

mary somerville 1780-1872

Quote from the first page of her recollections:

*Cheerful though wise, though learned, poplar,
Liked by the many, though valued by the few,
Instructs the world, yet dubbed by none a blue.*

I find Mary Somerville so very fascinating because she came from nowhere to be one of the most renowned mathematicians of her day.

She was born in Jedburgh at her aunt's house but spent her childhood in Burntisland. The house she lived in still stands though the town has changed out of recognition.

Her parents (Martha Charters and William Fairfax) were not wealthy but they were middle class so had a couple of live-in servants. Her father, a lieutenant (later vice-admiral) in the navy, was at sea for long periods.

Mary spent her early childhood collecting shells and flowers and she learnt from her father how to garden. Many of mother's family lived in Edinburgh and once Mary was older they came through for the season. Her brother Sam lived in Edinburgh and attended the High School.

Her mother thought that women should only learn how to run a household and consequently had not prioritised Mary's education. Her father was shocked to find her aged 8 or 9 unable to write (though she could read) so at 10 she was sent to Boarding School in Musselburgh.

She hated it. Hardly surprising given the following description:

"I was enclosed in stiff stays with a steel busk at the front, while, above my frock, bands drew my shoulders back till the shoulder blades met. Then a steel rod, with a semi-circle which went under the chin, was clasped to the steel busk in my stays. In this constrained state I and most of the younger girls, had to prepare our lessons."

She stayed only one year, learnt very little, but her thirst for learning was not destroyed. She spent the fine weather outside as before, but bad weather she spent inside reading, to the displeasure of some family members. As a result, she was then sent to local school to learn needlework which she was good at. This was then added to her household tasks to be completed before any reading was permitted.

When she was about 13 her mother rented an apartment in Edinburgh and Mary went to writing school where she also learnt arithmetic and took music lessons.

The following summer she taught herself some Latin. She visited Jedburgh. Here she found that her uncle approved of her thirst for knowledge and helped her with her Latin. Jedburgh always held happy memories for her.

She was then sent to live with her uncle William Charters in Edinburgh in order to go to a dance school and to learn more writing and arithmetic. However his family were severe and they put her down because they disapproved of her literary bent. She was obliged to observe a silence on the subjects that interested her.

She later said that their abuse of the Liberal Party made her a Liberal! (Liberals were in favour of education.)

Back in Burntisland she found in a fashion magazine what turned out to be an algebraic equation. She was intrigued by this and went to great lengths to surreptitiously read books in other houses about the subject.

On her next visit to Edinburgh she attended an art class run by the artist Alexander Nasmyth where she was told perspective is geometry and advised to read Euclid. She tried to find a book on Euclid but failed.

Back in Burntisland she got Mr Crow (tutor to her youngest brother Henry) to buy her some books on Euclid and Algebra and read them in bed. She was stopped by her mother but she'd managed the first six books of Euclid by then. Her Father commented that:

"We must put a stop to this or we shall have Mary in a strait jacket one of these days"

She enjoyed 'the season' in Edinburgh, attended parties, balls and went to the theatre. Eldest brother Sam died in India at the age of 22

In 1804 she married Samuel Greig (It was still the era of matchmaking). It was thought to be a good match as she had no fortune (in spite of father being high up in the Navy!). Her husband had reorganised the Russian Navy and had now moved to the Russian Consulate in London. He did not prevent, though he actively discouraged, her studies. She was lonely but pursued her more acceptable French classes. She was widowed in 1807 and returned to Burntisland with two children and an income, where she could take up her studies again.

She read Newton's Principia but also read about Calculus which was not considered 'correct' at this time (reverence for Newton). This led to her becoming acquainted with Mr Wallace, later Professor of Mathematics at Edinburgh University, through solving problems in a mathematical journal. He gave her the book list to cover a course in Mathematical and Astronomical Science. She was pleased with her new library.

She was considered eccentric and foolish and her conduct was disapproved of by many, including her own family who expected her 'to keep a gay house', but as she was quite independent she could ignore it.

She found that Burntisland was sadly changed. Enormous shoals of herring had brought in sea birds and whales but also speculators, and the town had expanded. They sold the house and took a summer residence in the countryside towards Kinghorn.

This period (1812) was the height of the fame of the Edinburgh Review. Through reading it Mary became acquainted with the famous men of the time – Henry Brougham, Playfair etc.. Professor Wallace suggested that his brother read through some of her reading list with her. Mary had barely started on this when she married again – to her cousin William Somerville.

