

Great Irish Geoscientists

by
Patrick N. Wyse Jackson



Introduction **1**

Biographies

William Richardson (1740–1820)	2
Thomas Oldham (1816–1878)	5
Maxwell Henry Close (1822–1903)	8
George Henry Kinahan (1829–1908)	11
Sydney Mary Thompson (Madame Christen) (1847–1923)	14
James Robinson Kilroe (1848–1927)	17
John Joly (1857–1933)	21
Charles Irving Gardiner (1868–1940) & Sidney Hugh Reynolds (1867–1949)	24
James Ernest Richey (1886–1968)	28
John Kaye Charlesworth (1889–1972)	31

Suggested further reading

Inside back cover

First published 2009 © Geological Survey of Ireland

Patrick N. Wyse Jackson

Department of Geology, Trinity College, Dublin

Introduction

This booklet examines the work of a number of geoscientists who were either Irish by birth, or who carried out most of their important work in Ireland. Ireland has produced a large number of geoscientists many of whom have made important contributions to the understanding of the Earth's structure, history and evolution. Over the last 300 years the rocks in Ireland have been studied in detail, while during the same period a large number of Irish geoscientists have also worked abroad. In the United States Thomas Condon was a geological pioneer and as many as fifteen Irishmen surveyed India's geology and mineral wealth. In the late 1700s and early 1800s Ireland was the focus for the debate between those who considered that basalt and granite were laid down in water and those who, correctly, said that they were produced under the effects of igneous heat. Early studies on earthquake waves were carried out on Killiney Beach, and later they were utilised to reveal that the Earth had an outer liquid core. Many important fossils were first described in Ireland and these have helped date and correlate rocks worldwide. Irish scientists were at the forefront in the debate on the age of the Earth.

These biographical accounts are reprinted with permission and with minor modifications from the articles in the series 'Irish 'Rock Stars'' previously published between 2004 and 2009 in the magazine *ES2k* and its successor *Earth Science Ireland*. Some additional illustrations are published here.

Rev. William Richardson
(1740–1820)

*The dotted urchin's studs the cliffs adorn
And blue basalt is stamped with Ammon's horn*
(William Hamilton Drummond 1811 *The Giants' Causeway*, p. 87)

In the 1700s there was some confusion as to the origin and nature of basalt and other igneous rocks such as granite - were they originally molten or precipitates from water? The 'Neptunists' (or 'watermen'), followed the view of Abraham Gottlob Werner who regarded basalt as having been precipitated from water, while the 'Vulcanists' or 'Plutonists' (or 'firemen') argued that the rocks were the products of igneous mechanisms. The Vulcanist theory was championed by Nicholas Desmarest who observed extinct volcanoes in central France, and the Plutonist theory by James Hutton who proposed a plutonic origin for granite.

In 1740 Susanna Drury painted several views of Giant's Causeway and engravings of these were distributed across Europe. Desmarest declared on seeing them, that the basalts were volcanic in origin, and in 1786 the Rev. William Hamilton (1755-1797), a Fellow of Trinity College, Dublin, published an influential memoir which further advanced this standpoint. Hamilton was later unfortunate to be lynched by an unruly mob who objected to his role as a local magistrate in County Donegal where he also ministered.

The igneous and plutonic theories were rejected by Richard Kirwan in 1799 in his important book *Geological Essays*, as well as by the Rev. William Richardson (Figure 1), the rector of Clonfeacle in County Tyrone and a former Fellow of Trinity College. As he spent part of each year at Portrush Richardson examined the ground for himself, and transmitted a steady stream of papers to the Royal Irish Academy that were published between 1802 and 1812. He claimed authority, as a resident, to make his views known, but asserted not to subscribe to any theory or belong to any faction. Undoubtedly he was a Neptunist and argued against the volcanic origin of basalt on a number of grounds:

1. There was no evidence of a volcanic mountain or cone in Antrim.
2. Plants are found developed on lava flows elsewhere but not in between the basalt layers.
3. The constituents of basalt and lava were different.
4. The layers of basalt were horizontal and regular in thickness.
5. The physical appearance of basalt and lava were different.
6. The contact relationships of basalt and lava were different.
7. The basalt was divided into regular masses while lava is found as a irregular mass.
8. The basalt of Portrush contained fossil marine shells (which he discovered in about 1799).



Figure 1. Cartoon of William Richardson (courtesy of E.C. Nelson)

The last point is certainly the most eye-catching. If basalt contained ammonites (Figure 2) then it must be sedimentary. Debate over in favour of the Neptunists! However, specimens of the ammonite-bearing stone were examined in Edinburgh by Sir James Hall and others who immediately recognised that they were not basalt but were a fine-grained dark sedimentary rock that had been baked by hot basaltic material which had



Figure 2. Ammonites at Portrush.

resulted in its similar appearance to basalt. (The rock is actually a Lower Jurassic Lias mudstone, the ammonite is *Paltechioceras*, while the intrusion is the dolerite Portrush Sill). This swung the scales in the favour of the Vulcanists; additional support came from later observations of columnar basalt in unequivocal lava flows. The debate was at an end.

Even though he visited Edinburgh and was shown the context and relationships of the local basalt Richardson continued to hold to his outdated geological views right up to his death. Although he came out on the wrong side in this geological debate Richardson deserves some merit as his work was based on extensive fieldwork and close observation of geological features. It was only his interpretation that was flawed.

The Giant's Causeway continues to draw thousands of visitors each year, and for modern-day geologists it is worthwhile remembering the contributions - wrong or right, made towards our present understanding of the formation of one of Ireland's geological treasures.

Thomas Oldham
(1816–1878)

The town of Bray, which during Victorian times was a thriving holiday resort, is situated nearly fifteen miles south of Dublin. The Promenade runs parallel to the shoreline, and today as in the past day-trippers and other longer-term visitors walk southwards along it towards the impressive promontory of Bray Head. This headland, which rises out of the Irish Sea and resembles an upturned rowing boat, is composed of Cambrian shales and greywackes in which are also found resistant quartzite horizons.



Figure 3. Thomas Oldham.

