

James Croll LL.D., F.R.S.

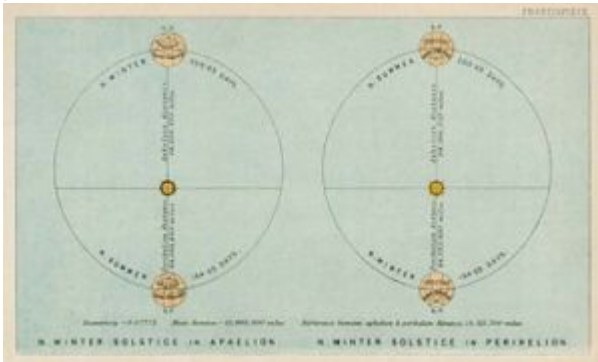
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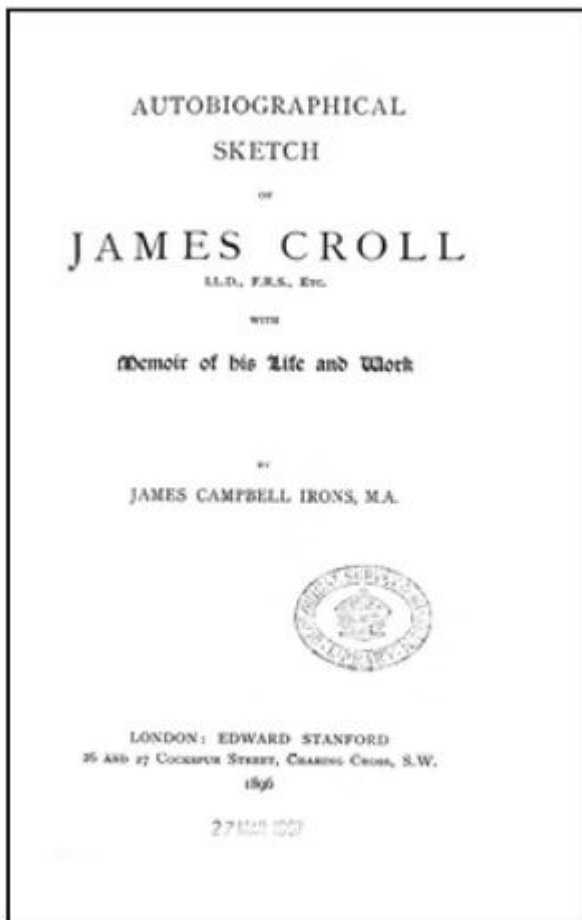
James Croll LL.D., F.R.S., Portrait



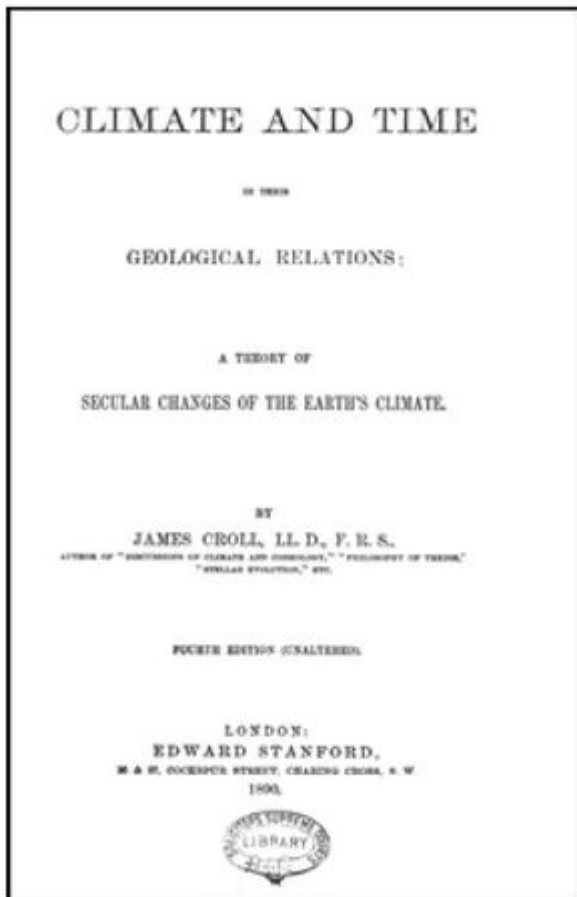
Frontispiece from *Climate and Time* (1875), showing the earth's orbit when eccentricity is at its maximum limit.