One of her future husband's sisters wrote to her saying she'd hoped she'd give up her studies and make a useful and respectable wife for her brother! William wrote his sister a severe letter and no one interfered again.

Oh, how different was this man! During her childhood her uncle (Rev. Thomas Somerville) was the only relative who had actually encouraged her studies. His son was a good botanist and mineralogist who had travelled widely in Africa. Instead of writing up his travels he was happy educating his children and assisting his wife by proofreading and copying manuscripts. He also took her work to the Royal Society. Much correspondence to her was addressed through him.

William was appointed head of the army medical department in Scotland so they settled in Edinburgh. Mary studied Greek and botany from his clerk Donald Finlayson (and after 1815 Donald's brother George). Many of the books 'on her list' were in French – the lingua franca of the time – particularly as France was far ahead of Britain in Mathematics. So the French lessons in London had their use. (Remember all thorough this she was having children – married women could be pregnant nearly all the time as there was no contraception.)

Mary's brother-in-law Samuel Somerville lived near Abbotsford (having sold the family estate at Drum at Gilmerton near Edinburgh). Walter Scott was not publically known as the author of the Waverley novels at that time, but Mary's son Woronzow said Walter Scott would write at the dining table and would put his papers away when visitors arrived. His (Scott's) son Charlie would get them out and the two boys would sit and read them. Woronzow's tutor was the original dominie Simpson in Guy Mannering. Walter Scott had edited 'Memorie of the Somervilles' – it was never published but passages found their way into the Waverley novels.

In 1816 she moved to London where she took painting lessons and started to study mineralogy. Collecting minerals was a fashionable pursuit – Geology being a new science. Here she met the Herschels – William, his sister Caroline and son John. Caroline's life mirrored hers in many ways.

In summer of 1817 she went on a tour of Switzerland. On the way she met leading scientists of the day most significantly Laplace. Laplace famously said to her that only three women could understand his work – These are yourself, Mrs Somerville, Caroline Herschel and a Mrs Greig of whom I know nothing.” (Of course, Mary was first *and third* of these three.)

In Paris she met Mrs Marcet who had published 'Conversations in Chemistry' a book which profoundly influenced Faraday.

In the winter she visited Rome. She says she stopped the carriage frequently to gather specimens of the flora which was completely new to her – a pleasure now deprived by railway travelling.

Surprisingly to modern minds, she, a member of the Church of Scotland, is presented to Pope Pius VII. There are notes about the strict Calvinist minister in Burntisland and remember she is not particularly well known at this point. (She says she was also presented to Gregory XVI later)

She notes that there were troops of brigands outside the Papal States and it was considered unsafe to travel as they carried off people to the mountains and then ransomed them and sometimes mutilated them as they still do in present day (1872) Naples.

Met a Mr Smith, an anti-slavery campaigner which reminded her as a girl she took part in the campaign not to take sugar in her tea or taste anything with sugar in it. Many cousins and acquaintances also took part in this boycott. (1788+)

There had been an eruption of Vesuvius just before her arrival at Naples. It was still smoking so she ascended it and walked round looking at the red-hot chasms while holding a hanky over her nose! They bought some minerals. Then they went to the excavations at Pompeii and bought an original bronze statuette of Minerva from a workman!

Back at home (1818) she engaged a French maid so that the children would learn French. This is a recurring theme. She never wanted her children, particularly her daughters to suffer as she did through lack of education.

Mary counted many of the famous scientists of her day amongst her new circle of friends. There was Thomas Young who helped in the translation of the Rosetta stone (he is better known now for his wave theory of light), and Charles Babbage (father of the computer).

Their mineral collection had now become quite large as had their interest in geology and the formation of the earth itself. There was still a lot of opposition from the church to these geological discoveries. Mary noted that even when she published 'Physical Geography' in 1848 she was preached against, in York Cathedral. She mused of Rev. Dr. Buckland that:

“facts are such stubborn things that he was obliged to join the geologists at last”.

Mr Wallaston, inventor of the reflecting goniometer (used to measure the angles of crystals), had discovered seven dark lines crossing the solar spectrum which he demonstrated using a prism. This was the first of a series of discoveries that proved that the earth contains matter that is also found in the sun, stars etc. This so fascinated Mary that she went onto do some experiments herself and published them in a paper entitled “On the magnetizing power of the more refrangible solar rays” (refrangible – that can be refracted). This was read to the Royal Society by her husband on February 2nd 1826. It was the first experimental paper presented to the Society by a woman in her own name. Although the results were later disproved it brought Mary significant recognition.