In 1840 a young geologist by the name of Thomas Oldham (Figure 3) discovered odd-looking radiating and fan-shaped impressions in the shales but waited four years until he exhibited them to a meeting of the Geological Society of Dublin. He then showed them to the English palaeontologist Edward Forbes, who gave them the name *Oldhamia* in honour of their discoverer. Forbes declared that they were “bryozoans” and further named



Figure 4. Oldhamia antiqua (Geological Museum, TCD).

the radiating traces *Oldhamia radiata* and the fan-shaped marks *Oldhamia antiqua* (Figure 4) Later others ascribed them to a bewildering array of plant and animal affinities, but it is sufficient to regard them as trace fossils of unknown origins. For many years these fossils were considered to be the oldest on Earth.

Who was Thomas Oldham? Born in Dublin in 1836, he was educated at Trinity College, and later at the University of Edinburgh where he studied civil engineering but also attended the lectures of the geologist Robert Jameson. Oldham returned to Ireland in 1838 and joined the Ordnance Survey team as chief assistant under Joseph Ellison Portlock who was examining the geology of Londonderry and parts of adjacent counties. Portlock was clearly impressed and helped by the young man, as he states in the introduction to his 1843 geological report of the district: “whenever I have required his aid ... I have found him possessed of the highest intelligence and the most unbounded zeal”. Oldham was then appointed as Curator to the Geological Society of Dublin, and in 1845 succeeded John Phillips, nephew of William Smith, in the Chair of Geology at Trinity College, Dublin. The following year he was asked to head up the Irish Branch of the fledgling Geological Survey – Phillips had wanted this position but was not appointed and so had returned to England.

Immediately Oldham initiated a programme of geological mapping initially at a scale of six inches to the mile – fortuitously base-maps at this scale were available for the whole country; they were not available to those surveying Britain. The first maps published by the Geological Survey of Ireland were

county maps; the first three were Wicklow 1848, Carlow 1849, and Kildare 1849, but by 1857 the now familiar one inch to the mile map series was established.

In 1850 he married Louisa Matilda Dixon of Liverpool, and although he was drawing two salaries he felt that he would be unable to support his future family. That November he resigned his Dublin positions when he was offered the post as first Superintendent of the Geological Survey of India. This was to mark the start of a migration of Irish geologists to the sub-Continent. His own brother Charles followed him; as did William King, son of the Professor of Geology at Queen's College, Galway; Valentine Ball, who later returned to the Chair of Geology at Trinity; and at least 12 other Irish geologists.

In India Oldham oversaw an ambitious mapping programme that initially focused on the coal-bearing successions, and he found time himself to contribute sixteen papers on the topic. A number of Irish geologists made major discoveries in India that continue to have bearings on modern-day geology. Henry Benedict Medlicott coined the term "Gondwana Series" in 1872 while Oldham's son Richard Dixon Oldham distinguished three types produced by earthquakes: now known as P (compressional), S (shear), and L (Love)-waves, based on his observations made after the Great Assam Earthquake of 1897. In 1906 Richard showed from arrival patterns of waves from various earthquakes that the Earth had a core, which he thought was liquid in nature.

On the grounds of poor health Thomas Oldham resigned his Indian position in 1876 and retired to Rugby in England where he died on 17th July 1878. He received many honours in recognition of his work, including a gold medal from the Emperor of Austria in 1873, and the Royal Medal from the Royal Society in 1875, but these pale into insignificance when one remembers that his name is enshrined in geological literature in the generic name of a small, but important Cambrian trace fossil.

Maxwell Henry Close (1822–1903)

It might surprise some readers that a number of clerics made important discoveries in geology in the 1800s. William Buckland was Professor of Geology at Oxford and is remembered for his work on cave faunas in England amongst others. He later became Dean of Westminster, before ending his days in an asylum. The Dean of Llandaff in Wales, William Daniel Conybeare named the Carboniferous with William Phillips and also described Liassic marine reptiles. In Ireland Samuel Haughton was a cleric and also held the chair of geology at Trinity, while our present subject Rev. Maxwell Henry Close (Figure 5) penned a number of important papers on the glaciation of Ireland and its deposits.

Close was born in Dublin in 1822 the eldest son in a large family of Henry Samuel Close of Newtown Park, County Dublin. Maxwell received his early education at Weymouth, and then entered Trinity College, Dublin from where graduated B.A. in 1846; he took his M.A. in 1867.



Figure 5. Rev. Maxwell Henry Close.



Figure 6. Colour map that accompanied Close's 1867 paper on the general glaciation of Ireland.

Rather than follow his father into the banking business, he chose to be ordained a priest in the Church of England in 1848. He was first appointed curate of All Saints, Northampton, and then rector of Shangton a small village in Leicestershire the following year, a position he obtained through the system of lay-patronage and family connections: his cousin Robert Isham was the local landlord.

This preferment ultimately troubled Close, and he resigned in 1857 and became a curate at Waltham-on-the-Wolds, a village nearby.

Four years later he returned to Dublin, a move precipitated by the death of his father, and from then until his death he devoted his energies to geological, scientific and other interests, including the Irish language, and the provision of free library services. He also volunteered clerical work in churches and charities around the city. For many years he lived a bachelor-existence and lived in a hotel at 38 Lower Baggot Street.

Close was soon immersed in the work of various Dublin organisations. He gained membership of the Royal Irish Academy in 1867, and later he served as Treasurer of this body; he was also a Council member of the Royal Dublin Society. Elected a Fellow of the Geological Society of Dublin in 1862 (it was restyled Royal Geological Society of Ireland two years later), he served as Secretary for some years and as President in 1878 and 1879, and published five papers in its journal. He was also a Fellow of the Geological Society of London.

