Darwin's travels on the *Beagle* and his theory of natural selection

Charles Darwin's radical insights into the mechanism of evolution grew out of his observations of the geographical distribution of species while on board the survey ship H.M.S. *Beagle* (1831–1836)

■ When Darwin discovered the fossil remains of giant extinct animals including armadillos and ground sloths in South America, he immediately realised their significance, since these earlier forms lay directly beneath the feet of their modern forms. He deduced that the modern species must be descended from the fossilised species.

■ He realised that the bird species of the Galapagos Islands were almost certainly derived from ancestral South American forms. Furthermore, there were distinct species of finches and mockingbirds on the different islands. Each type had evolved from a common ancestor through migration, isolation and adaptation to different local environments. This process is known as divergence.

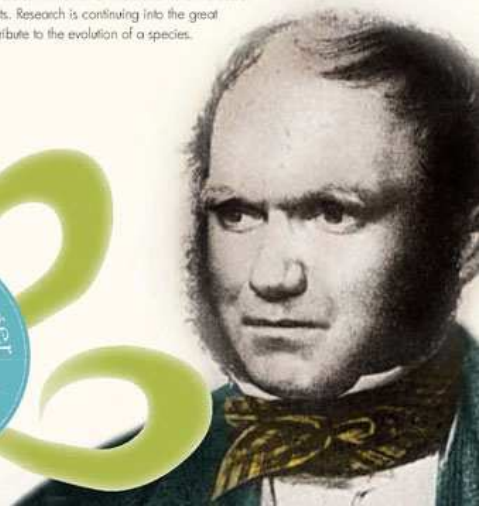
■ After his return to England, Darwin learned from animal breeders that there is significant variation between the individuals making up any species. He then proposed that in the 'struggle for existence' individuals that were best adapted to the local conditions would tend to be more likely to survive and breed, while those with any unfavourable characteristic would be at a disadvantage.

■ Darwin developed his theory to explain how a population became adapted to changes in its environment through the process of natural selection.

■ Darwin did not share his theory for many years. In 1858, Darwin heard of the work of Alfred Russel Wallace, who had explored similar concepts of evolution through his work on the natural history of islands in Indonesia. Darwin and Wallace made a joint presentation to the Royal Society, London, and the two became firm friends. Darwin finally published his ideas in his seminal book *On the Origin of Species* in 1859.

■ Darwin demonstrated that evolution has resulted in a complex 'tree of life', not a ladder of steps leading towards a single goal.

■ A comprehensive body of research undertaken since 1859 has established evolution as a fact. All organisms found on Earth today share a common lineage that goes back to the origin of life. Humans share structural and molecular features with other animals and have molecular processes in common with plants. Research is continuing into the great variety of mechanisms that contribute to the evolution of a species.



Darwin · Praeger & the CLARE ISLAND SURVEYS

Robert Lloyd Praeger

From the 1890s to the 1950s, Robert Lloyd Praeger dominated the world of Irish natural history

■ Praeger was born in Holywood, Co. Down, on the 25th of August 1865. As a child, his interest in flora and fauna was fostered through his membership of the Belfast Naturalists' Field Club, whose outings brought him into contact with the foremost naturalists of the day.

■ Praeger worked initially as a civil engineer, but became a librarian in 1893, when he moved to Dublin to join the National Library of Ireland. He then joined the Dublin Naturalists' Field Club, and took part in the many Club excursions to all parts of Ireland.

■ Praeger had an outstanding intellect. He was the leading authority on Irish botany and very knowledgeable about the other natural sciences. He was famous as an energetic observer and worker, and he was an excellent writer. Praeger worked incessantly, publishing many hundreds of articles and academic papers popularising the study of Ireland's flora and fauna. He was also recognised for his contributions to Irish archaeology, ecology, Quaternary geology, history, librarianship, phytogeography, travel and zoology.

■ Praeger was recognised internationally, and he used his overseas contacts and his excellent leadership skills to organise the Lambay survey (1905) and the more ambitious Clare Island Survey (1909–11). He soon gained a reputation among the Clare Islanders for his firm command of the assembled experts from Ireland and abroad.

