



The original hand-painted drawing for Ernest Rutherford's coat of arms. Image courtesy of the College of Arms.

UNFREEZING TIME

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Cambridge University now claims Nobel Prize winner Ernest Rutherford (1871–1937) as one of its own great scientists, but when this pioneer of nuclear physics arrived from New Zealand in 1895, chauvinistic dons scorned him as a colonial interloper with the wrong sort of education and an unfortunate accent. Choosing to ignore the hostile atmosphere, he persevered. That may be why he is commemorated on a laboratory wall by a large carving of a crocodile, the creature that never looks back – or perhaps it is a tribute to his booming voice, which warned colleagues of his approach like Captain Hook's alarm clock in *Peter Pan*.

Rutherford proved equally fanciful when planning his personal coat of arms. In 1931, he became a Baron, choosing the title Lord Rutherford of Nelson 'to honour my birthplace and home of my grandfather.' Stemming from ancient chivalric traditions, heraldry is

associated with arcane vocabulary and mythical creatures seem far removed from science but can be given a modern twist. Victorian geologists jokingly replaced unicorns and griffins with recently discovered dinosaurs, while Margaret Thatcher paired Isaac Newton – whose statue she passed every day on her way to school in Grantham – with a Falklands Admiral.

Located near the Tower of London, the College of Arms houses a splendid collection of hand-painted armorial designs dating back many centuries. The College has generously allowed us to reproduce the original hand-painted drawing shown here; other details were added later. Although Rutherford received professional advice, the ideas and the inspiration were his – and by celebrating his double roots in New Zealand and in science, Rutherford created an idiosyncratic image that united the past with the present.

The most obvious representation of time is the curved cross on the shield, which refers to the behaviour of radioactive materials. Rutherford was among the earliest scientists to insist that atoms are not solid balls, but

have a central nucleus made up of several smaller particles. Radioactive elements such as uranium or radium release energy when a nucleus spontaneously splits into two or more smaller pieces. Although there is no way of knowing exactly when any particular nucleus will change, Rutherford found that every element has its own characteristic half-life, the length of time it takes for half the atoms in a sample to break down. Half-lives vary enormously, from under a minute for thorium to over an hour for the artificial element rutherfordium, and stretching to several thousand million years for uranium. But in every case, the shape of the curve over time is identical – and Rutherford's crucial discovery takes central pride of place on his coat of arms.

Rutherford's mathematical depiction of radioactivity was translated into Blazon, the traditional heraldic language that is based on Norman French, Anglicised Latin and Old English: 'Per Saltire arched Gules and Or, two inescutcheons, voided of the first in fess, within each a martlet Sable.' Like a chemical formula, it is opaque to the uninitiated but carries a precise meaning. A saltire is a diagonal cross – as seen, for example, on the Scottish flag – while gules, or and sable signify the colours red, gold and black. An inescutcheon is a small shield within a larger one, and the two small birds are martlets, mythical creatures that lack feet and are unable to roost during their entire lives. They aptly symbolise the immense energy – the crocodile-like determination – for which Rutherford was renowned. In contrast, the larger bird perched on the top is a kiwi, a reminder of his origins in New Zealand.

Rutherford had already been appointed to the Order of Merit, and the badge of this select group is normally shown dangling just below the strip that has here been left vacant for an appropriate motto. Rutherford specified the Latin phrase *PRIMORDIA QUÆRARE RERUM* (To seek the first principles of things), which is a quotation from Lucretius, the Latin philosopher of the first century BCE. His major work *De rerum naturæ* (*On the nature of things*) was revived in the seventeenth century, and its depiction of a universe governed by chance encounters between tiny particles was very influential on Newton and the development of physics.

New Zealand is represented more conspicuously by the sinister supporter, the Maori warrior standing to the right of this image (but to the left or sinistral side from the perspective of a knight bearing these arms on his shield). Rutherford's parents had both been born in Great Britain, but he was brought up on a flax-milling estate near a Maori settlement at a time of great tension between colonial settlers and Maori farmers protesting against increasing mechanisation and the seizure of their land. Rutherford knew the language so well that he once swore vehemently in Maori after accidentally receiving an electric shock from a piece of apparatus.

The most intriguing figure is the dexter supporter, Hermes Trimegistus. This mythical Egyptian priest, an amalgam of several historical characters, became famous during the Renaissance as the author of mystical cabbalistic texts, and he has often been hailed as the founding father of alchemy. While his contemporaries scoffed at this ancient practice, Rutherford liked to present himself as a modern alchemist who used science rather than magic to achieve results. In 1919, he had transformed nitrogen atoms into oxygen by bombarding them with a stream of alpha particles (the nuclei of helium atoms). Shortly before he died, he chose this topic for a lecture called *The Newer Alchemy*. Jokingly, he remarked that even though scientists had now mastered transmutation into gold, they had to start from an even more expensive metal – platinum.

Shifting his focus from the past to the future, Rutherford confidently but wrongly predicted that experiments on splitting atoms were unlikely to yield useful amounts of energy. He died unexpectedly in 1937, but less than ten years later, two bombs were detonated over Japan.

References and Further Reading

Patricia Fara, 'Scientific coats of arms,' *Endeavour* 29 (2005), 101-3

Rutherford's birthplace – PastWord

*Dr Patricia Fara is a historian of science and has been President of the AHS since 2016. This is number nineteen in a series of short articles in which she discusses a number of images, each illustrating a different way of incorporating time and its passing within a picture without showing a clock.