As early as 1863 Close published a paper on the striated surfaces found on granite in south County Dublin, which he followed with a series of papers on the glaciation in Ireland. Through these he made a major contribution to the understanding of the dynamics of ice flow over Ireland and the nature of the resultant glacial deposits. At this time many scientists did not hold to the glacial theory and explained the presence of such features as having been formed through the action of floating ice over a submerged surface. Close was in a minority, in believing that they were formed by land-ice. Travelling throughout Ireland he mapped the distribution of striae which showed conclusively that land ice was responsible for the glaciation and the formation of boulder clay. Additionally he demonstrated for the first time that the ice had not been confined to the upland regions but that it had covered the lowlying central plain of Ireland too. His findings were published in his seminal paper in 1867 which was accompanied by an important map showing the directions of ice-flow in Ireland (Figure 6). He later collaborated with the Survey geologist George Henry Kinahan (the subject of an earlier part in this series) in a detailed description of the glaciation of parts of Connaught in western Ireland.

Late in life he turned his attention to physics, astronomy and literary subjects, and published two books *Ausa dynamica* in 1884 (2nd edition, 1888) and *A few chapters in astronomy* in 1894 under the pseudonyms John O'Toole and Claudius Kennedy respectively.

Close was a keen Irish-language enthusiast and for quarter of a century was a member (and for some of this period, treasurer) of the Society for the Preservation of the Irish Language. Following his death on 12th September 1903 at his hotel lodgings, he left the Royal Irish Academy a bequest of £1000 a huge sum at the time, which amounted to a tenth of his estate, to offset the costs of publishing a dictionary of Irish. However, he imposed a strict condition that at least some of the dictionary had to be published within a decade of his death, or else the money would revert to his estate. The first part, that of part of D appeared in the final month before the crucial deadline and the final part some seventy-three years later in 1976.

George Henry Kinahan (1829–1908)

In the graveyard of Holy Trinity church in the Church of Ireland parish of Castlemacadam, beside Avoca, close to the celebrated copper mines, is a large block of Leinster Granite supported dolmen-like on some lesser stones (Figure 9). At first you could be excused for thinking that serves no purpose but in fact it was placed there to mark the grave of the geologist George Henry Kinahan (Figure 7) and that of his wife. He was a larger-than-life character who was gruff, combatant, and most-probably highly opinionated, but nevertheless had the common touch. He was greatly loved by many in rural Ireland whom he met while mapping, and especially by the miners who laboured under difficult conditions in the Avoca district. They affectionately knew him as the ‘the big miner’ and they carried his coffin at his funeral.

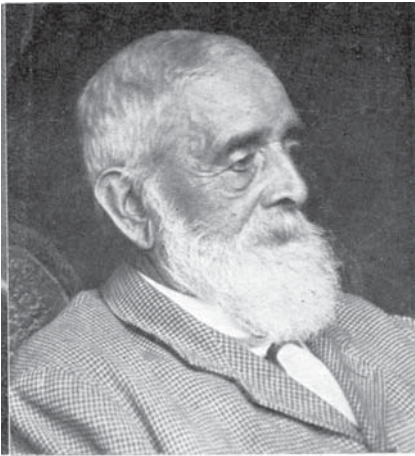


Figure 7. George Henry Kinahan (from R. Ll. Praeger, Some Irish Naturalists, 1949)

Kinahan was born in Dublin on 19th December 1829 the son of a barrister, and died at Woodlands, Clontarf, Co. Dublin on 5th December 1908. Educated at Trinity College, Dublin, he read Engineering, Following graduation he was immediately employed to work on the Drogheda Viaduct, an

impressive railway bridge that spans the river Boyne on the railway line connecting Dublin and Belfast. He then entered the service of the Geological Survey of Ireland (GSI) in 1854. By the time of his retirement he had risen through the ranks to District Surveyor, the second-most senior member after the Director. His brother John Robert Kinahan (1828–1863) was a medical doctor who had his own geological interests and who wrote



Figure 8. Glacial moraines at Mount Leinster (painting by Harriette Kinahan illustrating a paper published in 1882)

extensively on Irish Cambrian trace fossils. Their sister Katherine was to marry Hugh Leonard in 1876, and he, like George, was an officer with the GSI. However he had a shorter career and had to retire in 1881. In Kinahan 1855 married Harriette Anne Gerrard; their son Gerrard became a geologist, but he was killed by a poisoned arrow in 1888 in West Africa while mineral prospecting. She was a good artist whose drawings her husband often used to illustrate his publications (Figure 8).

Within the GSI Kinahan was noted for his endless energy and enthusiasm to explore even the most difficult of terrains, but equally he was renowned for his acerbic manner, and fiery temper, and he thought nothing of letting his colleagues know what he thought of them and their work. This led him into direct and open conflict particularly with Edward Hull the Director of the Survey, who frequently threatened his underling with dismissal. For many years Hull had the sense to always ensure that he had a third person present whenever he met with Kinahan—for both men working under such circumstances must have been difficult. Nevertheless, they were productive times. All told he mapped approximately one-eighth the area of Ireland and authored or co-authored twenty-six memoirs and thirty-eight maps.

Kinahan was President of the Royal Geological Society of Ireland 1880-1881, a Member of the Royal Irish Academy, and an Honorary Member of

both the Manchester Geological Society and the Institution of Mining Engineers.

He was a prolific author who wrote on a wide variety of geological, archaeological and natural history topics. He penned a series of papers on Irish folklore in the 1880s. To the *Geological Magazine* alone he contributed 85 papers. He made major contributions to the understanding of the complex geology of western Ireland, wrote on Irish glacial deposits, the Precambrian of Canada (which he visited in 1884), the estuary of the River Slaney to highlight just four topics. He authored seven books; his *Manual of the Geology of Ireland* was published in London in 1878 at the same time as Hull's *Physical Geology and Geography of Ireland* with which it competed for sales and readership! With Alexander McHenry, a Survey colleague, he published a handy volume on reclaiming bogland, landed flooded by the sea and other wastelands. However, for me and others interested in urban geology and building stones, Kinahan's multi-part *Economic Geology of Ireland* (1885–1889) remains the most useful reference work to the stone, slate and clay resources of Ireland. All told Kinahan was a fine field geologist who assembled an encyclopaedic knowledge of Ireland's geological history.

