basins, ignoring the probability of their margins being faulted.

He then continued writing about the geology of Scotland first with a synthesis of the geology of the Midland Valley (George 1960), then with an evaluation of the whole of Scotland, in the British Caledonides. He finally discussed aspects of the European Palaeozoic in *Aspects of the Variscan Fold Belt*. He was amongst the first to bring together much of the work on the whole of the Palaeozoic rocks of Scotland. In this area he was a bit of a pioneer,

Although the regional geology of Britain, in a palaeogeographical series, was already done by Wills (1951), very few people had drawn on a modern synthesis of the geology of Scotland, looking at the Archaean rocks in the NW, the metamorphic block of the North and the sedimentary rocks of the Midland Valley and Southern Scotland – integrating them all into a complete compendium of Scottish geology. It was in this work he was to show both the strengths and weaknesses of his background, particularly his background in South Wales. He applied the kind of stratigraphy which had stood him well on the southern side of St George's Land (the old landmass which stretched across central Wales and England) where old blocks were overstepped and formations were laterally persistent for some distance.

He projected the Palaeozoic rocks, from Ordovician to Carboniferous, well into the Highlands, and in the south, over the Southern Upland Fault well into the Southern Uplands, seeing the Midland Valley as a post Lower Devonian (i.e. Middle Devonian) structure. He was careful to note that the Arenig rocks at the Highland Boundary Fault were similar in lithology to those at Ballantrae and saw no reason to stop their extent at the Fault, so continued them across it, over the present Highlands and suggested a possible link with the Durness Limestone in NW

Scotland. A few years later, Harper (1967) demonstrated that the Dalradian rocks were cooling from metamorphism at roughly this time, so such a correlation would be most unlikely.

With all its weakness, Kennedy's earlier (1958) paper on the Midland Valley, in many ways, was an account with far more appreciation of the problems which the region presented. Being brought up in Scotland, and having a background quite different from George, he did not extend rocks too far beyond their outcrop. However neither Kennedy nor George had looked carefully at the rocks they were discussing nor had they read papers describing them and existing at the time. For example, George rightly pointed out that the Lower Old Red Sandstone overlapped the Highland Boundary Fault at a number of places to rest on the Dalradian – which indeed it does at Creiff, Blairgowrie, Kerriemuir, Dunkeld and Kintyre. But when it does, the Lower Old Red Sandstone often has a totally different composition from contemporary rocks south of the Fault suggesting that they were laid down possibly in a different basin.

Stuart Henderson (Director of Glasgow's Museums), Sir Edward Bailey, Professor T. N. George and Hugh Brown M. P. examining the geological relief map of Glasgow at the Centenary Exhibition, 1958.

George continued to use associations seen elsewhere to deduce what was happening in Scotland. For example, he had the Southern Upland sequence begin in the Cambrian, which then extended over the Midland Valley to meet the Cambrian at the Highland Border. This he argued on the grounds that the Ordovician (in North Wales) was "never being known to occur in ground that was earlier without a Cambrian cover". Indeed the Cambrian unconformity is one of the great, widespread unconformities of the world, cutting as it does all other rocks types, but this has limited applicability to the Southern Highlands which was probably undergoing an uplift at or shortly after this time.

George, when he wrote about Scotland, used stratigraphy alone to elucidate the problems of structure. He had done this with a measure of success in Wales. We now know that palaeocurrents, composition of the conglomerates and reconstruction of the environments of deposition are also needed and in the years following his syntheses these became far more important. The results showed that the Midland Valley is a far more complex structure and Scotland a more complex area than he had deduced.

References

GEORGE, T. N. 1940. The structure of Gower. *Quarterly Journal of the Geological Society of London,* **96**, 131 – 198.
GEORGE, T. N. 1958. The Lower Carboniferous Palaeogeography of the British Isles. *Proceedings of the Yorkshire Geological Society,* **31,** 227 – 318.
GEORGE, T. N. 1960. The stratigraphical evolution of the Midland Valley. *Transactions of the Geological Society of Glasgow,* **24,** 32 – 107.
HARPER, C. T. 1967. The geological interpretation of potassium-argon ages of metamorphic rocks from the Scottish Caledonides. *Scottish Journal of Geology,* **3**, 46 – 66.
KENNEDY, W. Q. 1958. Tectonic evolution of the Midland valley of Scotland. *Transactions of the Geological Society of Glasgow,* **23**, 106 – 133.
WILLS, L. J. 1951. *Palaeogeographical Atlas*. Blackie
VAUGHAN, A. 1905. The Palaeontological sequence in the Carboniferous Limestone of the Bristol area. *Quarterly Journal of the Geological Society of London,* **61**, 181 – 305.

