

## JOHN GRAHAM COMRIE ANDERSON

Emeritus Professor J. Graham C. Anderson, who died at his home in Lisvane, Cardiff, on 20th February 2002, aged 91, was born in the Hillhead area of Glasgow on 26th April 1910, the son of Edmond Archibald Anderson, at that time an aerated water manufacturer, and Annie Maude Anderson, née Comrie. His mother was born in Rothesay, the daughter of James K. Comrie, a Glaswegian stockbroker, and his Irish-born wife Mary J. Comrie. The family lived in Cardiff before moving to Glasgow, but they also had a second home in Rothesay. His paternal grandfather was Secretary, i.e. General Manager, of the Callander and Oban Railway from its beginning until 1910.

Graham attended Glasgow Academy and entered Glasgow University in 1928. He was taught his first year geology by Professor J.W. Gregory FRS, this being the last year before Gregory retired in 1929. More influential on Graham were Professor E.B. Bailey FRS, a tectonic geologist, who succeeded Gregory and under whom Graham graduated MA, BSc (with 1st Class Honours in Geology) in 1932, and G.W. Tyrrell, the renowned igneous petrologist. Graham Anderson spoke and wrote French fluently, as Glasgow University then offered Honours Science students the opportunity to take a pass degree in an Arts Subject and Graham took French. He never lost his pronounced Glaswegian bluff manner and accent and his origin was always immediately recognisable, even if sometimes the meaning of his words, especially to students unfamiliar with the dialect, was somewhat puzzling. His geological work was mainly in the fields of petrology, tectonics and, with time, increasingly in engineering geology.

Supervised by Bailey and Tyrrell, whose influences are apparent in his choice of subject, he stayed on in Glasgow University to complete, in 1935, a PhD entitled *Contributions to the Caledonian igneous geology of the SW Highlands*. This was unusually forward looking in being composed of the drafts of three distinct papers, two of which were even published in 1935. One was on the marginal intrusions of Ben Nevis including the Coille Lianachain complex, another on the Arrochar intrusive complex and the third, on the SE margin of the Etive Granite complex, was subsequently enlarged to include the whole of the Etive Granite, whilst Graham was a Carnegie Research Fellow in Glasgow, and published in 1937. With commendable industry, he also published in 1935 a paper on the Dalradian succession in the Pass of Brander. This no doubt represented field work done on low ground, from his camp near Loch Awe station, on days too misty or wet for work on the nearby high ground of Ben Cruachan, with its bevy of Munros and Corbetts (near-Munros). Field work in the summers of 1932, 1933 and 1934 involved some very long hikes and camping, which suited a young man keen on mountain walking who had been trained by Bailey. Eventually, before he left Scotland, he had climbed no less than 218 of Scotland's 284 Munros--a very considerable feat, especially as, without a motor car, some involved in-and-out walks totalling tens of kilometres. In 1936 he joined the Geologists' Association and was a member for 66 years, only slightly longer than his 1937 Life Fellowship of the Geological Society of Edinburgh. He spent a year (1936-37) as a temporary Lecturer in geology at the University of St Andrews before being appointed in 1937 to HM Geological Survey of Scotland, based in Edinburgh.

In the Survey he worked in the Scottish coalfields and the Lothians oil-shale field as well as in the Scottish Highlands. In particular he developed a flair for engineering geology which had emerged first while he was a student, as shown by two papers published in the Quarry Managers' Journal in 1934 and 1935. Whilst with the Survey, he published a lengthy study on *Scottish Sands and Gravels* among other applied subjects with the Institute of Quarrying, and was made an Honorary Member of that Institute. He also published, often jointly, in the Wartime Pamphlet Series of the Survey on limestones, silica rocks, slates, sands and gravels and also in applied *Memoirs* such as *The Granites of Scotland* (1939) and *The Limestones of Scotland* (1949). Indeed, he actually did only limited mapping during his time in the Survey, partly because it was mostly wartime and the Survey then worked largely on strategic geological materials. In the Survey he was popular and regarded as a good colleague, although like the writer, he was not a smart dresser, especially with wartime clothes restrictions. Typical field gear was an aged Trench coat with a rear hacking cut, riding breeches, sometimes perforce repaired with safety pins, an old 'Biggles'-type airman's helmet with the ears cut out and boots which alarmingly quickly became worn through at the soles; on one such occasion forcing a longer walk back along the sleepers of the West Highland Railway to avoid the sharp heather of the shorter way across the Moor of Rannoch! Later he was seconded from the Survey to advise on the crucial aspects of the engineering geology of five major projects, those of the Sloy, Cruachan, Shira, Nant and Grampian Hydro-Electric Schemes, which gave him exceptional expertise in the engineering problems associated with dam foundations, tunnelling, fractures and joints and slope stability. He obtained a DSc from Glasgow University in 1945, was made a Fellow of the Geological Society of London in 1944 (becoming a Senior Fellow in 1994) and was elected FRSE in 1947, being a Fellow for 55 years. He rose to become a Senior Geologist in the Survey and, like several of his Geological Survey contemporaries, (e.g. S. E. Hollingworth who went to University College London; F. W. Cope, Keele; W. D. Evans, Nottingham and J. H. Taylor, Kings College London), he later moved to academia. In 1949 he was appointed to the Chair of Geology at University College, Cardiff, succeeding Professor A. H. Cox, and remained there until retirement in 1977, being Head of Department for 28 years.