Next time you are driving through Avoca, take a few minutes to stop at Holy Trinity, Castlemacadam and locate the Kinahans' grave. There under a granite boulder, on which the craved inscription is hardly legible, lies one of the giants of nineteenth century geology in Ireland.



Figure 9. Grave of George and Harriette Kinahan, Castlemacadam, Avoca. (Photograph courtesy Gordon Herries Davies)

Sydney Mary Thompson (Madame Christen)
(1847–1923)

2008 was the International Year of Planet Earth and to mark this the Geological Survey of Ireland has, amongst other events, organised a competition for schools. Children are being asked to identify a glacial erratic in the locality. This reminds us of the aspirations of the committee established in the 1870s by the British Association for the Advancement of Science (BAAS) to report on the distribution of such exotic blocks of stone. This was important and topical work whose importance can be measured in that during the period 1874 to 1908 the Association granted the considerable sum of £157-16s-6d to support the study.



The work of this Committee was championed in the north of Ireland by a number of ladies led by the energetic and able Sydney Mary Thompson (1847–1923) (Figure 10) who was assisted by Mary K. Andrews (1852–1914) daughter of a professor at Queen's. They formed part of the Geological Section of the Belfast Naturalists' Field Club which had been founded in 1863.

Thompson was born at Whitehouse in County Antrim one of several

Figure 10. Sydney Mary Thompson (Madame Christen) at Murlough Bay, Co. Antrim.

children of James Thompson, a Belfast linen merchant. She was a niece of the naturalist William Thompson. Following her schooling and a three-year period spent in Dresden, she trained at the Belfast Government School of Art and in London and later joined two Belfast art groups.

From an early age Thompson was a keen student of glacial features and on 29th September 1894 she was elected a member of Glacialists' Association. In the same year she joined the Geologists' Association. Quickly she began to make a mark as a geologist. In July 1895 she organised a visit to the region by the Geologists' Association and during the trip the visitors enjoyed her hospitality at her father's house at Macedon Point, north of Belfast.

Between 1893 and 1899 the Belfast group mapped and named erratics, and collected small samples of these exotic blocks of rock. They wished to determine the direction of ice-flow in Ulster. Their results were written up by Thompson, published in the *Proceedings* of the Belfast Naturalists' Field Club, and they also contributed their findings to the BAAS committee. Thompson's major find was that of a piece of Ailsa Craig microgranite at Moys, inland from Limavady, Co. Londonderry which demonstrated the furthestmost western extent of the Irish Sea Glacier. Small pieces of this distinctive granite which contains tiny flecks of the

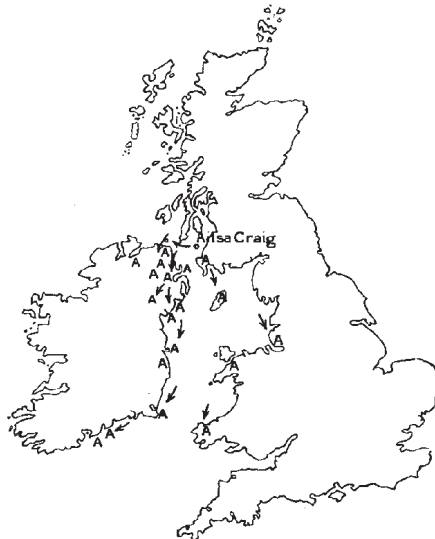


Figure 11. Distribution of Ailsa Craig granite erratics in Ireland and Britain (from W.B. Wright, The Quarternary Ice Age, Macmillan, London (1914), p. 56).



Figure 12. Erratic from Garvagh collected by the Belfast Naturalists' Field Club. (Image courtesy Ulster Museum)

blue-coloured mineral rebeckite, was carried by the Irish Sea Glacier southwards and was incorporated into glacial sediments along the east coast of Ireland (Figure 11). Its presence allowed geologists to trace the flow of this long-melted glacier.

Today the Belfast group's collections of erratics are in the Ulster Museum where the small samples are contained in dove-coloured boxes whose lids are neatly held down with pink ribbon (Philip Doughty, personal communication, July 2007 – who also remarked to me that the colour of the ribbon suggested a feminine touch) (Figure 12).

In 1901 Mary Andrews published an important paper in which she identified twelve species of fossil shells and foraminifera in the glacial sands at Moel Tryfaen in north Wales. The importance of this site is that it is high above sea level and demonstrated the ability of ice to deposit marine shells at high elevations.

At the age of fifty-three Sydney Mary Thompson married a Swiss artist Rodolphe Christen and was from then on styled 'Madame Christen'. For two years following their marriage they traveled throughout Europe and then settled near Aberdeen. Unfortunately they enjoyed only a brief marriage; Rodolphe died at home on 7th September 1906 aged only 47. Four years later his widow published a biography of her husband in which is reproduced his pencil drawing of her cutting their wedding cake whilst on a picnic. Appropriately she is sheltering in the shadow of a large erratic.

Sydney Mary Thompson died of heartfailure in Landudno, on the north coast of Wales on 16th July 1923. Whenever you see a large glacial erratic the work of this energetic lady will be brought to mind.

James Robinson Kilroe **(1848–1927)**

Given the obvious and long-standing importance of agriculture to the economy of Ireland it is unsurprising to find that great store has been placed on the study of the soils and unconsolidated sediments on which this economy is based. There have been a series of surveys undertaken during the last three hundred years and our present subject was at the forefront of Irish pedological study in late 1800s and early 1900s.

In 1756 Charles Smith provided a short account of the soils of Co. Kerry, locating an ‘ash-coloured clay’ near Castlemaine which he stated ‘seems proper for the potter’s use’. Just under thirty years later the chemist and mineralogist Richard Kirwan applied his considerable mind to the question of which manures were best used for improving Irish soils. The various statistical reports on Irish counties published by the Royal Dublin Society contained information on soil types and distribution.