■ He also wrote over 20 highly readable books. *The Way That I Went*, documenting his extensive travels around Ireland, appeared in 1937 and has never been out of print.

■ He was President of the Royal Irish Academy (1931–1934) and co-founder and first president of An Taisce (1948).

■ Praeger retired from the National Library of Ireland as Librarian in 1923. He continued to publish work on the natural history of Ireland and Europe into the early 1950s.

■ Praeger died in Craigavad, Co. Down, on the 5th of May 1953. He is buried in Dean's Grange Cemetery, Dublin.

R. Lloyd Praeger

Darwin · Praeger & the Clare Island Surveys

Darwin's influence on Praeger

Praeger's attitude to the study of natural history was challenged by Darwin's ideas

- Praeger attended school at the Royal Belfast Academical Institution. One of his teachers there was James Lawson Drummond, an influential figure in the field of natural history in Belfast during the nineteenth century

- To Drummond and others, the study of natural history was an important part of general education, as it fostered in students an aesthetic appreciation of the universe, eventually leading to an understanding of its very meaning and purpose.

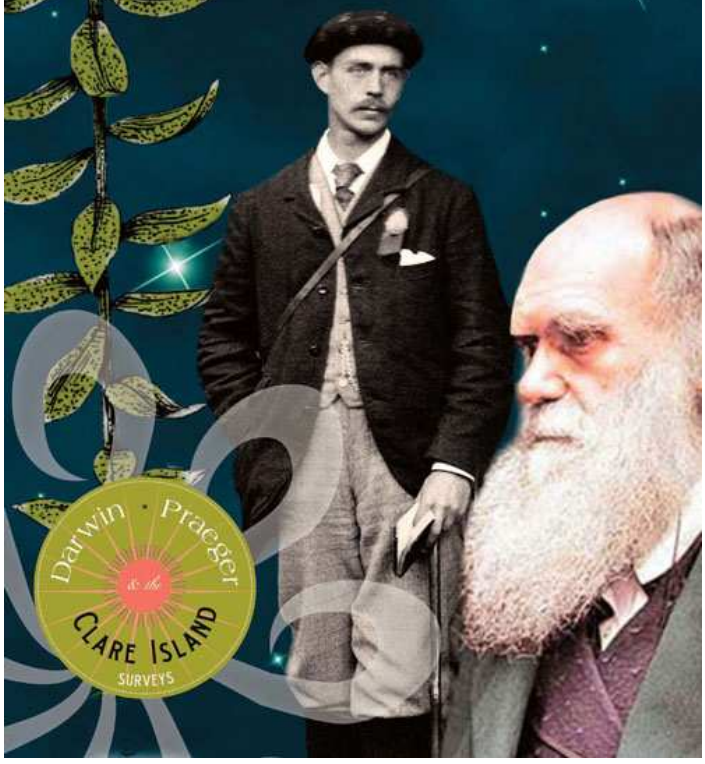
- Natural history was the means to show the manifestation of God's plan and that nature was 'a world of perfect government'. Praeger began his studies of natural history in this context.

- It could be said that Darwinism changed Praeger's certainty of these moral lessons of nature. Ultimately Praeger became an enthusiastic supporter of Darwin's ideas on natural selection: in 1913 he wrote

> 'Thus any slight variation which helps a plant to hold its own will tend to continue, because the plant that possesses it will be more likely to flourish and to produce seed than its neighbours, and the children tend to have the same characteristics as the parent. This is the simple principle which underlies the theory of Natural Selection, which will be always associated with the name of the great naturalist, Charles Darwin, who first propounded it in 1859.'

- Thus Darwinism presented Praeger with challenging new questions for investigation.

- The Clare Island Survey was, in part, Praeger's attempt to demonstrate Darwin's theories and replicate his research methods in an Irish context. Praeger's work and the Clare Island Survey are part of the history of Darwinism itself.



