

# HAMILTON



William Rowan Hamilton was born at midnight on 3 August 1805. His father was land agent to Archibald Hamilton Rowan, Killyleagh, Co. Down. Hamilton Rowan, an active United Irishman, was imprisoned, escaped and lived in exile in Philadelphia for several years. At great personal expense, William's father paved the way for Rowan's return to Down. The Hamilton family's ensuing straitened circumstances may have contributed to William being sent, aged three, to live with his uncle James, who ran the diocesan school at Trim, Co. Meath. William remained there until he entered TCD in 1823. His uncle taught him a range of oriental and modern languages, Hebrew and the classics. Mathematics was not within James's competence, but recognising his nephew's computational skills, he gave William a copy of Lloyd's *Analytical geometry*, thereby exposing him to the world of mathematics.

At TCD, Hamilton was a brilliant student, producing his first major paper, 'Theory of systems of rays', and being appointed Andrews professor of astronomy, all before graduating! Hamilton's work showed that the entire optical system and all solutions for paths of light rays through the system could be completely described by one characteristic function. This function led Hamilton to deduce the existence of a new optical phenomenon, conical refraction. This was the first prediction of a new physical effect on the sole basis of the mathematical structure of a theory: it established Hamilton's international reputation and he was knighted in 1835.

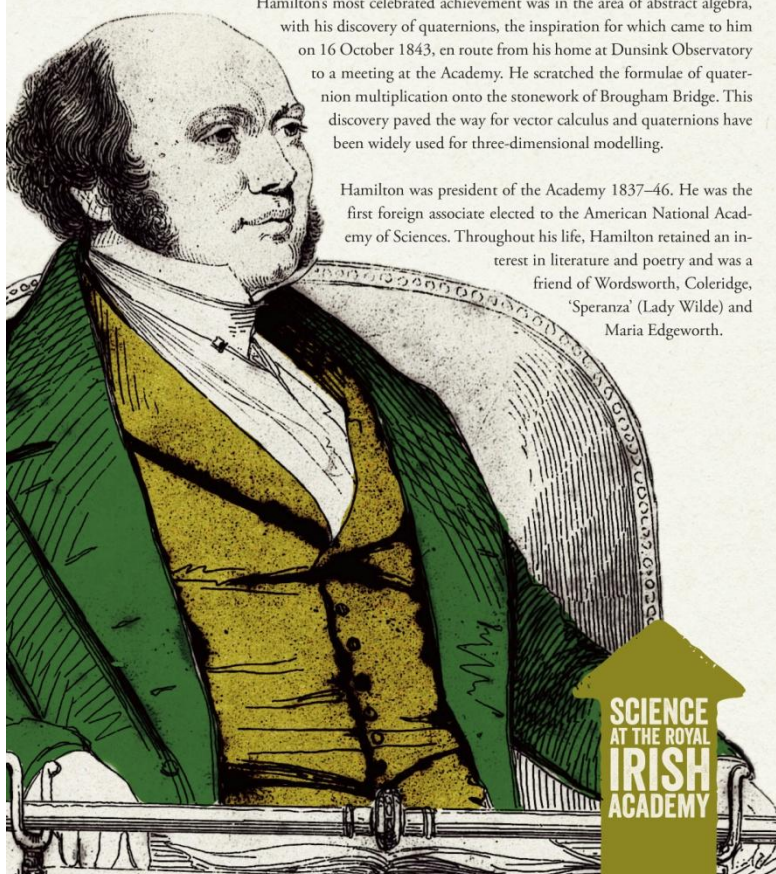
Hamilton next published two groundbreaking papers on dynamics. Erwin Schrödinger (1887–1961) gave the Hamilton formulation a central role in his construction of quantum mechanics.

Below: Detail from the pocket book in which Hamilton first entered the fundamental formulae of quaternions. J. R. Colthurst, 'The Icosian Calculus', *Proc. RIA* 50 (1944–5). Courtesy of the Board of Trinity College Dublin. © TCD

$$\begin{array}{l}
 i^2 = j^2 = k^2 = -1 \\
 ij = k \quad jk = i \quad ki = j \\
 ji = -k \quad kj = -i \quad ik = -j
 \end{array}$$

Hamilton's most celebrated achievement was in the area of abstract algebra, with his discovery of quaternions, the inspiration for which came to him on 16 October 1843, en route from his home at Dunsink Observatory to a meeting at the Academy. He scratched the formulae of quaternion multiplication onto the stonework of Brougham Bridge. This discovery paved the way for vector calculus and quaternions have been widely used for three-dimensional modelling.