Robert Kane in 1843 in his book *The Industrial Resources of Ireland*, lamented the dearth of analyses of Irish soils and he set out to rectify this matter. Although in the following Thomas Antisell had read a paper to the Royal Dublin Society such analyses of the most important soils of Ireland, Kane saw an opportunity to achieve his goal. In 1845 the Geological Survey of Ireland was established and its offices were located in the impressive former townhouse of Lord Castlecoote at 51 St Stephen’s Green. It shared these premises with Kane’s Museum of Irish Industry, and soon the geologists were ordered to make collections of representative samples of soils encountered as they undertook their geological programme. Soon this directive brought Kane and Thomas Oldham, Local Director of the Irish Survey, into dispute. Oldham realised that such collecting was a severe drain on their primary goal, that of determining the nature of Ireland’s geological foundation. Not long afterwards the geologists abandoned the collection of soil samples and only resumed in the 1890s once their primary objective had been reached, and a one-inch to the mile coverage of geological maps published.



Figure 13. James Robinson Kilroe (Geological Survey of Ireland).

From the 1960s An Foras Taluntais published a series of maps and reports on the soils of most Irish counties that had been surveyed as part of the National Soil Survey of Ireland. This work culminated in 1969 of the publication of a comprehensive soil map of Ireland. Today the work of pedologists continues and An Foras Taluntais in association with the Environmental Protection Agency has recently launched a Soil Database Website.

James Robinson Kilroe (Figure 13) was born in Co. Roscommon in 1848, the eldest son of a linen worker turned farmer and his first wife Susan Robinson. According to a piece by his great granddaughter published online on a Kilroe Family forum, Kilroe's grandfather had been drowned together with his two brothers while trying to rescue a farmer who had fell through ice on a frozen lake. Shortly afterwards his widow gave birth to a son but left him in the care of an aunt when she emigrated to Canada.

James Robinson Kilroe was employed as a school teacher in England before taking up a position as a Temporary Assistant Geologist with the Geological Survey of Ireland in 1874. He was promoted to Geologist in 1890. Sent to Sligo, Donegal, Tyrone and Fermanagh he carried out mapping and was later acknowledged by the mineralogist Frederick Henry Hatch to have been responsible for the discovery of the orbicular granite at Mullaghderg near Dungloe in Donegal (This important locality has since been damaged by sampling). Kilroe's findings on the solid geology of these

areas were published in several Survey Memoirs, and he also published elsewhere an account of two Carboniferous outliers that he had discovered on Slieve League. In the 1880s he wrote on glacial topics and discussed the evidence for the direction of ice flow in Donegal.

Figure 14. Soil horizon above folded limestone (Drawing by Edward Townley Hardman from Kilroe's 1907 paper, page 10). Note the pedologist's primary piece of field equipment – the spade.



In 1890 following the publication of the final geological map the Survey staff was reduced through retirements. Kilroe was retained and soon found himself undertaking surveys of the drift deposits as part of a new mapping programme in the early years of the 1900s under the direction of George Lamplugh. This concentrated on the glacial drift deposits around the major urban centres. During the survey of Londonderry Kilroe discovered a 'gravel dyke' which was the important feature, a ice-wedge pseudomorph.

At this time Kilroe began investigating the soils of Ireland (Figure 14) and this work culminated in the publication in 1907 of his *A description of the soil-geology of Ireland, based upon geological survey maps and records, with notes on climate*. Earlier he had published a synopsis of this paper and included a map of the drift (Figure 15). This volume contains an outline

John Joly (1857–1933)

When the Russian scientist Dmitri Mendeleev developed the idea of the Periodic Table of the elements over a two-week period early in 1869 it is unlikely that he would have predicted the nationalistic fervour that marked the discovery and naming of elements in the late 1800s. Gallium (for France) in 1875, Germanium in 1886 and Polonium in 1898 were so named. In 1922 John Joly (Figure 16), of Trinity College, Dublin named Hibernium, a new radioactive element he had discovered in granite. Unfortunately for both Joly and Ireland it was later discovered that the new element was in Samarium which had been isolated over sixty years earlier.



Figure 16. John Joly: an early photograph (Courtesy of the late Ted Nevill).

Joly was born on 1st November 1857 in Hollywood House (the Rectory), Bracknagh, County Offaly, the third and youngest son of John Plunket Joly and Julia Anna Maria Georgina *née* Comtesse de Lusi, and this year we are celebrating the sesquicentenary of his birth. He was a distinctive man who sported a bushy moustache and wore pince-nez perched on his nose. By all accounts he was highly popular with his students, and very generous to colleagues with his time and expertise.

Educated at the Rathmines School in Dublin, and later at Trinity where he studied classics and modern literature and later engineering. He was to

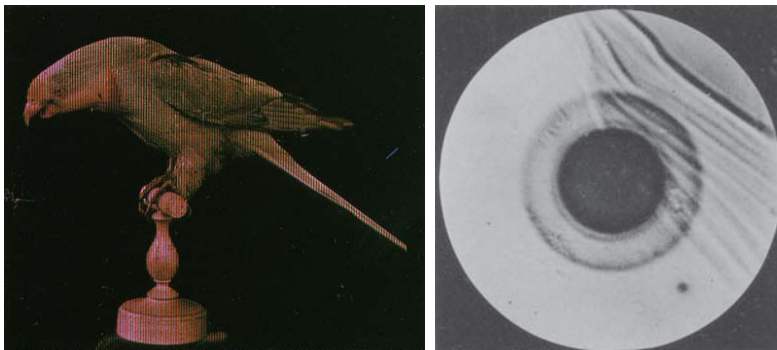


Figure 17 (left). Colour image of a parrot taken by Joly using his 'Joly Method'. This stuffed bird is now in the Department of Geology, TCD.

Figure 18 (right). Pleochroic halos in Leinster Granite from Co. Carlow.

remain there for the rest of his life, holding assistantships in engineering and then in physics before obtaining the Chair of Geology and Mineralogy. In his early career he can be regarded as being an inventor and physicist. His steam calorimeter allowed for the measurement of the specific heat of minerals and this piece of equipment later played an important role in the development of the kinetic theory of gases.