G. W. Tyrrell: an underrated geologist

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After leaving Watford Grammar School, G. W. Tyrrell left the Royal College of Science, now Imperial College, London in 1904, without a degree. He had studied under Professor Judd, a very prominent igneous petrologist, who was clearly impressed with him. He came to Glasgow as an assistant to Professor J. W. Gregory in 1906 and then became a lecturer in 1913. He became President of the Geological Society of Glasgow from 1923 – 1926, succeeding Peter Macnair and succeeded by Murray Macgregor. In 1909 he had already set out work which he thought ought to be done around or near to Glasgow. Tyrrell, a shy and diffident man, was an excellent teacher and extra-mural lecturer and became, largely through a masterful book on petrology, an internationally renowned igneous petrographer. His book was reprinted 21 times and translated into 'most of the languages of the scientific world' (Bailey 1958).

The status of igneous petrology at the time was growing very fast in Britain and much of that was centred on the west of Scotland where the bulk of the range of igneous rocks was to be found. Sorby (1858) had already described crystallites from the pitchstone on Arran and this brought attention to the Tertiary rocks of the west of Scotland and Arran in particular. Zirkel (1867), Allport (1872) and Judd (1874) had published studies of the Tertiary Volcanic rocks of the Western Isles. With the appearance of Teall's book *British Petrography* in 1888, Geikie's book *The Ancient Volcanoes of Great Britain* (1897) and Harker's *The Natural History of Igneous rocks* (1909) it was clear that a great deal of knowledge was accumulating on these varied igneous rocks. Whilst the descriptive, field part of igneous rocks was well covered by British and Continental workers, (including the work on ring dykes and ring fractures in the development of calderas) much work, and particularly the experimental side, was to be done at the Carnegie Institute, Washington.

In 1906 Tyrrell came to Glasgow with igneous rocks foremost in his mind. Working with Gregory he built up the Department from a one room unit into a Department with microscopes, thin sectioning equipment and a strong foothold in the Hunterian Museum.

G. W. Tyrrell
Photograph courtesy of Professor Don Bowes who was given the original by G. W. Tyrrell's daughter.

His early paper on the Kilpatrick Hills (1909) sets out the work he was going to do for the rest of his life. He pointed out that whilst others had worked on the Tertiary rocks of the Western Isles he had his eye on the Carboniferous rocks of the Midland Valley, the intrusive rocks in Ayrshire, the Old Red Sandstone rocks of the Ochils and Sidlaws and the nearby rocks on Arran. Unable to pay his fees at Imperial College and living off a small salary from Gregory he was able to examine the rocks around Glasgow, which he could access with comparative ease and at minimum expense. As we all know, he was indeed fortunate, as they are amongst the most varied rocks in the world, and possibly no more so than on Arran.

As time went on, and with his publications becoming more voluminous, his reputation soon spread and investigators and explorers all round the world began to send their collections of igneous rocks to Tyrrell in Glasgow. So rocks collected from the Himalayas, South Africa, India, Antarctica and Canada arrived here for identification and comments which he freely gave. Although he did not have the money to get out to many of these places, such a situation, where he was examining the rocks collected by others, gave him a very wide range of knowledge of their distribution and content. Later, he visited some of the places he had received rocks from.

In 1926, revised in 1929, he published his book *The Principles of Petrology* which resulted in the financially strapped Tyrrell being given a free trip to Russia including the Kola Peninsula. This book was an instant success and showed Tyrrell to have an enormous grasp of the significance of all rocks but particularly the igneous group. His classification of igneous rocks is now the accepted one and, compared with those proposed by his contemporaries, is both clear and concise. This book showed him to be very well aware of the conditions of formation of all rocks, and from his Carboniferous experience he was able to draw out many of the generalizations. If this book is a reflection of his teaching here then it is no wonder that he was regarded as a brilliant teacher and extra-mural lecturer.

It would be difficult to summarize his contribution generally when research of it is clearly going to show how varied and considerable it is. However, to illustrate just one of his contributions, we take the association of igneous rocks. In his book of 1926 and picked up later in his final paper to the Geological Society of America (1955) he approached the subject of Petrographic Provinces. Many people, and particularly in Britain, were beginning to define the rock associations with which they were dealing. Judd (1886) defined a Petrographic Province as "rocks erupted during any particular geological period present certain well-marked peculiarities in mineral composition" – distinguishing them from other provinces. Tyrrell, in his review of Igneous Action and Earth Movements (*Principals of Petrology*, 2nd Edition 1929, p143 – 146), classifies igneous rocks in terms of their distribution on the Earth's surface. He correlated igneous activity with periods of strong earth movement, some of which are slow vertical movements of large blocks of the earth's crust and others with short lateral movements which produced mountains.