Hamilton was president of the Academy 1837–46. He was the first foreign associate elected to the American National Academy of Sciences. Throughout his life, Hamilton retained an interest in literature and poetry and was a friend of Wordsworth, Coleridge, 'Speranza' (Lady Wilde) and Maria Edgeworth.



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# KIRWAN

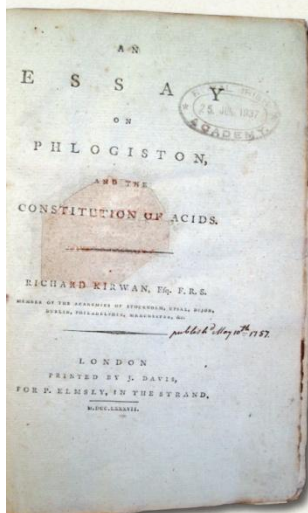
## MAN OF SCIENCE



Richard Kirwan (1733–1812), chemist, mineralogist, meteorologist and philosopher, was second president of the Academy.

Raised at Cregg Castle, Co. Galway, Kirwan was educated in France and was destined for the priesthood. However, in 1755, on the death of his elder brother in a duel, he returned to Ireland. He married Anne Blake of Menlough Castle, assembled a laboratory there and began to amass a library. He read for the Bar at London but only practised for two years. He then spent almost a decade studying the physical and chemical sciences and learning modern languages. He lived in London, 1777–87, where he was an active member of the Coffee House Philosophical Society, contributing to the debates on chemistry. In 1782, he was awarded the Royal Society's Copley Medal for his work on 'chemical affinity'. This work contributed to the establishment of Richter's law of reciprocal proportions.

Kirwan's *Essay on phlogiston* caused the most controversy of his many publications. In the eighteenth century phlogiston was thought to be a component of all combustible bodies. Kirwan considered phlogiston to be 'inflammable air'. In time, experimental evidence disproved the phlogiston theory and in 1791 Kirwan publicly announced his conversion to the eminent French scientist Lavoisier's views!



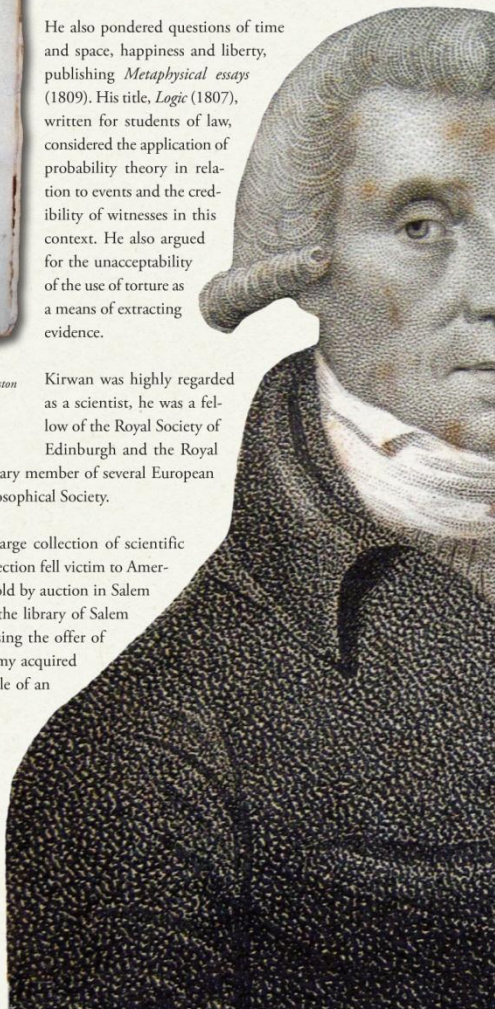
Above: Title page of Kirwan's *An essay on phlogiston and the constitution of acids*, 1st edn. (1787).  
Right: Richard Kirwan, *Philosophical Magazine* 13 (1802).

His important *Elements of mineralogy* is featured on the next panel and his large body of work in the field of meteorology is described on the Weather panel.