Joly had the ability to focus his mind on a wide variety of subjects outside of his immediate academic discipline, and together with his life-long friend the botanist Henry Horatio Dixon, he explained the mechanism of the 'ascent of sap' or transportation of water in plants. They showed that this was driven by a pressure gradient set up in plant vessels through the loss of water from the surface of leaves by transpiration. In the late 1890s he invented a system of colour photography called the 'Dublin method' or 'Joly Method' (Figure 17) which until the advent of digital methods was essentially the scheme used for colour photography. He established a business on Brunswick Street (now Pearse Street), Dublin to exploit his invention but it failed, as it proved difficult to produce colour prints from his glass slides.

After his professorial appointment in 1897 he shifted his focus to matters more geological, but he cannot be regarded as a field geologist. To my

knowledge he never drew a geological map, nor did he accumulate large collections through his own collecting. However he is now remembered in geological circles for his considerable and important research into geochronology and in the fledgling subject of geodynamics and tectonics.

Towards the end of the nineteenth century William Thomson (later Lord Kelvin) argued that the Earth was between 24 and 40 million years old. However in 1899, Joly published an influential paper in the *Scientific Transactions of the Royal Dublin Society* in which he calculated the Earth to be 100 million years old, and soon the earlier estimate evaporated away. Joly derived his global time-span from an estimate of the volume of sodium in the oceans which he divided by the rate at which it was carried into the oceans by rivers. It is not surprising that he turned to the sea for his inspiration as he was a notable yachtsman, who was also a Commissioner for Irish Lights for whom he undertook an annual inspection of lighthouses. He was a pioneer in the field of radioactivity and its connections to geology. In 1907 he demonstrated that pleochroic halos (Figure 18) found in biotite in some granites were formed as a result of the decay of radioactive zircon crystals. He established the Irish Radium Institute in 1914 that exploited the medical advantages of radium.

Joly was probably the most brilliant Irish scientist of his generation. He was elected a Fellow of the Royal Society before being admitted to the Irish equivalent, and received medals from the Royal Society, the Royal Dublin Society and the Geological Society.

He died in Dublin on 8th December 1933 and is buried in Mount Jerome Cemetery. Forty years later he had a crater on Mars named for him, which was appropriate given his research on the nature and origin of Martian Canals.

Charles Irving Gardiner & Sidney Hugh Reynolds
(1868–1940) (1867–1949)

Every so often a partnership is developed and sustained over time so that when one individual is mentioned immediately the name of the other comes to mind. This is most obvious in the field of comedy, but even in geology we have our partnerships. Mention the Scottish geologist Ben Peach, and his colleague John Horne immediately appears alongside. In Ireland such double acts are hard to recall, but given their considerable years spent on field studies in this country a pair of English geologists merit a place in this tableaux of Great Irish Geoscientists.

Charles Irving Gardiner (Figure 19) was born in 1868, son of Samuel Rawson Gardiner a historian noted in his time for his assessment of Oliver Cromwell and the Puritans. While studying mathematics and physics at Cambridge Charles' fascination with geology began when he attended the lectures of Professor John Edward Marr. There he met Sidney Hugh



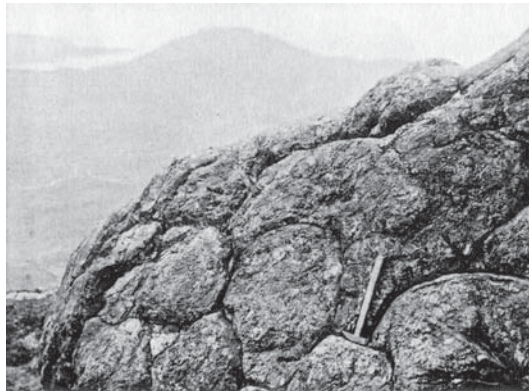
Figure 19 (left). Charles Irving Gardiner (courtesy of Paul Mohr)

Figure 20 (right). Sidney Hugh Reynolds (courtesy and copyright of University of Bristol)

Reynolds (Figure 20) and their life-long friendship and collaboration began. On graduation in 1895 Gardiner was appointed Senior Science Master at Cheltenham College where he remained until his retirement in 1928. Although a busy schoolmaster Gardiner found time for his field studies and also authored two books aimed at the general public: *An introduction to geology* (1914) and *Geology* (1923). On retirement he became Curator of the recently established Cowle Museum at Stroud, and during this time he discovered important reptile fossils in the Great Oolite at Stow-in-the-Wold. These are now in the Natural History Museum in London. In 1940 the Museum was requisitioned for use by the army and Gardiner's curatorial tenure suddenly terminated. He died shortly afterwards.

Reynolds who was born in Brighton was a year older than Gardiner. He embarked on an academic career in geology in 1894 when he was appointed a lecturer at University College, Bristol (later the University of Bristol) where he remained all his life. Geology in Bristol suffered in two ways at this time: space was short and so his office doubled-up as a teaching laboratory, and the teaching collection was small and limited. Over time Reynolds amassed a large and educationally valuable collection. In 1909 he was elevated to the Chair of Geology and Zoology. On retirement in 1933

Figure 21. Pillow-lava near the top of Bencorragh, Co. Mayo (Photograph by S.H. Reynolds).



he continued his research but unfortunately much of his personal collections were lost as a result of the bombing of the city during World War II.

Throughout his life Reynolds was a keen and able photographer and for many years was Secretary of the Committee on Photographs of Geological Interest whose efforts were supported by the British Association for the Advancement of Science. In 1904 and 1908 he donated to the collection images of the Isle of Arran, faults in Devon, igneous rocks of north Wales, and general views of Somerset. In total he contributed nearly 1200 images to the resource. Today many of his photographs of Irish scenery and geology are housed in the Ulster Museum, and in examining them it is easy to recognise the difficulties of having to carry heavy and cumbersome equipment to places as inaccessible as the top of Bencorragh near Lough Nafooeoy (Figure 21) across difficult, often boggy terrain.