Mountains he saw as associated with the distribution of granodiorite-andesites. The granodiorites are deeper within the crust and the andesites occur as higher level volcanoes. Deeper parts of mountain chains such as the Caledonian in Norway and the Archaean crust generally are noted for their anorthosite-charnockite association suggesting a provenance in drier parts of the crust. This plateau basalt kindred seems to be associated with the opening of oceans. The Thulean province, made up of plateau basalts, "appears to be connected to the crustal inbreak that initiated the North Atlantic". In his last paper Tyrrell (1955) revised his classification and saw four associations (kindreds): 1. Ophiolites, 2. Andesites & granodiorites, 3. Trachybasalts and 4. Quartz-dolerites. Ophiolites he saw as associated with geosynclines; granodiorites and andesites associated with mountains and both basalts and quartz-dolerites associated with post-orogenic phase. He showed at least three examples of these rock associations in Scotland, along the Atlantic margin in N America, the Hercynian and the Mediterranean.

In terms of what we know today, these associations lead us directly to plate tectonics (which Tyrrell did not believe in) and it is probably because of the terms used in his classification that they were not really investigated to any degree. Tyrrell died of a stroke which he may have developed after an invitation by the Geological Society of America to visit and tour North America and Canada. He was not particularly interested in his career; he did geology because he enthusiastically enjoyed the subject. He was a brilliant teacher and taught extra-mural classes at Glasgow, keeping the Geological Society topped up with members. He also led great field trips, particularly to Arran where he also wrote a Memoir on the island (a very unusual thing to do by someone who had no experience of the Geological Survey).

Tyrrell was probably amongst the most brilliant researchers to have been produced by Glasgow. In spite of his diffidence he was invited to both Russia and North America as a world expert on igneous rocks and travelled widely. He was well known in Britain, friendly with most of the igneous petrographers, including H. H. Read and yet he did not become a fellow of the Royal Society of London and his work was not widely quoted. He was regarded as a 'safe pair of hands' and as such was used by his peers. What they failed to recognise was that he was also a profound thinker and often a far better thinker than they were themselves, and so much of what he wrote on igneous rocks bears that out.

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References

ALLPORT, A. 1872. On the microscopic structure of the pitchstones of Arran. *Geological Magazine,* **9**, 1 – 10, 536 – 545.

BAILEY, E. B. 1958. Some aspect of igneous petrology, 1908 – 1958. *Transactions of the Geological Society of Glasgow,* **23,** 29 – 52.

GEIKIE, A. 1897. *Ancient Volcanoes of Great Britain.* **1, 2,** MacMillan

HARKER, A. 1909. *Natural History of Igneous Rocks.* Methuen.

JUDD, J. W. 1874. On the secondary rocks of Scotland. Second paper. On the ancient volcanoes of the Highlands and the relation of their products to the Mesozoic strata. *Quarterly Journal of the Geological Society of London,* **30**, 220 – 302.

JUDD, J. W. 1886. On the gabbros, dolerites and basalts of Tertiary age in Scotland and Ireland. *Quarterly Journal of the Geological Society of London,* **42,** 49 – 97.
SORBY, H. C. 1858. On the microscopic structure of crystals, indicating the origin of minerals and rocks. *Quarterly Journal of the Geological Society of London,* **14**, 453 – 500.
TEALL, J. J. H. 1888. *British Petrography: with special reference to the igneous rocks.* Dulau & Co.
TYRRELL, G. W. 1909. The classification of the post Carboniferous Intrusive Igneous rocks of the West of Scotland. *Transactions of the Geological Society of Glasgow,* **13**, 298 – 317.
TYRRELL, G. W. 1926. *The Principals of Petrology*. Methuen
TYRRELL, G. W. 1955. The distribution of igneous rocks in space and time. *Bulletin of the Geological Society of America,* **66**, 405 – 426.
ZIRKEL, F. 1867. Mikroskopische Untersuchungen über die glasigen und halbglasigen Gestiene. *Zeitschrift der Deutschen Geologischen Gesellschaft,* **19**, 785 – 788.

Working with fossils at the Hunterian Museum – a glimpse at the lives of John Young, John Young and Ethel Currie