Darwin · Praeger & the CLARE ISLAND SURVEYS

The Clare Island Survey 1909–1911

Following the publication of *On the Origin of Species*, the flora and fauna of islands became the focus of interest for naturalists


Helga II

In 1908, Praeger and his colleagues selected Clare Island off the coast of County Mayo for the subject of an extensive survey. It was chosen over other islands such as Arranmore in County Donegal and Great Blasket in County Kerry because of its large size and variable topography, as well as its relative accessibility from the mainland.

The survey was the most ambitious collective project undertaken in Ireland at the time. More than a hundred researchers, recruited from Ireland, Britain, Germany, France, Denmark, Switzerland and America, visited the island between April 1909 and November 1911 to examine the island's flora, fauna, geology and archaeology.

The survey ship *Helga II* dredged the surrounding sea bed to gather samples of the marine life found in the sand and gravel.

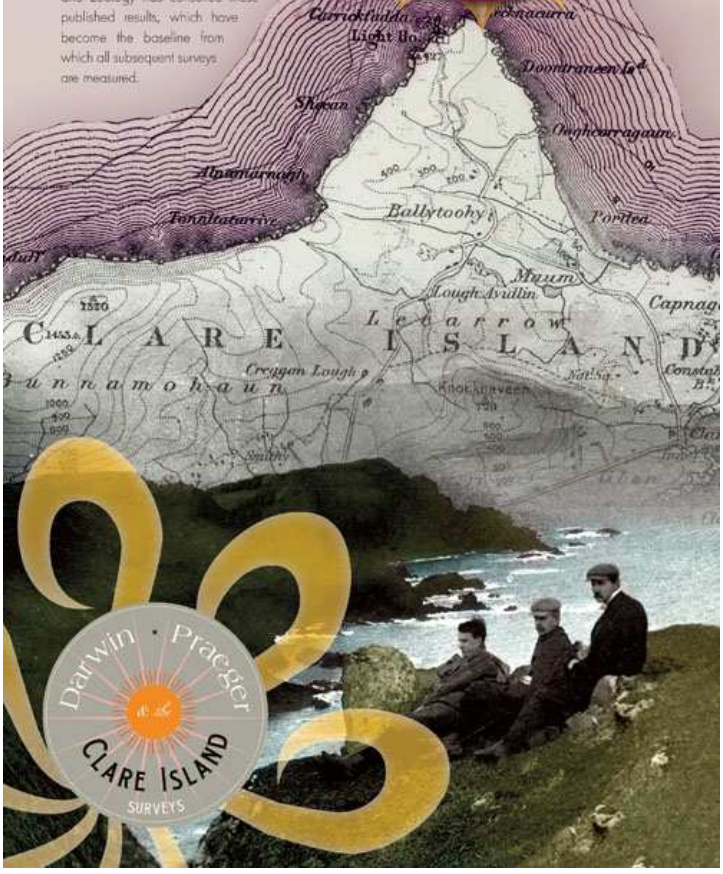
The results of the survey were written up by 40 contributors and were edited by Praeger. They were published in 67 reports in a special 3-part volume of *Proceedings of the Royal Irish Academy* between 1911 and 1915.

The survey of the island's ancient remains recorded the details of 37 sites and artefacts, including the medieval abbey, 6 promontory forts and 8 holy wells.

Since its completion, virtually every researcher in the areas of Irish archaeology, botany, folklore, geology, history, marine science and zoology has consulted these published results, which have become the baseline from which all subsequent surveys are measured.