He also pondered questions of time and space, happiness and liberty, publishing *Metaphysical essays* (1809). His title, *Logic* (1807), written for students of law, considered the application of probability theory in relation to events and the credibility of witnesses in this context. He also argued for the unacceptability of the use of torture as a means of extracting evidence.

Kirwan was highly regarded as a scientist, he was a fellow of the Royal Society of Edinburgh and the Royal Society (London) and was an honorary member of several European academies and of the American Philosophical Society.

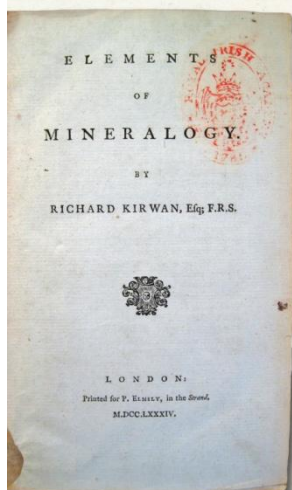
During his lifetime he amassed a large collection of scientific books. In 1781, part of his early collection fell victim to American privateers. The collection was sold by auction in Salem (Mass.), eventually forming part of the library of Salem Athenaeum. After his death, exercising the offer of first refusal on his books, the Academy acquired what constitutes an excellent example of an eighteenth-century chemist's library.





# KIRWAN

## THE MINERALOGIST



Title page of Kirwan's *Elements of mineralogy* (1784).



Richard Kirwan made significant contributions to the understanding of the earth and its rocks. His *Elements of mineralogy* (1784) was the main textbook in English for many students of the evolving discipline of geology. He was also responsible for the acquisition of an important mineral collection in 1792 that was used for recognising the various mineral resources of Ireland.

### Elements of Mineralogy

In the late eighteenth century scientists were looking closely at the rocks in the landscape. Rocks are made of various minerals, each important in understanding the raw materials of nature and the potential for natural resources useful to industry. Minerals may be characterised by their colour, crystal shape, hardness, chemistry and other features.

In Kirwan's time some minerals were well known. Iron, gold and silver had been mined for centuries. Many other minerals had yet to be described in detail or their relationships to each other understood. His proficiency as a chemist allowed him to analyse the chemical composition of various minerals. He was aided by an extensive knowledge of German, which allowed him to communicate with the leading scientists of the day. At the time, the research of German

mining schools was central to the understanding and exploitation of natural resources.

### The Leske Mineral Collection

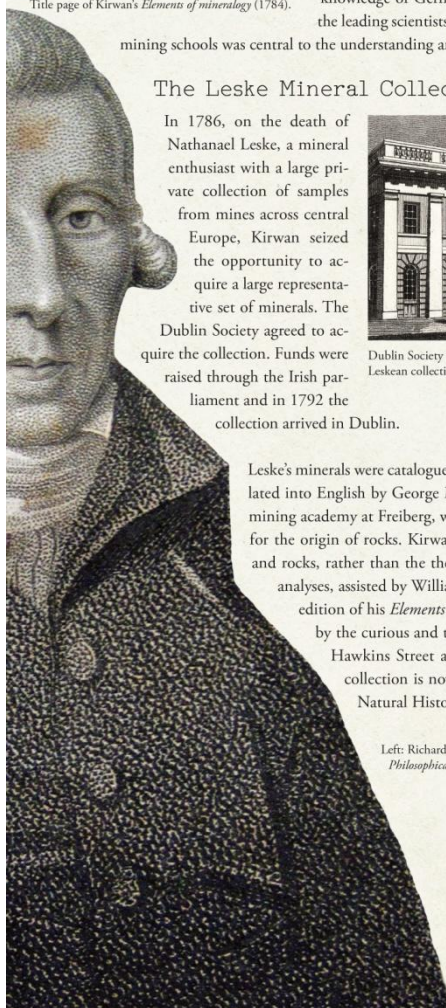
In 1786, on the death of Nathanael Leske, a mineral enthusiast with a large private collection of samples from mines across central Europe, Kirwan seized the opportunity to acquire a large representative set of minerals. The Dublin Society agreed to acquire the collection. Funds were raised through the Irish parliament and in 1792 the collection arrived in Dublin.



Dublin Society House (RDS Museum), Hawkins Street, home of the Leskean collection until 1815. *Hibernian Magazine* (Aug. 1801).