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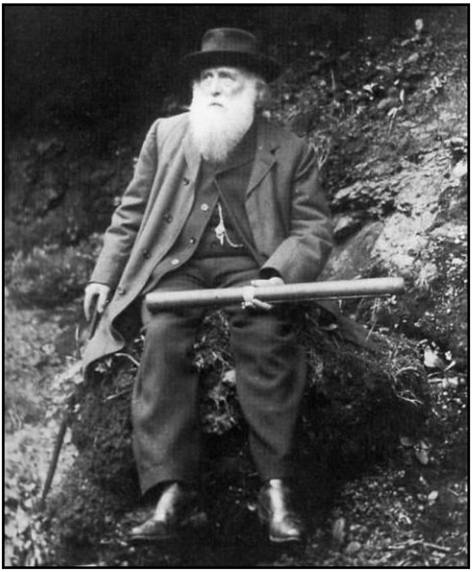
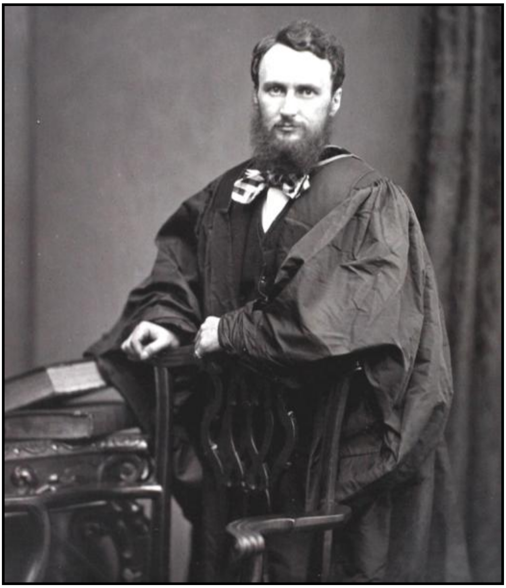
The Hunterian Museum has been fortunate to have had some enlightened geological curators in its past history. Most notably from amongst these are the Carboniferous stratigrapher Ethel Currie of the twentieth century, and the illustrious, but perhaps confusing, John Youngs of the nineteenth century. All three of these geologists have made major contributions to our understanding of the geology of Glasgow as well as further afield.



John Young LLD

The two John Youngs are perhaps confusing because they were both employed by the Hunterian Museum at the same time; one as Assistant Keeper and the other as Keeper. Usually they are distinguished by their titles. John Young the Assistant Keeper was Mr Young and then Dr Young, whereas John Young, the Keeper, was Professor Young, although both were Fellows of the Geological Society. Luckily, one was an LLD and the other an MD FRSC.

John Young LLD was born in Lennoxtown in July 1823, the son of Thomas Young (a carpenter from Glasgow) and Jean Robertson (daughter of a farming family in Campsie). From a young age he was interested in the fossils of his native Campsie Hills. As a blockcutter by trade, he started working as a message boy in 1833 at the Lennoxmill Printworks of Dalglish, Falconer & Co where his father was foreman joiner. He would work for 16 hours a day for 6 pence even when the weather caused their clothes to ice-up. His fascination with fossils grew and by 1851 he was a recognised authority on the geology of the Campsie district, often taking groups from the Natural History Society on excursions. He was chosen to exhibit a collection of local rocks and fossils during the 1855 meeting of the British Association held in Glasgow. At the inception of the Glasgow Geological Society in 1858, he was elected one of the first Honorary Associates. That same year, he conducted a number of field trips to the Campsies and presented his first paper on *The Geology of the Campsie District*. In 1859, the post of Assistant Keeper of the Hunterian Museum became vacant. John Young was awarded the position with support from Lord Kelvin and other members of the Glasgow Geological and Natural History Societies at a salary of £40 per year with accommodation (which was effectively a drop in salary). In 1847, he married Margaret Stirling, daughter of Peter Stirling (a mason from Campsie) and Elizabeth Downie (daughter of a mill-wright). By 1861 he is recorded as living at the Hunterian Museum in the Old College with his family, and in 1871, he was living in the university grounds at Partick. His wife died in 1874 at the age of 47 as a result of 'nervous shock'. That same year he was awarded a life membership to the London Geological Society. In 1883 he was awarded the proceeds of the Murchison Medal Fund by the Geological Society of London, this being the highest honour the society could bestow. Despite all his work and recognition from several prestigious organisations, he was only awarded a Doctor of Laws from the University in 1893. He died in Troon in 1900 aged 76, of a stroke after being weakened by illness suffered during the winter of 1899. Perhaps his contribution is best summed up by the obituary notice in the Glasgow Herald which stated: "The museum contains abundant evidence of the knowledge, zeal, and skill which have made its fossil and mineralogical departments objects of interest to men of science everywhere, while the reputation of the University was enhanced by having on its staff one whose work was valued as it was widely known." John Young LLD was also known as "the Good".



John Young MD

John Young MD was born in Edinburgh in 1835, the son of David Young (a successful accountant from Angus) and Ann Grant (of Invernesshire and daughter of a Captain of the 55th Regiment of Foot). John went to the Royal High School in Edinburgh where he was taught by the Rector, Leonhard Schmitz of Aix-la-Chapelle in France. Schmitz was a well known classical scholar and author, and appears to have had a great influence on the young John. He first worked at the Royal Edinburgh Asylum, having qualified as M.D. in 1857. John joined the Scottish Geological Survey in 1861 where he worked with Archibald Geikie, who was also educated at the Royal High School at the same time as John. In 1864, John had an accident when he slipped and broke his kneecap on field work in Girvan. It did not heal properly and he was slightly lame for the rest of his life.