His main mapping in the Highlands was largely undertaken outside of his Survey duties in his own time, apart from time spent in some quarries, and the field work was helped by the award of a grant from the Clough Memorial

Research Fund of the Edinburgh Geological Society. His major work was on the Dalradian rocks of the Highland Border, and he published on those in Angus, Kincardine, Bute and Arran, and eventually, in 1947, on the whole Stonehaven to Arran belt in an important paper in the Royal Society of Edinburgh's *Transactions* (Vol 61, pp 479-515). This firmly ("not a shred of valid evidence") disposed of the Gregory concept of the 'Lennoxian' in which Gregory erroneously considered the southern Dalradian to be Lower Palaeozoic rocks unconformable on the Dalradian. Graham's paper, submitted in May 1945, was the first to describe in some detail the Aberfoyle anticline, initially identified by Henderson in 1938. Unequivocally, Graham considered the anticline to 'close upwards', although perceptively, he did realise that such a NW-facing fold was inconsistent with the SE-facing structures identified by Clough and elaborated by E.B. Bailey, but was unable to deduce a satisfactory solution. Nevertheless, the conundrum posed by Graham's 1947 paper did spark the interest of Robert Shackleton, whose brilliant solution of a downward-facing Aberfoyle anticline not only elucidated the closure of the whole Tay Nappe structure, but whose method in so doing revolutionised the mapping and interpretation of folds in metamorphic rocks. Graham never accepted Shackleton's solution. By a curious coincidence, Anderson and Shackleton were both elected to the Council of the Geological Society of London simultaneously and served for the period 1958 to 1962.

In view of the interest of his mentor, E.B. Bailey, (who was Director of H. M. Geological Survey from 1937-45), in extending the knowledge of Dalradian stratigraphy and structures into Ireland, it was understandable that Graham, probably on Bailey's suggestion, should have also turned to Ireland, and in papers in 1946 and 1947, again completed outside Survey duties, he correlated the enigmatic rocks south of Lough Derg with the Moine rocks of Scotland, their first recognition outside Scotland. This was an important discovery which he carefully argued, based on 370 km<sup>2</sup> of mapping. Later in 1954, as Professor, he went on to reconnaissance-map the Slieve League Peninsula in Donegal and extended the claimed area of Moine rocks to include the whole of the Killybegs Group, which was not generally accepted. The problems of the Moine-Lower Dalradian contacts, which his Irish work only emphasised, encouraged a return to the Highlands and his last paper in the Society's *Transactions* (1956), was on the Moinian and Dalradian rocks between Glen Roy and the Monadhliath Mountains; a vast wild area 30 x 60 km. He retained his resilience and ability to walk long distances for many years. His final foray in Ireland was to study the Wenlock rocks of South Mayo (1960).

He did not take to the mid-50's advances in structural geology, with the new emphasis on mapping multiple folding in metamorphic rocks and noting of structural information. Graham was a 'broad brush' mapper, not given to intricate data recording or looking at every outcrop, and with his large, rather clumsy handwriting, which almost embossed the paper, his field maps were notable for broad generalisation of ground walked over quickly rather than examined in detail. But many of his walk-over surveys filled in urgently needed information (eg for a proposed hydro-scheme) where no geological mapping existed. After the 1950s, most of his work was in engineering geology or in simple pre-plate tectonic geology summaries such as *The Pre-Cambrian of the British Isles* (1965), *The structure of the British Isles* (1968; with T. R. Owen); and *The structure of Western Europe* (1978). He was not enthusiastic about building a school of graduate research students, but W. R. Church worked on the Irish Moines, T. E. Smith on the Laggan district in Scotland, D. Powell on Dinorwic in Wales, G.G. Lemon (a staff member in Cardiff) on the Ox Mountains, Co Sligo and J. M. C. W. Baker (also staff) on the Rosslare Complex, and all were clearly influenced by Graham.