Croll's attempt to reconstruct the probable path of the Ice Age in north-western Europe, from *Climate and Time* (1875)



Title page of : *Autobiographical sketch of James Croll*. London:Edward Stanford, 1896



Climate and time. London:Edward Stanford,
1890

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James Croll LL.D., F.R.S.

Text by David Bate 2010.

James Croll was born in 1821, the son of a Perthshire stonemason and crofter. He received only a basic education and was dogged by poverty and ill-health, yet managed to devote all of his spare time to study and philosophical reflection.

In 1864, while working as janitor at the Andersonian College and Museum in Glasgow, he published a remarkable paper on The physical cause of the change of climate during geological epochs. Croll postulated a theory that variations in the shape of the earth's orbit were responsible for cyclical climate changes, including ice ages.

Croll's work attracted much attention and prompted Archibald Geikie to offer him a position with the Scottish branch of the Geological Survey in 1867. Croll was given the relatively undemanding job of office-keeper, which left him sufficient freedom to pursue his climate studies.

These culminated in 1875 with the publication of his epoch-making book [Climate and Time](#). A work of striking originality, it caused a profound stir in scientific circles both at home and abroad.

In 2010 the Quaternary Research Association established the [James Croll Medal](#), its highest award for merit, in recognition of his work on the astronomical theory of ice ages and his seminal contributions on ocean circulation and its impact on recent climate.

Timeline

- 1821 Born at St. Martins, Little Whitefield, Perthshire on January 2nd. Son of David Croll, stonemason. Tried various occupations; millwright, insurance agent, etc.
- 1859 Obtained appointment as Keeper in Andersonian University, Glasgow. Pursued studies on electricity, heat and physics, causes of climatic changes. Accepted land ice theory.
- 1864 1st paper on cause of climatic change. Attracted attention of Lord Kelvin Ramsay and A. Geikie.
- 1867 Appointed to post of Secretary to Scottish Geological Survey.
- 1875 Published volume on "Climate and Time" (results of 11 years of research).
Other lines of research: Determination of present rate of subaerial denudation by ascertaining quantity of sediment annually carried down by rivers.
Suggested Scandinavian Scottish ice-sheets coalesced on floor of North Sea, moving west.
Investigated cause of glacier motion.
Attributed submergence during Glacial period to displacement of earth's centre of gravity by polar ice-cap.
Philosophical questions. (Last work: "The Philosophical Basis of Evolution".)
- 1872 Wollaston Fund.
Hon. degree of LL.D. conferred by St. Andrews University. F.R.S., Honourable Member of New York Academy of Science (and later of - Bristol Natural Society, Psychological Society of Great Britain, Glasgow Geological Society, Literature and Antiquarian Society of Perth and Perthshire Society of Natural Sciences).
- 1877 Murchison Fund.
- 1881 Resigned from Survey (ill-health).
- 1890 Died December 15th.

Biographies and obituaries

Autobiographical sketch of James Croll LL.D. F.R.S, etc with Memoir of his life and work by James Campbell Irons, M.A. London : Edward Stanford 1896.

Horne, J. Obituary notice of Dr. James Croll, F.R.S. Transactions of the Edinburgh Geological Society. v. 6 p.171-187.

List of papers and works in Appendix to Autobiographical Sketch pp. 527-535.

[History of the Geological Society of London](#) (1907) p 238.

[History of the Geological Society of Glasgow](#) (1908) p 204.

[James Croll](#) — Wikipedia article

[James Croll, LL.D, FRS - A forgotten hero of Perth?](#)

[James Croll - from Janitor to Genius](#). Special issue of Earth and Environmental Science Transactions of the Royal Society of Edinburgh Vol 112 Special issue 3-4 September 2021.

Publications

Works listed in the BGS Library catalogue

Irons, J.C.. Croll, J.. 1896. Autobiographical sketch of James Croll : with memoir of his life and work. - London: E. Stanford

Croll, J.. 1875. Climate and time in their geological relations : a theory of secular changes of the Earth's climate. - London: Daldy, Isbister