Why did this unlikely pair work in Ireland? Simply for no other reason than it was suggested to them by Marr, who considered that an examination of some of the Lower Palaeozoic rocks in Ireland would be worthwhile and that they showed flair for such a task. So at the beginning of numerous summer vacations between 1893 and the outbreak of the First World War in 1914 the pair would be found on a passenger ship heading to Ireland. They began their mapping programme in Kildare (publishing their detailed findings in 1896), before moving on to Portrane (1897) and Lambay Island (1898) in Co. Dublin. They then turned their attention westwards to Dingle and the fossiliferous and volcanic rocks at the western end of the Dingle Peninsula (1902). There they carefully mapped out the distribution of numerous rhyolitic bands. Finally they worked in Mayo and Galway around Tourmakeady (1909), Glensaul (1910), the Kilbride Peninsula (1912), and Lough Nafooeoy (1914). Reynolds discovered a rare crustacean at Kilbride, Co. Mayo named *Caryocaris kilbridensis* by Henry Woodward in 1912. Gardiner authored a paper on the Silurian of Balbriggan in his own right in 1899. All of their eight joint papers on Irish geology appeared in the *Quarterly Journal of the Geological Society* and in reading them one soon grasps the quality of their observations and interpretations in districts where the geological structure was not easy to unravel. All contain highly detailed geological maps of which some are coloured (Figure 22).

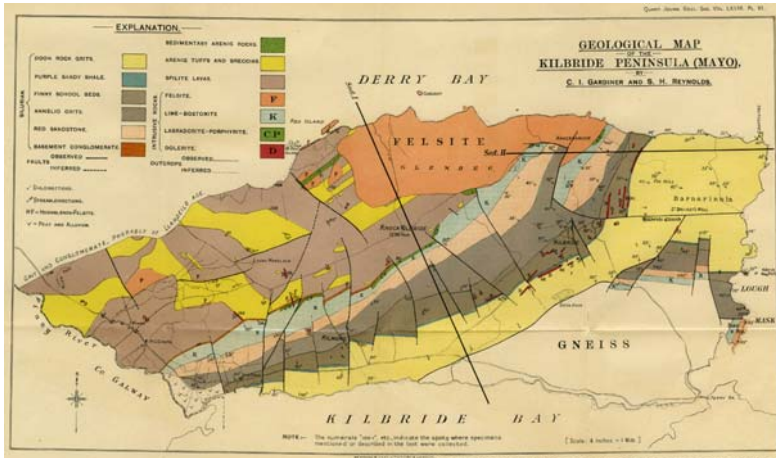


Figure 22. Geological map of the Kilbride Peninsula published in 1912.

Through their collaboration Gardiner and Reynolds made a significant contribution to the understanding of the Lower Palaeozoic geology of Ireland and it can be reasonably argued that their post-Irish studies together did scale the same academic heights. The onset of hostilities against Germany in 1914 stopped their Irish sojourns and following increased nationalistic tensions they decided that it would be prudent for two English geologists to cease visiting remote parts of western Ireland. Instead they turned to Scotland, and later Reynolds carried out valuable studies nearer to Bristol, and for recreation worked up systematic accounts of various Pleistocene mammals which were published by the Palaeontographical Society. He is also remembered for his seminal zoological book *The Vertebrate Skeleton* (1897 and 1913)

The excellence of the research carried out by the pair was recognised by their peers in the Geological Society; Reynolds receiving the Lyell Fund in 1904 and the Lyell Medal in 1928 while Gardiner received the Wollaston Fund in 1912. In all the citations for these awards their work in Ireland is highlighted. Although now dated Gardiner and Reynolds' compendium of publications was perhaps the most significant contribution made to the understanding of Ireland's geology in the two decades just prior to major political change in the country.

James Ernest Richey **(1886–1968)**

Two of my colleagues are enthusiastic gardeners of some considerable skill, but I doubt that they use their plants as aids to recall the names of friends, as did the geologist born 120 years ago on 24th April 1886 at Desertcreat Rectory, Co. Tyrone. That geologist was James Ernest Richey (Figure 23), who named his rhododendrons after his friends, but who is better known in geological circles for his work on the volcanic rocks of western Scotland and northern Ireland.

Richey received his secondary education at St Columba's College which nestles in the Dublin Mountains south of Rathfarnham, after which he studied at Trinity College, where he was taught by John Joly. Richey excelled and graduated with a B.A. in natural sciences in 1908, and with a degree in Engineering in 1909. He was also the recipient of a Gold Medal, a rare accolade awarded only to exceptional students. Many years later in 1934 he was conferred Sc.D. by the College. Following graduation Richey spent two years as a Demonstrator in Geology at Oxford, before leaving joining the Geological Survey in 1911. In 1914 he enlisted and serving with the Royal Engineers on the Western Front. He was wounded, decorated for bravery and demobbed with the rank of Captain. In 1919 he returned to the Geological Survey; he was promoted Senior Geologist in 1922 and District Geologist in 1925, and remained in post until his retirement in 1946 at the age of sixty.



Figure 23. James Ernest Richey (courtesy British Geological Survey).

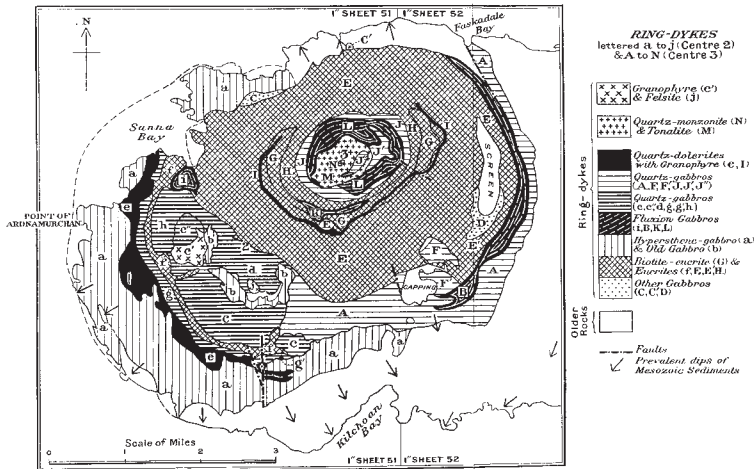


Figure 24. Geological Map of Ardnamurchan (from Richey, 1930) (used with permission of the Director of the British Geological Survey)

His early work in Scotland was carried out on Mull under the supervision of C.T. Clough, and then in 1920 he embarked on a mapping programme on Ardnamurchan – work for which he is principally remembered. In great detail he documented three ring centres each of which were characterized by a complex of ring dykes and cone sheets in varying associations with each other (Figure 24). While today some of his interpretations as to the genesis and emplacement of some of these igneous features are not fully accepted, it is a testimony to his accuracy that present-day Geological Survey maps of Ardnamurchan still closely reflect his mapping.