In 1866 he went to London with the Schmitz Family, after Leonhard Schmitz was appointed to Principal of the London International College at Isleworth, and married his daughter Eliza in Brentford. That same year he took the Chair of Natural History at Glasgow University, where he taught both geology and zoology, and was appointed Keeper of the Hunterian Museum. During his appointment, he attempted to sell the Hunter Coin Cabinet for the benefit of the museum twice and oversaw the transfer of collections from the Old College to Gilmorehill. He died at the age of 67 in 1902 as a result of a stroke. His wife lived on to the age of 87, dying in 1924 of old age. John Young MD has been described as 'unconventional, brilliant, and eccentric' as well as 'untidy, impetuous, scornful, flamboyant, brusque, outspoken, bearded and an exhibitionist in his dress and enormous slouch hat'. He was not considered a great teacher in geology as he considered lectures a "waste of time", but he was an ardent supporter of women in education. He earned the nickname "the Bad". Why this is, is unclear as he certainly supported John Young the Good in attempting to get recognition for his contribution, "care and assiduous attention" to the collections of the Hunterian Museum. He considered that John Young (the Good)'s "salary is far too little for a man of his position in Science, and a very inadequate payment for the services he has rendered to the University in all these years" (Court Minutes 1895).

Ethel Dobbie Currie has been the only female curatorial member of the geological staff of the Hunterian Museum. She was born in December 1898 the daughter of James Currie (a quantity surveyor from Glasgow) and Elizabeth Allan (daughter of a brass finisher from Glasgow). Her parents were married in Philadelphia in 1896, but returned to Glasgow before she was born. She attended school at Bellahouston Academy and went on to the University of Glasgow to study geology.

Ethel Currie

Her whole professional career was spent in the University of Glasgow. She graduated BSc under Professor J. W. Gregory in 1920, and after a short period as Demonstrator in his department was appointed Assistant Curator of the geological collections in the Hunterian Museum. The laborious administration of the collections that she undertook was less well known to the public than it deserved to be. Visitors to the museum knew her better through the many geological exhibits she prepared. She researched fossils as opportunities arose when collections came to the museum. These included Mesozoic and Tertiary sea-urchins from Africa and southern Asia. She also described Mesozoic corals from Somaliland, and even collections of rock specimens from the Silurian. Some of this work appeared in the first volumes of Monographs of the Hunterian Museum, a series she helped Professor Gregory to establish. Although credited by T. N. George (1964) as having published on a xiphosure from Lesmahagow, the paper was actually written by her brother Leslie Douglas Currie.

Later she developed her technique of studying the morphology of ammonites to produce a comprehensive description of the Scottish Carboniferous goniatites. This work had its germs in an analysis of the fauna of Skipsey's Marine Band. It expanded into a detailed account of every known species and variety of Scottish goniatite and resulted in a volume that became of major importance to Carboniferous stratigraphy.

In 1952 she became the first woman President of the Geological Society of Glasgow in the hundred years of the Society's history. The Royal Society of Edinburgh bestowed upon her a similar distinction when she became, in 1949, one of the first three women to be admitted to the Fellowship and it also recognised her work when it awarded her the Neill Prize in 1945.

In her later years, she took a special interest in the morphology and relations of fossil vertebrates. Her long and devoted service was finally recognised by the University when she was promoted to the grade of Senior Lecturer in 1960. She retired through illness in 1962 and died six months later in March 1963 from a brain tumour.

John Young MD, John Young LLD and Ethel Currie DSc have all contributed substantially to creating the foundation on which the science of palaeontology has grown in Glasgow. Their contribution is not only recognised in Scotland, but worldwide. They have increased the global awareness of the research value of the collections of the Hunterian Museum and the University of Glasgow as well as enhancing the reputations of the Geological Society of Glasgow and other societies by their enthusiastic involvement. Although there is still some confusion over which John Young is which, their contribution to palaeontology has resulted in several species being named after them such as the trilobite *Youngia*, the ostracod *Youngiella*, the reptile *Youngina* and one that was named after both of them the demosponge *Youngella*.

Sources

ANON. 1901. John Young LLD. *Quarterly Journal of the Geological Society of London,* **57,** lxi.

CAMERON, J. 1891. *Calico Printing in Campsie: being sketches of its rise and progress in the parish, with jottings and reminiscences concerning employers and employed, trades, strikes, friendly societies &c.* Herald Office, KirkIntilloch. 59pp.

CROWN AND SCOTLAND ONLINE LTD. http://www.scotlandspeople.gov.uk. General Register Office for Scotland, Old Parish Registers, Census Records, Birth Marriage and Death Records.

CURRIE, L. D. 1927. On *Cyamocephalus*, a new synxiphosurine from the Upper Silurian of Lesmahagow, Lanarkshire. *Geological Magazine*, **64**, 153 – 157.

EWAN, E. L., INNES, S., REYNOLDS, S. & PIPES, R. (Eds.) 2006. *The Biographical Dictionary of Scottish Women: From Earliest Times to 2004*. 403pp.

GEORGE, T. N. 1964. Ethel D. Currie. *Transactions of the Geological Society of Glasgow,* **25,** 98 – 100.

