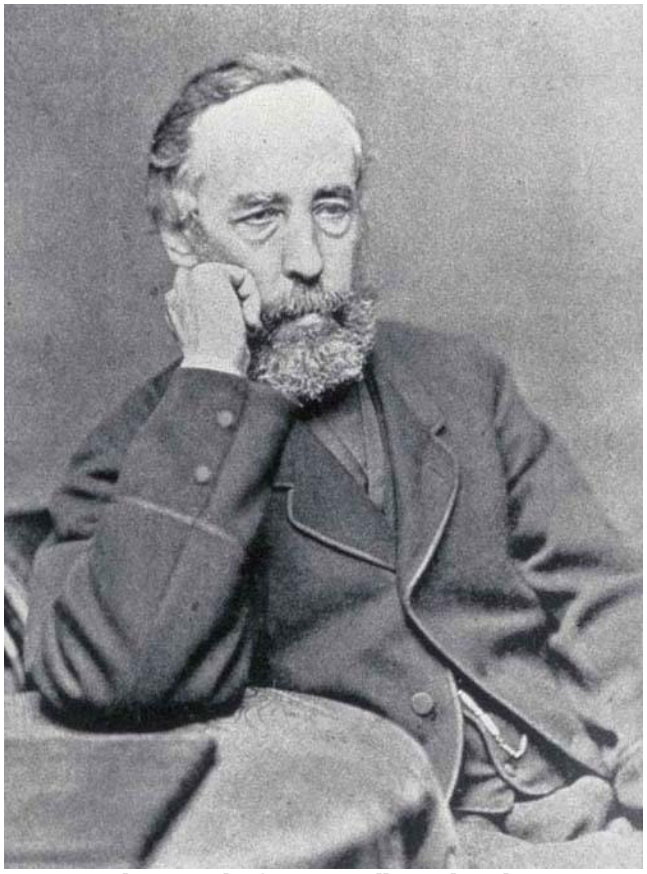

Figure 1: Photograph of James Croll © Wikipedia

JAMES CROLL
(2ND JANUARY 1821 – 15TH DECEMBER 1890)

James Croll is one of those characters who has been all but forgotten in Scotland and is virtually unheard of in his hometown of Perth, and yet made a fundamental contribution to our current day understanding of science and the ice ages.

Croll was born to David Croil, a stonemason and crofter, and Janet Ellis, in the crofting hamlet of Little Whitefield, about five miles north of Perth. His parents and older sibling largely home educated him until the death of his brother, forcing him to attend school.

He was forced to leave school after his family was cleared from their croft of approximately 20 acres and given land to clear, which amounted to only 4 acres. His father had to go back to work as a stonemason due to the negligible size of the croft they were left with which was not big enough to feed the family. James was given the task of tending the croft after he left school. At a young age he stumbled upon the monthly 'Penny Magazine' of the Society for the Diffusion of Useful Knowledge in a shop in Perth and suddenly his intellect was unleashed.

Croll read avidly from this moment forth, and by his late teens felt he had a pretty good grasp of most of the main disciplines in science. *"I remember well that, before I could make headway in physical astronomy…I had to go back and study the laws of motion and fundamental principles of mechanic. In like manner I studied pneumatics, hydrostatics, light, heat, electricity and magnetism. I obtained assistance from no one. In fact there were none of my acquaintances who knew anything whatever about these subjects."* Ironically geology was one of the few subjects he struggled to find much enthusiasm for and when the Scottish Geological Survey employed him, Croll stated it was "more by accident than by choice".

When Croll was in his late teens, it was a time when scientists believed that erratics (massive rocks that had been moved by ice over long distances from their source) were washed there by the diluvian floods Noah had once survived. The idea that glaciers covered large areas of the land was a controversial issue. But it was in 1837 when Swiss scientist Agassiz developed the theory of an ice age being responsible.

After travelling around Scotland for a low-paying job, he decided to return home and study algebra. As a 22 year old in a class of children he was a novelty, albeit not unique in classrooms of that period, but it is again evidence of his desire to learn.

Croll then produced his first book, reflecting his religious convictions, "*The Philosophy of Theism*". Then finally, at the age of 38, in an age when the average life span was often barely mid forties, he finally got the lucky break he needed. After being in many varieties of employment it wasn't until he got a job as a janitor at the Anderson College in Glasgow that

he found his life's work. With an extensive supply of books available, Croll would sit and read his way through the library; often while his brother David did his chores for him.

The theory proposed by Agassiz that glaciers were once much more advanced and their advance and retreat had shaped the landscape, was now much more firmly established and in 1864 Croll waded into this area of debate and wrote a critical paper for the Philosophical Magazine: *"On the Physical Cause of the Change of Climate During Glacial Epochs"* based on the eccentricity of the earth's orbit and it's effect on the ice ages. He developed the idea that there were in fact several ice ages and that they were brought about in part by changes in the orbit of the earth round the sun, the tilt of the earth in relation to the sun during different seasons and by the 'wobble' of the magnetic poles over time. The combination of these factors, exacerbated by 'feedbacks' like changes in the extent of ice and the consequent variation in the earth reflecting sunlight back into space, could explain the regularity and causes of several historical ice ages, and indeed predict future ones.

This began a period in which Croll corresponded regularly with many of the greatest scientific minds of the day, arguing, commenting on and explaining theories about subjects such as the ice ages, ocean currents, evolution and the age of the sun.

In 1867 he was persuaded by RSGS founder Archibald Geikie to join the Geological Survey of Scotland, despite failing the entrance exam.

In 1875 he published his most critical work, the distillation of his theory of ice ages and earth's orbit, called "*Climate & Time"*. In the following year, 1876, he was made a fellow of the Royal Society, an Honorary Member of the New York Academy of Sciences and was awarded an honorary degree by the University of St Andrews.

In all, Croll produced 92 scientific papers and in his last years he returned to the earlier themes of his religious papers, and produced his fourth and final book, *"The Philosophical Basis of Evolution*", which was rushed to print in order that he saw a copy before he died.

References

Paper by Mike Robinson, Chief Executive, Royal Scottish Geographical Society "*James Croll – Joiner. Janitor. Genius?"*

http://www.meteohistory.org/2006historyofmeteorology3/3fleming_croll.pdf

This is part of a series of Tayside Geodiversity biographies. Who have we missed? Please contact us if you would like to see someone included in the future.

Researched by Mike Robinson/Edited by Naomi Harper - 2013 (NH/CL)