In 1823 William was appointed physician to Chelsea Hospital and they had to move to Chelsea which they didn't like at all. The 'foul air' made them ill much of the time. However they had lost most of their fortune (attributed to a false friend) and they needed the money.

One highlight was that she met Ada Bryon (later Lovelace) and her mother – whom Bryon dubbed “The Princess of Parallelograms”. Mary acted as an informal tutor answering Ada’s questions on Mathematics. Other acquaintances were Lady Bunbury from whom she learnt much about fossils and the famous Napier family. She employed a German maid for her daughters.

The major change in her life came in March 1827 when William received a letter from Lord (Henry) Brougham suggesting that Mary write an account of Laplace’s “Mecanique Celeste”.

Why was Mary Chosen? Jane McKinlay explains in her book “Mary Somerville”:

Brougham, a founder of the “Society for the diffusion of Useful Knowledge”, wanted to add the work of Laplace. “Mecanique Celeste” was one of two major astronomical works by Laplace and it covered the work done on gravitational astronomy since the time of Newton. Few people in England had read it or in fact had much idea about French Mathematics. Mary, on the other hand had been acquainted with Laplace’s work and French Mathematical analysis for almost 20 years. This was because her initial training in mathematics had taken place under the guidance of Scots mathematicians at a time when French ideas were readily accepted in Scotland but not in England. Moreover she had made the acquaintance of Laplace and he thought highly of her talents.

She was eventually persuaded undertake this task. The completed manuscript was sent to Lord Brougham in 1830. Mary was surprised to get a letter of praise from Sir John Herschel and pleased that he had found so very few errors though he did suggest that she write a preface to explain the terms used therein.

The book was published in 1832 and warmly received by the scientific community. William received many letters thanking Mary! There was even a poem from William Whewell, Master of Trinity College Cambridge. Her relatives and others who had criticised and ridiculed her were now loud in her praise.

The preface – “Preliminary Dissertation” was published later and was probably the only part of the work that could be read by non-mathematicians, but the whole work became coursework material for Cambridge University students. It established Mary’s reputation as a brilliant scientific writer.

In 1835 Mary Somerville and Caroline Herschel were elected honorary members of the Royal Astronomical Society, the first women to achieve this honour.

The Royal Society voted to have a bust of her made and for it to be put in the great hall. In Liverpool a fine boat was named after her (unfortunately lost soon after).

Mary was elected honorary member of the Royal Academy of Dublin and Society of Physics and Natural History in Geneva. Sir Robert Peel, the Prime Minister, advised the King to award her a pension of £200pa (later raised to £300pa).

Mary was highly gratified but slightly puzzled by all this praise. She had recorded a clear point of view of some of the most refined and analytical processes and astronomical discoveries of her time. She was conscious that she had not made a discovery herself hence there was no originality. Then as now Maths is continually changing for she said

“Laplace, and all the great mathematicians of that age had barely passed away when the Quaternian system began to dawn” (complex numbers).

Soon after the initial publication (1832) they went to Paris where Mary found that the French mathematicians were all reading her book! She met M Bouvard, the French Astronomer Royal who advised her to write a second volume to complete Laplace’s works. She wrote most of “The Connexion of the Physical Sciences” while she was there. It was published after her return to England in 1834.

As Jane McKinlay explains in her book “Mary Somerville”.

This “was a comprehensive and authoritative description of the physical sciences incorporating the most recent scientific findings in physical and descriptive astronomy, matter, sound, light, heat and electricity and magnetism. Mary’s aim had been to explain such

aspects of natural phenomena as she was able to and to highlight the connections between the physical sciences. Yet, she in fact produced a work that helped to define the limits of physical science itself, a definition that was to be accepted by the scientific community for over 100 years."

Now at a loose end, Mary wrote a volume on the "Form and rotation of the planets" intended to be added to the book but it not published, likewise a volume on "Curves and surfaces of the second and higher orders". It was interrupted by a call for a new edition of the "Physical Sciences". She laid aside the other work and never returned to it. Physical Sciences went through 9 editions. It was published by John Murray who had published the Mechanism of the Heavens at his own risk – Shrewd businessman!

Note in an aside after William is held up on the road:

"that the railways put an end to highway robberies but now groups of young men rob in the streets of London. The progress of morality is slow compared with that of intellectual activity".