HARVEY, J. & OGILVIE, M. 2000. *The Biographical Dictionary of Women in Science Pioneering Lives from Ancient Times to the Mid-Twentieth Century*. Routledge, UK. 1499pp.

KEPPIE, L. 2007. *William Hunter and the Hunterian Museum in Glasgow* 1807-2007. Edinburgh University Press. 190pp.

LEAKE, B. E. & DURANT, G. P. 1993. Geology. *In* Thomson, R. Y. (ed.). *A Faculty for Science, A Unified Diversity: A Century of Science in the University of Glasgow.* Glasgow, University of Glasgow. p159 – 178.

MacDONALD, G. 1933. The Hunterian Coin Cabinet. *Glasgow University Publications*, **29**, 1 – 55.

McKENDRICK, J. G. 1903. Prof. John Young. *Nature*, **67**, 249.
MacNAIR, P. & MORT, F. (eds.). *The History of the Geological Society of Glasgow, 1858 – 1908.* Glasgow, Geological Society of Glasgow. 303pp.
MOORE, P. G. & GIBSON, J. A. 2007. *The Marine Station at Millport: laying the permanent foundations (1896)*, **23,** 31 – 49.
UNIVERSITY OF GLASGOW ARCHIVES. Papers of John Smith, 1846 – 1930, geologist, antiquarian & natural historian: GB 248 DC 054
UNIVERSITY OF GLASGOW ARCHIVES. Court Minutes 1895, C//1/4.
WATERSTON, C. D. & MACMILLAN SHEARER, A. 2002. *Former Fellows of the Royal Society of Edinburgh 1783 – 2002.* Part I, 506pp
WATERSTON, C. D. & MACMILLAN SHEARER, A. 2002. *Former Fellows of the Royal Society of Edinburgh 1783 – 2002.* Part II, 538pp
WEIR, J. 1965. Dr Ethel D. Currie. *Proceedings of the Geological Society of London*, **1618,** 112 – 113.

Archie Lamont (1907 – 1985), geologist and poet

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Some distance to the southwest of Edinburgh, under the Pentland Hills, lies the attractive village of Carlops, inhabited, for the last forty years of his life, by Archie Lamont (1908 – 1985). He lived alone in his cottage, a huge shambling old man, with tiny round spectacles, a massive bald head and a spectacular white beard. He seldom changed his clothes, he was not nice to be near, and he was frequently taken for a tramp. Yet he was a remarkable, if eccentric scholar, a geologist, classicist, poet and writer, and a fiery Scottish Nationalist.

Lamont was born in Rothesay on 21 October 1907, the eldest son of John and Barbara Lamont. His father was partner in a legal firm but many of his ancestors (likewise named Archie Lamont) had been seafarers. He was evidently a precocious reader and soon became familiar with the works of Cervantes and Walter Scott as well as ancient Greek myths. He had a highly successful school career at Rothesay Academy between 1918 and 1925, leaving as Dux Medallist, and having secured a bursary to study at Glasgow University. His time at Glasgow was highly formative; he began by studying Latin, Greek and English, but in his third year took up geology, attracted, as he wrote later, by Professor J. W. Gregory's approbation of Scottish Home Rule. And then after graduating with an MA in classics in 1928, he decided to continue his education with a BSc in Geology, with Geography and Botany as subsidiary subjects, though he was still torn between science and literature, and his future was decided only when he obtained a Demonstratorship in Geology.

The late 1920s and early 1930s were great days for Archie Lamont. He graduated with a First Class BSc in Geology, along with J. G. C. Anderson and A. Kerr Pringle, both of whom became university professors, wrote poems, attended field excursions, and tramped the Highlands with friends, writing evocative descriptions of the landscape. At the same time he became President of the Scottish Nationalist Association, and organised the Rectorial election of Compton Mackenzie in 1931. But despite his great size and strength, he suffered several illnesses, and a bout of pneumonia caused him to relinquish his Demonstratorship. When he recovered, he embarked upon a PhD on the Ordovician of the Girvan area, awarded in 1935, and his main paper on the Drummuck Group (Lamont, 1935) was undoubtedly his best work. His knowledge of the Lower Palaeozoic was immense, and he made positive contributions to the study of brachiopod ecology, trilobite morphology (Lamont, 1941, 1948, 1949) and antidunes. But although he continued to write voluminously, his contributions became increasingly idiosyncratic, and were usually short and poorly illustrated (e. g. Lamont 1978); a few of these are listed below. He was elected to Fellowship of the Royal Society of Edinburgh in 1950, and came to meetings as late as the 1980s.