Leske's minerals were catalogued by Dietrich Karsten. His catalogue was translated into English by George Mitchell. All three men were connected to the mining academy at Freiberg, where Abraham Werner expounded his theories for the origin of rocks. Kirwan focused on the chemical nature of minerals and rocks, rather than the theories of their genesis. He carried out detailed analyses, assisted by William Higgins and this contributed to the second edition of his *Elements of mineralogy*. The Leske collection was visited by the curious and the scientific in the Dublin Society museum at Hawkins Street and later in its Leinster House premises. The collection is now housed at the National Museum of Ireland, Natural History Division.

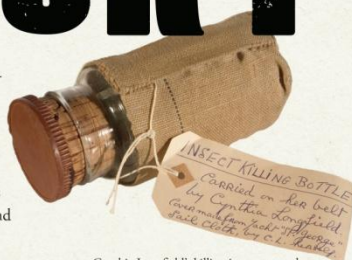
Left: Richard Kirwan, *Philosophical Magazine* 13 (1802).



# NATURAL HISTORY

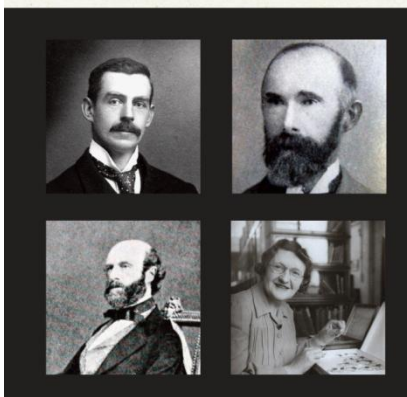


The first study of Irish natural history published in the English language was Gerard Boate's *Ireland's naturall history* (1652). It was published posthumously, Boate having died in 1649, shortly after his arrival in Ireland to take up a post as physician to the Cromwellian army. It was intended as a vade mecum for settlers in a boggy, rainsoaked country and it had a distinctly utilitarian focus.



Cynthia Longfield's killing jar, cover made from the sail cloth of the *St George*.

The investigation of the landscape – surveying, topographical description, observation of fauna and flora – continued over the next three centuries, reaching its high point with the groundbreaking Clare Island Survey (1909–11), organised by Robert Lloyd Praeger (1865–1953) and the Royal Irish Academy. This survey brought a plethora of scientific disciplines together, resulting in a comprehensive snapshot of the natural history of one island at a period in time. A second survey of Clare Island has recently taken place to study any changes in the environment which may have occurred in the intervening period.



Clockwise: Robert Lloyd Praeger, Richard J. Ussher, Alexander H. Haliday, Cynthia Longfield.

A pro-active member of the Academy and president (1931–4), Praeger was a prolific author, probably best remembered for *The way that I went* (1937). He published important botanical studies including *Irish topographical botany* (1901) and *The botanist in Ireland* (1934), as well as 700 articles and monographs.

Below: Drawing of *Sempervivum wulfenii* from the Praeger Collection.



One of the participants in the Clare Island Survey was Richard J. Ussher (1841–1913), who devoted much time to exploration of the habitats of rarer birds in Ireland. Ussher was also interested in the study of mammalian and avian fossils and spent a lot of time digging in caves in counties Clare, Cork, Sligo and Waterford searching for new specimens and adding to the knowledge of the extinct Irish fauna. The Library holds Ussher's collection of bird notes.

Entomology is represented by two major collections – that of Alexander H. Haliday (1807–70) and Cynthia Longfield (1896–1991). Haliday established many major taxa and described numerous insect species new to science. His manuscript *Catalogue of Irish insects* remains the only attempt to create a comprehensive checklist of Irish insects. Haliday's library of books and offprints is considered to be the finest collection of early entomological works in Ireland.

Self-taught, Cynthia Longfield had a lifelong passion for insects and became the acknowledged Odonata expert in the then British Museum (Natural History). She participated in several collecting expeditions to South America, Asia and made a solo six-month trip to Africa. Her works include *The dragonflies of the British Isles* (1937) and the innovative *Dragonflies* (1960). Longfield's insect collection is at the National Museum of Ireland, whilst her books and papers are held by the Academy.