From 1840 she resided in Italy, having gone there because of William's health. She started writing "Physical Geography" here. Initially she knew few people and William was dispatched to borrow books (University libraries not being open to women) but soon she was receiving accolades there. Her notes from Italy present a travelogue with science woven through it.

1845 – A new edition of 'physical Sciences' and a visit to England. Visited old friends including the Herschels. Travelled north to Scotland and finds Jedburgh 'invaded by manufactories' and the Manse no more. Edinburgh has expanded – Queen Street now in the centre of the New Town instead of the edge.

Back to England in autumn of 1848. 'Physical Geography' published to favourable reviews. It was used as a textbook for many years.

"The book dealt in detail with a range of sciences immediately associated with the Earth: geology, topography, hydrography, meteorology, oceanography, zoology. It can be seen as a pioneering work in that it anticipated a regional approach to Geography rather than a national one." (Jane McKinlay)

Xmas 1841. Mr Adams (higher honours Camb.) and M Leverier (French astronomer Royal) had separately discovered the orbit of Neptune. Mr Adams had said that it was a sentence in 'Physical Sciences' (1842 ed) that led him to calculate it. (The sentence points out inconsistencies in the orbit of Uranus that may be because of the presence of another body.)

Mary had formed such a close relationship with Faraday that she was sent a copy of everything he published and she regarded him as the greatest experimental philosopher and discoverer since Newton. The extract of Faraday's letter to Mary showed how much he appreciated her comments and approval.

Italy at this time was involved in the revolutions of 1848, 1859 and unification in 1870. Mary's observation of how events impacted on her make interesting reading to those familiar with the history of this time. The French were heavily involved in helping the local populace detach itself from the Austrian backed rulers of Tuscany in 1859.

William died in 1860. She felt the need to do something (She is 80 years old!). Her daughters suggested a new book. She started on "Molecular and Microscopic Science". She used the public libraries in Turin and subscribed to various periodicals. Although she was deaf and her hands shook, she could still see well and worked 4-5 hours every day. It dealt with animate and inanimate matter but surprisingly did not include Dawin's theory of evolution. (She later read Dawin's "Descent of Man". However her friend Frances Power Cobbe, who she much admired, opposed the theory, as of course did many others.)

Of the new book she said that she should have stuck to Mathematics and not tackled a 'popular' book!

Watched the 1868 eruption of Vesuvius through a telescope. When the Lava cascaded down one side destroying trees, vineyards etc , her daughters climbed the other side that evening to look into the new craters! Mary associated the activity of Vesuvius with earthquakes on the West coast of South America at that time, and minor earthquakes in other parts of Europe. She also wondered whether the unusually wet weather for months before was significant.

In 1869 Mary signed a petition to Parliament in favour of female suffrage and became a member of the General Committee for Women's Suffrage in London. She corresponded with Mr Stuart Mill about his suffrage bill and book "Subjection of Women". Noted that in America the emancipated slaves were able to vote but the women were not. She also signed a petition to London University asking that women might take degrees.

1870. Physical Geography updated to take account of 'discoveries' in Africa and the opening up of China and Japan. Mary was awarded the Victoria Medal for 'Physical Geography' by the Royal Geographical Society in London in 1869. Also the gold medal from Geographical Society in Florence which was coined for that purpose. Became an honorary member of the Association of Italian Geographical Society in 1870.

Mary kept abreast of all events until the end of her life. In 1870 she watched the eclipse of the sun, and had a stream of visitors who had gone to Sicily to watch it, visit her on their return. They wanted to ascertain the composition of the corona. The aurora was seen in Italy that year. She left a detailed account of the eruption of Vesuvius in 1872.

Lastly she cites the things she is sorry not to live to see.

"I regret that I shall not live to know the results of the expedition to determine the currents of the ocean, the distance of the earth from the sun determined by the transits of Venus, and the source of the most renowned of rivers, the discovery of which will immortalise the name of Doctor Livingstone. But I regret most of all that I shall not see the suppression of the most atrocious system of slavery that ever disgraced humanity – that made known to the world by Dr Livingstone and Mr Stanley, and that which Sir Bartle Frere has gone to suppress by order of the British Government."

To the last she kept her intellect and sight and died in her sleep in November 1872. Her scientific library was bequeathed to Girton College Cambridge – the only ladies college at that time.

It is strange that Somerville College is at Oxford while all her links were with Cambridge

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