In 1936 Lamont married Rose McKinlay, a protozoologist, by whom he had one son, Patrick, later a distinguished mathematician. But the marriage did not last long, and Patrick and Archie seldom communicated. He moved first to Dublin, working on the Tramore Limestone, and then to Birmingham as Assistant Lecturer, then as Lecturer, a post he held, as a declared pacifist, throughout the war. He became highly familiar with the Lower Palaeozoic of Wales and the Welsh Borders, and supervised the researches of Harry Whittington, later Professor at Cambridge, who held him in high regard. Likewise he championed the work of B. B. Bancroft, the first geologist to erect Stages for the subdivision of the upper Ordovician of Shropshire. Initial criticism of Bancroft's work eventually gave way to acceptance, and his Stages form the basis of the divisions we know today.

Murray Macgregor, Archie Lamont, G. W. Tyrrell and family, E. B. Bailey and J. Begg, excursion to Criaghead, Girvan, June 1932.

After the war Lamont, though only 38, retired from teaching and returned to Scotland. He settled in Carlops and was awarded a research fellowship at Edinburgh University. From here he worked on the fossiliferous Silurian rocks of the Pentland Hills, recognising that they were pre-Wenlock, rather than Ludlow, as originally believed. His papers on this area (Lamont, 1947) were very good, and form the basis of much subsequent work, recently summarised (Clarkson et al. 2007). His last paper published in a standard journal (Lamont & Lindström, 1947), was on conodont stratigraphy in the Southern Uplands.

After 1951 Lamont no longer worked at Edinburgh University, having quarrelled with the then Professor, but he was still active, and wrote innumerable letters to the 'Scotsman' mainly on Scottish Home Rule, and published articles on a wide variety of topics; geology, fossils of the Pentland Hills, Scottish history, Arabs in biblical literature, mimicry in plants and animals, Scotland and Shakespeare, ecology of leaf shapes – all reflections of the enormously broad interests he had developed when young. Most of these contributions were published in the 'Scottish Journal of Science', which he founded himself and to which he was just about the sole contributor for twenty years.

Archie Lamont was a complex and baffling figure. On the one hand he was a man of great erudition and singular sensitivity and awareness, as indicated by some of his early poems (Lamont 1943). He could be very kind and welcomed parties of students and foreign visitors to his cottage. He had a vast library of geological books and papers (now dispersed to other workers) and he would write long hand-written letters full of information to anyone who requested it; the envelopes were stamped 'The Scots Secretariat'. Yet he was quite terrifying when aroused on any topic which impugned the honour of Scotland. His belligerence (contrasting so oddly with his deeply held pacifism) alienated so many of his former friends, even his fellow Nationalists, that towards the end of his life he had very few left. Some of his scientific ideas became somewhat bizarre in his later years; for example I remember him declaiming, at one of the last meetings of the Edinburgh Geological Society that he attended, that the basalts of Skye were sedimentary in origin. And those of us who knew him were concerned that anyone should live in such primitive and indeed squalid conditions as prevailed in his cottage in Carlops, but material comforts interested him not at all.

In some ways it is hard to connect the huge, shabby, white-bearded old recluse of Carlops with the ardent young scholar and poet of fifty years before. Yet throughout his life it was the same interests and ideals that sustained him, and ultimately the same search for truth, however unlikely some of the paths into which it led. He was, of course, unhappy with his isolation from scientific and literary communities, and about the lack of acceptance of some of his more extreme ideas. He cannot have been unaware that most people regarded him more as a curiosity than a serious thinker, and as his own worst enemy. Yet his early scientific work was good, and quite influential, and his fight for Scottish independence never flagged. Perhaps his life is best summarised by a couplet from one of his own poems:

"I stood upon the threshold of a dream.
But the grey shadows stole the dream away"

Archie Lamont (Kildonan, 1933)

Selected references

CLARKSON, E. N. K., HARPER, D. A. T., TAYLOR, C. M., & ANDERSON, L. I. (eds.) 2007. Silurian Fossils from the Pentland Hills, Scotland. *The Palaeontological Association Field Guides to Fossils,* **11**, 1 – 218.

LAMONT, A. 1935. The Drummuck Group: a stratigraphical revision with descriptions of new fossils from the lower part of the Group. *Transactions of the Geological Society of Glasgow,* **19**, 288 – 334.

LAMONT, A. 1941. Trinucleidae in Eire. *Annals and Magazine of Natural History. Series 11,* 8, 438 – 469.

LAMONT, A. 1943. *Patria Deserta*. Oliver & Boyd, Edinburgh, 72pp. (subsequently re-published as *Selected Poems*)

LAMONT, A. 1947. Gala-Tarannon beds in the Pentland Hills, near Edinburgh, *Geological Magazine,* **84**, 289 – 303.
LAMONT, A. 1948. Scottish Dragons. *Quarry Managers' Journal,* **31**, 531 – 535.
LAMONT, A. 1949. New species of Calymenidae from Scotland and Ireland. *Geological Magazine,* **86**, 313 – 323.
LAMONT, A. & LINDSTRÖM, M. 1957. Arenigian and Llandeilian cherts identified in the Southern Upland by means of cherts etc. *Transactions of the Edinburgh Geological Society,* **17**, 60 – 70.
LAMONT, A. 1978. Pentlandian Miscellany: Mollusca, Trilobita, etc. *Scottish Journal of Science* (privately published), **1**, 245 – 302.