Croll, J.. 1889. Discussions on climate and cosmology. - London: Edward Stanford

BGS archives

Ref No	Title	Description
BCRA/204Y/B/5	Christmas Pot, etc, Clapham Bottoms, Ingleborough.	Reports, 2 surveys
GSM/DC/A/C/7/483,511,505	J Croll: Letter on his appointment.	
GSM/DC/A/C/8/151,155,226	J Croll: Letter on his promotion.	
GSM/DC/A/C/8/270-272,277	J Croll: Letter on his position.	
GSM/DC/A/C/8/281-283	J Croll: Letter on overpayments.	
GSM/DC/A/C/24/370	J Croll: Letters on sick leave.	
GSM/DC/A/C/25/11	J Croll: Medical certificate.	
GSM/DC/A/C/25/11,14-15,34	J Croll: Letter on superannuation.	
GSM/DC/A/C/25/14,15,34,48,246	J Croll: Letters about Croll's retirement and pension.	
GSM/GL/Cr	James Croll	
GSM/GL/Cr/1	Letter from James Croll to Ben Peach	
GSM/GL/Cr/2	Letter from James Croll to Ben Peach	
GSM/GL/Cr/3	Letter from James Croll to Ben Peach	
GSM/GL/Cr/4	Letter from James Croll to Ben Peach	
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James Croll LL.D. F.R.S - obituary

From: History of the Geological Society of Glasgow (1908) p 204.

James Croll was one of the early members of the Glasgow Geological Society, who ultimately achieved a wide reputation in virtue of his researches on the probable cause of climatic change.

Born in 1821 at St. Martin's, Perthshire, he encountered great difficulties, like many Scotsmen, in the early part of his career. For years he tried various occupations with indifferent success, and at last obtained an appointment in the Andersonian University, Glasgow, which proved the turning point of his life. It placed within his reach the University Library and the Library of the Philosophical Society, Glasgow. It gave him leisure to pursue those studies on electricity, heat, and the physical causes of climatic change, which formed the subjects of his earlier papers.

It brought him into contact with the founders of the Glasgow Geological Society, with whose aims he strongly sympathised. He took special interest in all questions connected with the glaciation of the country, for he realised that the iceberg theory was doomed, and that nearly twenty years had been lost by geologists, owing to their refusal to adopt the suggestions of Agassiz regarding the former extension of land ice in Scotland.

Accepting the land ice origin of boulder clay and moraines, Croll proceeded to deal with the question of the probable causes of climatic change. His first contribution to this subject was published in 1864, which immediately arrested the attention of Lord Kelvin, Sir Andrew Ramsay, and Sir Archibald Geikie. Through their instrumentality he was appointed Secretary to the Scottish star' of the Geological Survey in 1867 a position which he held till his retirement in 1881.

His researches on the probable causes of climatic change extended over a period of eleven years, and were published in 1815 in one volume entitled "Climate and Time." This work embodies Dr. Croll's main contributions to the scientific research of his time. His contention was that glacial cycles arise indirectly from cosmical causes. He investigated the problem of the eccentricity of the earth's orbit and its physical relations to the Glacial period. By means of Leverrier's format, he calculated tables of eccentricity for three million years in the past and oile million years in the future, with the view of determining periods of high eccentricity, which, according to his theory,

were coincident with cycles of extreme cold. He next pointed out the various physical agencies affecting climate resulting from periods of high eccentricity, of which by far the most important is the deflection of ocean currents. He called special attention to the influence of the Gulf Stream as an agent in the distribution of heat on the surface of the globe. He held that a high condition of eccentricity produces an accumulation of snow and ice on the hemisphere whose winter occurs in aphelion, and that opposite effects supervene on the other hemisphere which has the winter in perihelion. When the northern hemisphere is being cooled, the north-east trade winds far exceed in strength the south-east trade winds, and thus deflect the Gulf Stream into the Southern Ocean. The deflection of this warm current, combined with other causes, would place Europe under glacial conditions, while the temperature of the Southern Ocean would be raised.

In addition to the numerous memoirs bearing on the physical causes of climatic change, he pursued other lines of research, to some of which brief allusion may be made. He tried to determine the present rate of subaerial denudation by ascertaining the quantity of sediment annually carried down by the river systems, and he further showed the value of this method as a measure of geological time. He was the first to suggest that the Scandinavian and Scottish ice-sheets coalesced on the floor of the North Sea, moving westwards towards the Atlantic, thus accounting for the marine shells and boulders of Secondary Rocks in the Caithness boulder clay. He investigated the cause of glacier motion, and advanced an ingenious explanation of his own. He also attributed the submergence during the Glacial period to the displacement of the earth's centre of gravity by a polar ice-cap. At the close of his life he reverted to those philosophical questions which had attracted him in his early years. In his last work, "The Philosophical Basis of Evolution" issued before his death, he contended that the production of motion and the determination of motion were essentially different. He associated the phenomena of evolution with this continuous direction of motion, which, to his mind, implied will and purpose.

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