In 1933 he received the Lyell Medal of the Geological Society, and in his acceptance speech stated that he was drawn to work on the Mourne Mountains because in his youth he could see them on the horizon from the family home. Given his background and that of his wife, Henrietta Lily McNally who also hailed from Co. Tyrone, it is easy to understand why he returned to Ireland to investigate the Mournes. Later he shifted his attention to Slieve Gullion and did all of his Irish work during his holidays from the Survey – he and his wife and three daughters would live in a caravan that doubled up as a field station.

Following retirement he moved from Edinburgh to Monifeith near Dundee and worked as a consulting geologist where his skills as an engineering geologist came to the fore. He was the first recipient of the Baker Medal of the Society of Engineers, and also published a text-book on engineering geology. Richey also spent time as a part-time lecturer at Queen's College, Dundee, but by some accounts his delivery style in this forum was not the most inspiring.

Richey has been described as a 'versatile and dedicated field geologist, equally at home amongst igneous, sedimentary and metamorphic rocks' and was noted as an energetic, purposeful and quick worker. His lasting geological contribution was his detailed mapping and interpretation of the volcanic centres associated with the Thulean Volcanic Province (known in his day as the 'British Tertiary Province'). He authored 102 papers and memoirs some of which are now considered classics – these include his 1930 Memoir on Ardnamurchan and his synoptical account of Tertiary volcanic districts published in the British Regional Geology series in 1935 (a second addition appeared in 1948 with the third published in 1961).

A final thought has crossed my mind: a striking variety of rhododendron is 'Prince Charming' with pinky-white flowers. I wonder if Richey grew it in his garden, and if so which geologist did he associate it with?

John Kaye Charlesworth **(1889–1972)**

John Kaye Charlesworth (Figure 25) was born in Leeds, but was orphaned at the age of eight. Determined to gain an education, he attended his hometown university where he was influenced by Percy Fry Kendall (1856–1936), and later continued his studies at London, Breslau and Munich. On being turned down for military service in the First World War he took up a temporary lectureship at Queen’s University, Belfast in 1914. After a brief interlude at Manchester between 1919 and 1921, Charlesworth returned to Queen’s in 1921 as Professor of Geology.

Early in his career in 1919 he went to Spitsbergen where he observed glaciers; by its close he was an acknowledged expert on the Pleistocene. Back in Belfast he began detailed mapping of glacial features across Ireland (with occasional excursions into Scotland), following men such as William Bourke Wright (1876–1939) and fellow Yorkshireman George William Lamplugh (1859–1926) who had also trod the Irish glacial deposits. From his field observations he built up a dynamic picture of glacial activity, a

story he published in numerous papers, including one co-authored with his son Henry who later became a professor of geology in Alberta.



He was elected a Member of the Royal Irish Academy in 1919, received the Commemorative Medal from the Belfast Naturalists’ Field Club in 1936, the Neill Prize from the Royal Society of Edinburgh for his Scottish work, the Prestwich

Figure 25. John Kaye Charlesworth.

Medal from the Geological Society of London in 1957, and in that year became a C.B.E in recognition of his geological and public work (from 1947 for a period he served on the National Insurance Advisory Committee established by the Government). His glacial researches aside, his other major contributions to Irish geology were his books *The Geology of Ireland* (1953) and *Historical Geology of Ireland* (1963), and the four bibliographic listings that appeared in the *The Irish Naturalists' Journal* between 1937 and 1972 which list 1466 papers on Irish geology. These were undoubtedly a most valuable resource to those interested in Ireland's geology at a time before such compilations could be self-generated in seconds using specialist databases such as GeoRef.

Today Charlesworth's work is rarely cited in treatments on the Irish Pleistocene. The reasons for this may be due to a number of factors. The interpretations of some features that he described are now seen in a different light, i.e. features regarded by him to be moraines are not, and so his patterns of the Irish deglaciation differ from those prevalent today. Secondly, detailed sedimentological examination of sections of glacial material which revealed much about landform formation only became the norm from the 1950s onwards, and by then Charlesworth's field days were over. Thirdly, late in his career new dating methods were being applied to Pleistocene stratigraphy which moved the understanding of this complex time span significantly onwards. Nevertheless, his work was for its time well regarded. Charlesworth's large canon of work was encapsulated in *The Quaternary Era* which appeared in 1957, and although largely dated by the time of its publication, may be regarded as his most important legacy.

Suggested further reading

A number of biographical sources for persons of Irish birth or those who worked in Ireland include the following:

Dictionary of Irish Biography, 9 volumes (2009). Cambridge University Press & Royal Irish Academy.

Dictionary of National Biography, 60 volumes (2004). Oxford University Press

Mollan, C., Davis, W. & Finucane, B. (2002). *Irish Innovators in Science and Technology*. Royal Irish Academy and Enterprise Ireland.

G.L. Herries Davies (1995) *North from the Hook*. Geological Survey of Ireland.

Patrick N. Wyse Jackson (1993) *In Marble Halls: geology in Trinity College, Dublin*. Trinity College, Dublin.

Acknowledgements

I am grateful to the Dr Peadar McArdle (Director GSI) and Dr Mary Carter (GSI) for their support of this project, and thank those who supplied photographs and images for use in this booklet. Dr Tony Bazley (Editor, *Earth Science Ireland* kindly gave permission for these articles to be reprinted in this format.



Geological Survey of Ireland

Beggars Bush
Haddington Road
Dublin 4

Tel: 01-678 2000 Fax: 01-668 1782

Web: www.gsi.ie