During his long tenure of the Chair in Cardiff he progressively became more and more involved in consulting as an engineering geologist and less concerned with academic geology. Indeed, he was interested in practical things and with his blunt down-to-Earth pronouncements and way of speaking, he projected the antithesis of a 'head in the clouds' academic don. As his engineering reputation spread, he was increasing in demand, not only in the UK, but also abroad in problems related to dams, tunnels and cuttings associated with reservoirs and hydro-electric projects. He was consulted over the Clywedog Dam, the Ffestiniog and Dinorwic Pumped Storage and the Rheidol Hydro-Electric schemes, the Craig Goch project, the Kielder Dam and tunnels, the Calder Reservoir and tunnels in Renfrewshire, the Irvine Bay sewage tunnel and abroad the Volta River (Ghana) scheme, the Kariba North Bank Power station (Zimbabwe-Zambia) and the Kotmale Dam, Sri Lanka. He became a Member of the South Wales Institute of Engineers, was awarded a medal by this Institute, and served as President in 1976-7. He obtained diamond drilling equipment for the Department of Geology so that local engineering geology problems in the South Wales valleys, such as depth through 'the drift' to rockhead, could be established, often to the chagrin of the Departmental technicians who did the drilling. He and Dr C. R. K. Blundell published such a map for the Cardiff district in 1965. Graham became a most successful engineering geology consultant and he summarised some of the expertise acquired through his wide experience in a most readable book, jointly with C. F. Trigg, of *Case-histories in Engineering Geology* (1976), which is still used today. This includes summaries of the dangers of steep valley slips and tip failures, based on experiences in South Wales, as well as a general review of building dams, tunnels, bridges, cuttings, foundations and harbours.

Inevitably, with anyone expected to be Head of a Department for 28 years, during which the Universities changed almost unbelievably, Graham found some changes hard to adjust to, such as staff involvement in policy-making and

implementation through staff meetings. Such consultations were almost unknown in British Universities before the 1950's and Graham did not readily adapt to them even when new University regulations required them. He suffered from unusually poor coordination and so never learnt to drive and this, together with his phenomenal walking ability and a deep interest in railways and train travel, prompted him to continue to take field classes by train for a long time, although coaches were also used. Extended walks, unthinkable today, between widely-scattered teaching localities on day-trips from Cardiff, were common, such as from Pontypool Road to Usk and beyond and Bridgend to Southerndown, with diversions and back, 16 km minimum. His Honours student excursions to the French Alps and the Massif Central were remembered not only for the geology but also the education in French life and the Professor's expertise in the French language. He was noted for his extremely modest requests to the University College for Departmental capital and running costs, and he was most reluctant to apply for new equipment for staff research (although he early acquired a range of geophysical equipment). This, together with his lack of interest and encouragement for forging new scientific developments in the Department, caused considerable staff discontent and eventually left the Department weak in research. However, this has to be understood against a background of extremely limited funds in the College and of poor administration of what there was, which eventually led the College to the point of bankruptcy. He oversaw the enforced move of the Department from Newport Road to the splendid Natural History Wing which completed the impressive Main Building in Park Place in 1962, although initially the space allocated to geology in the new building was minimal, as more ambitious Professors exploited his lack of politicking and his reticence to insist on a reasonable space allocation.

This memorable move prompted Graham and D. Bidgood, following an invitation from the Director of the Geological Survey of Norway, Sven Foyen, to organise a summer expedition in 1962 to Porsangerfjord in Finnmark, Norway, to commemorate the opening of the new Departmental accommodation. From this small beginning, the first Cardiff Arctic Norway Expedition was launched under Dr R A. Gayer in 1966. Graham supported this mapping project, led by Dr R A. Gayer, and although he himself did not undertake any research in Norway, this was the main academic project he encouraged over many years, and he nominally supervised many of the postgraduates. In 1967 he participated in a week-long excursion across Finnmark into Russia. He also attended several International Geological Congresses, including Prague, 1968, (disrupted by the Russians), and Sydney, 1976. He enjoyed photography and in retirement he was an enthusiastic leisure traveller. In 1983 he published the first single volume field guide to geological excursions in England, Wales, Scotland and Ireland, *Field Geology in the British Isles*, which unfortunately was not well received.

In a sense, the most impressive and lasting memorials to him are not in the University but in the permanently stable dams and tunnels, robustly constructed, in wild surroundings, about which little or nothing is heard because they were so soundly built on secure foundations.

He married Margaret Firth in 1938 and they had two children, Alison and Neil. Alison's two sons, Iain and Andrew Lovejoy are Graham's only grandchildren. In 1990, he married Joan Truman, whom I particularly thank for assistance and information, together with J. M. C. W. Baker, H. Bartlett, C. J. Burton, J. W. C. Cope, R. A. Gayer, G. S. Johnstone and J. W. Leake.

**Bernard Elgey Leake**

***John Graham Comrie Anderson. MA, BSc, PhD, DSc (Glasgow), FGS: born 26 April 1910; elected FRSE 3 March 1947; died 20 February 2002.***