The speakers, together with Dr Alan Owen, President of the Society, and Dr Mike Keen, Department of Adult and Continuing Education.

Dr David Stephenson, Dr Brian Bell, Professor Bernard Leake, Professor Brian Bluck, Dr Mike Keen, Professor Paul Bishop, Dr Alan Owen, Professor Euan Clarkson, Professor Howel Francis, Dr Neil Clark

Photograph by Charles Leslie.

Civic Reception by Glasgow City Council
City Chambers, George Square
Thursday 26th June 2008

The Lord Provost's Office of Glasgow City Council kindly hosted a Civic Reception and Dinner to mark the 150th Anniversary of the Society.

The evening was enjoyed by about 50 of our members and an address was delivered by Bailie Catherine McMaster on behalf of the Lord Provost.

Bailie McMaster welcomed the company, saying that she was "thrilled to be here this evening to celebrate what is a very special occasion indeed – the 150th Anniversary of the Geological Society of Glasgow." She recognised that the Society had been one of the pioneers of adult education, and of promoting the common good of people in the City. Self-improvement and a desire to satisfy a growing popular interest in the sciences, including geology, were the basis of the emergence of the Society.

She noted that Lord Kelvin, a professor at the University of Glasgow, renowned teacher and inventor, was the longest serving President of the Society, holding the position for 21 years from 1872 to 1893. The centenary of the passing of this astonishing scientist was commemorated by the City last year and she had the honour of being present with the Glasgow Philosophical Society in the celebration of his life and work at the unveiling of a monument at his grave in the Necropolis. His extraordinary intellect led to the construction and laying of cables along the seabed to connect continents, carrying telegraphic and telephonic information – the nascent internet.

Bailie McMaster also noted that geology remains a subject of perpetual fascination around the globe and that the Society has more than 400 members, half of whom live in the Glasgow area but the remainder are spread throughout the United Kingdom, as well as Australia and Switzerland. The founding principle of the Geological Society of Glasgow, as an open association of amateur and professional geologists, makes the subject truly accessible to everyone. She concluded by saying:

"I commend you on your work and very much hope that your Society continues to go from strength to strength for many more years to come. May your efforts continue to enrich the life of the City with members filled with curiosity and willingness to engage with academic institutions in a dialogue of listening and learning. Congratulations to you all, and have a fantastic evening"

The following reply was given by Dr Alan Owen, President:-

Bailie McMaster, on behalf of the members of the Geological Society of Glasgow and our Honoured Guests from the Councils of our sister societies in Edinburgh and Aberdeen, I would like to thank you most sincerely for your kind words and for hosting this excellent dinner.

Glasgow can be proud of the diversity of its people, of its culture (in all senses) and of the multitude of organisations that thrive within the city. The Geological Society of Glasgow is one of these organisations and as you have rightly noted, its origins lie very much in the Victorian desire for self-improvement and the striving to understand the natural world. These principles continue to the present day, and throughout its history the Society has catered both for the professional geologist and the interested amateur through its programme of lectures, field excursions and scholarly publications.

Geology is a fantastically diverse subject, containing aspects relating to chemistry, biology, physics, geography, mathematics, engineering, computing and so on. At all levels it attracts people with a wide range of backgrounds and interests, from the highly focused to the simply curious. It is also a science which is readily accessible to those without formal training in the subject and one in which the 'amateur' can still make a contribution through careful observation or a chance discovery. Importantly for many, it is also a subject that involves getting out into its natural laboratory, the great outdoors. This can, on occasion, result in getting cold and wet – but that in itself can be a good thing, bringing people together through shared hardship, especially on reflection in the pub at the end of a hard day in the field.

It is my great privilege to have been the President of the Society during its very successful Sesquicentenary Session. As a professional geologist I am always tremendously humbled to see the dedication to geology shown by members of the Society for whom the subject is not, and has not been, their livelihood. This applies especially to members of the Society's Council who dedicate considerable amounts of time to ensuring that the Society functions efficiently. It is this dedication by the interested, and in many cases highly knowledgeable, amateurs that will continue to drive the Society forwards towards its 200th Anniversary. In recent years, the efforts of the RIGS group in identifying and documenting sites of geological interest are opening up geology to an even wider public and further realising the aspirations of our Victorian founders.

In this last context, I must thank Glasgow City Council and especially its Land & Environmental Services arm for the very positive way in which they have embraced the RIGS concept. In particular, we have great hopes for the development of Fossil Grove, which is undoubtedly an internationally important site. I would also like to thank the City for the most attractive carpet bedding display in Victoria Park celebrating our first 150 years.

Finally, it gives me great pleasure to thank the City once again through you, Bailie McMaster and the Lord Provost's Office, for the wonderful hospitality you have shown us this evening.

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