The numbers of plant and animal species found exceeded all expectations:

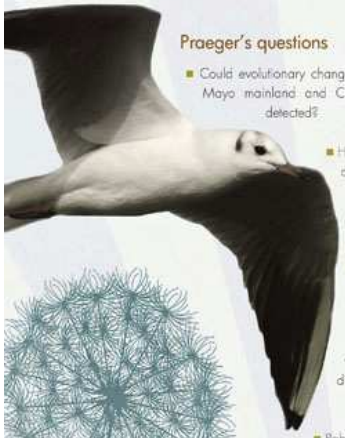
- 3,219 species of plants
- 585 plant species new to Ireland
- 11 plant species new to science
- 5,269 species of animals
- 1,253 animal species new to Ireland
- 109 animal species new to science



Darwin · Praeger
CLARE ISLAND
SURVEYS

The questions of 1909

The publication of *On the Origin of Species* in 1859 and of studies describing how plants and animals re-colonised Krakatoa after the famous volcano eruption in 1883 led Praeger to ask his Clare Island researchers to consider two questions.



Praeger's questions

- Could evolutionary change between the Mayo mainland and Clare Island be detected?
- How did the process of colonisation take place?

Praeger's conclusions

- As secretary of the committee and editor of the reports, Robert Lloyd Praeger asked all authors to give their considered opinion on
  - How plant or animal groups colonised the island, and
  - Whether the findings suggested that the island's species differed in any way from populations on the mainland.

- Robert Lloyd Praeger had hoped that a pattern of dispersal and historic separation would have left their mark. He could not conceal his disappointment at the discovery that after the Ice Ages, Clare Island was presumably connected to the mainland by a land bridge and that many of the plants and animals were common to both the island and west Mayo.

- What Praeger did not appreciate at the time of the survey is that an island flora is never static: plants and animal species appear and disappear over time. The 1909–1911 survey provides us with an incredible snapshot in time.

- Without the survey we would have few details by which to measure the island's life today. The value of the reports, specimens and observations by the original survey team grow in value day-by-day as we face further changes to agricultural practice and land use and most pressing of all, climate change.

Highlights of the New Survey of Clare Island, 1992–2009

Praeger's comprehensive First Survey spurred the Royal Irish Academy to launch a New Survey of Clare Island in 1992

Since 1909 major changes in human population and land-use have radically altered Clare Island. There have also been huge advances in our understanding of the physical and biological sciences. These advances made it inevitable that many significant new discoveries would be made during the course of the New Survey, some of which are presented here.

New seaweeds discovered: Three species of seaweed new to Ireland were found: *Aglaothamnion priceanum*, which is new to science; *Antithamnion densum*, which had not been found in Ireland or Britain before; and *Phymatolithon brunneum*, which had not previously been found in Ireland.

Freshwater algae on Clare Island: Clare Island is now known to be the most species-rich area of the British Isles, with 800 species found here. About one third of all the known species found in the First Survey have vanished and been replaced by different species.

Warmer seas: The large topshell (*Osilinus lineatus*) could not be found in the First Survey but is now common at two places. This species, from warmer waters to the south, had probably become temporarily extinct on the island as a result of the harsh winter of 1895.

A very rare fungus: *Nectriopsis oropensoides* has only been recorded once before in Britain, and never in Ireland.

New fossils: Hundreds of specimens of frond-like fossils of an alga were found on the flanks of Knockmore. It had been found in only one other place in the world, in the Midland Valley of Scotland, where the fossils were poorly preserved and so impossible to describe accurately. Since its discovery on Clare Island it has been named *Reticulodus clarus*.

Important plant finds: Two particularly interesting finds are *Lycopodiella inundata* (marsh clubmoss)—a rare species of occasionally flooded bog margin areas and lake shores; and *Geocalyx graveolens* (a species of liverwort)—an Atlantic species on the Irish Red Data List of protected species.

Plant invaders: Since Praeger's survey, the harbour area has been colonised by the invasive plant species *Gunnera tinctoria*, which is shading out the native vegetation.

Bird life: The exceptionally large fulmar colony on Clare Island is one of the most important in Ireland.

New discoveries in the 'Abbey': Conservation work on the medieval wall paintings uncovered images that were not previously recorded, including a hound chasing a deer, a painted version of the canopy tomb and a mounted Gaelic soldier holding a spear—a rare contemporary image of such a soldier. The most remarkable new discovery is that of an organ being played: the only representation of an organ from medieval Ireland. The medieval church known as the Abbey is a National Monument in State care.