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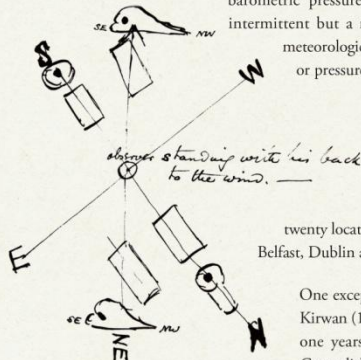


# WEATHER

## METEOROLOGICAL RECORDS



The earliest evidence of scientific meteorological activity in Ireland is the 'Weather Register' of William Molynex (1656–98), which began in TCD in March 1684 and included readings of barometric pressure. Over the next hundred years or so, progress was intermittent but a number of individuals made various efforts to record meteorological data by keeping weather diaries, recording temperature or pressure readings, or noting rainfall measurements.



Detail from letter of Sir John William Moore, MRIA (1845–1937), showing anti-cyclone cloud slope. MO/4/2. © Met Éireann

From its very early years, the Academy encouraged a more collaborative and standardised approach to scientific meteorology. In 1787, following a proposal to set up a network of observatories, the Academy's Council agreed to provide a barometer and a thermometer for twenty locations across the country. Readings were sent from Athlone, Belfast, Dublin and Galway for 1789 but input was not sustained.

One exception is the long series of observations made by Richard Kirwan (1733–1812), the Academy's second president. For twenty-one years Kirwan kept meteorological records at his home in Cavendish Row, Dublin. His was the first well-equipped weather station in Ireland with a barometer, thermometers, a rain-gauge and an anemometer of Kirwan's own design. Readings from 1791 until 1808 were published in the Academy's *Transactions* as were a number of Kirwan's papers on meteorology. Kirwan's theory on

air masses, including his descriptive terminology of that topic, foresaw twentieth-century meteorological concepts. Kirwan also developed a system of weather forecasting based on an analysis of climatological information from successive seasons, which proved so popular among farmers that he employed a special secretary to answer their letters of enquiry.

Although the Academy's own programme of weather observations had filtered, the Council continued to accept meteorological records from individual observers throughout the country. Examples include a 'Diary of the Weather' which records meteorological observations at Kilralnagh, Co. Wicklow, 1806–14 and observations taken by Maurice O'Connell at Derrynane, Co. Kerry from May 1845 until July 1846.

In 1851, the Academy organised a year-long meteorological survey carried out at sixteen locations, mainly coastguard stations or lighthouses. The Academy supplied instrumentation and instructions for observation. The survey was a success and in 1853 the results were summarised by Humphrey Lloyd.

Other significant meteorological data are those collected by the Ordnance Survey (1855–1959), held by Met Éireann. Uniquely, these include notes on prevalent diseases, anticipating the work of Sir John W. Moore (1845–1937), physician, who researched the connection between climate and public health.

November 1845		Derrynane	
Bar.	Therm.	Wind	Remarks
30.05	53.00	SE	Clear
30.07	55.15	SE	Clear
30.08	57.25	SE	Clear
30.09	59.35	SE	Clear
30.10	61.45	SE	Clear
30.11	63.55	SE	Clear
30.12	65.65	SE	Clear
30.13	67.75	SE	Clear
30.14	69.85	SE	Clear
30.15	71.95	SE	Clear
30.16	74.05	SE	Clear
30.17	76.15	SE	Clear
30.18	78.25	SE	Clear
30.19	80.35	SE	Clear
30.20	82.45	SE	Clear
30.21	84.55	SE	Clear
30.22	86.65	SE	Clear
30.23	88.75	SE	Clear
30.24	90.85	SE	Clear
30.25	92.95	SE	Clear
30.26	95.05	SE	Clear
30.27	97.15	SE	Clear
30.28	99.25	SE	Clear
30.29	101.35	SE	Clear
30.30	103.45	SE	Clear

Observations recorded in Nov. 1845 at Derrynane, Co. Kerry, the home of Daniel O'Connell, by his son, Maurice. Note these were made from the 'First Floor' and 'Study'. RIA MS 24 I 31. © RIA  
Below: Based on the original plate showing Rosapenna House, Co. Donegal, home of the Boyne family. The house gradually disappeared under the sands. W. Hamilton, 'Memoir on the climate of Ireland', *Trans. RIA* 6 (1797).



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