PIONEERS IN SCIENCE

Four Local Women who Changed our World

We all know the names of famous male scientists - Newton, Darwin, Einstein, but women scientists have often been neglected and forgotten. Thus it came as a surprise to learn, that over a period of 300 years, four women pioneers of science lived within 20 miles of our village. They were amazing, despite gender prejudice and discouragement! Let us remember and be inspired by them.

Margaret Cavendish (1623-1673

Margaret Bentinck (1715-1785)

Florence Nightingale (1820-1910)

Ada Lovelace (1815-1852)

Welbeck Abbey
Margaret Bentinck

Bolsover Castle
Margaret Cavendish

Teversal

Lea Hurst
Florence Nightingale

Newstead Abbey
Ada Lovelace

INTRODUCTION

Margaret Lucas Cavendish (1623 – 1673) was a philosopher, poet, scientist and writer and lived at Bolsover Castle. She published under her own name at a time when most women writers were anonymous and addressed topics such as gender, power and the scientific method.

Margaret's book The Blazing World, is an early example of science fiction in which she describes a utopian society. She has been described as an advocate for animals and as an early opponent of animal testing.

Margaret is unique in having published extensively in natural philosophy and early modern science and has been championed as a ground-breaking writer. She rejected classical philosophies and put forward her own ideas about the nature of living things.

FIRST WOMAN TO ATTEND THE ROYAL SOCIETY

During her lifetime the Royal Society, the oldest national scientific institution in the world, was founded, in London in 1660, to promote science and its benefits, and also scientific education.

Margaret was the first woman to attend a meeting at the Royal Society, in 1667, and she criticized and engaged with members and philosophers such as Thomas Hobbes, René Descartes, and Robert Boyle. The Royal Society then did not admit its first female full member until 1945.

Her 1668 book Observations upon Experimental Philosophy holds a unique position in early modern philosophy. Cavendish rejects the picture of nature as a grand machine and also views of nature which make reference to invisible spirits. Instead she develops an original system and draws on the doctrines of ancient Stoic philosophy. Her work is a document of major importance in the history of women's contributions to philosophy and science.

LONG-TERM EFFECTS OF HER WORK

Because Margaret was a woman author, willing to converse with men on natural philosophy, and because of her 'theatrical' sense of dress, she was called "Mad Madge", and labelled eccentric, while others studied and took her work seriously.

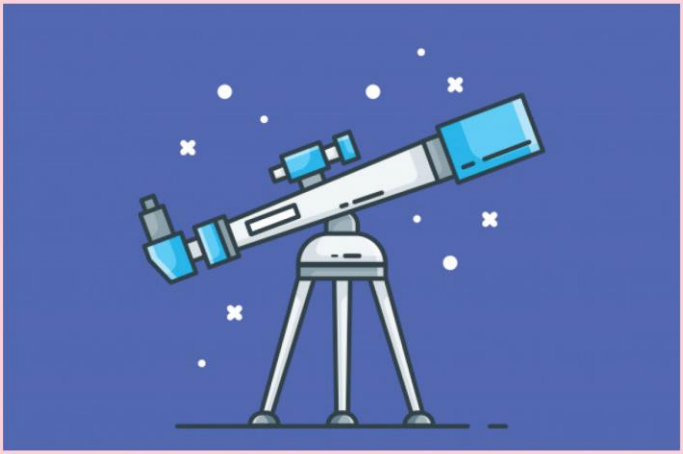
After centuries of neglect, her work became popular in the 1980s and the International Margaret Cavendish Society was established to "provide a means of communication between scholars worldwide" and to increase awareness of Cavendish's contribution to science.

THE DEVELOPMENT OF ‘SCIENCE’

During the 300 years between 1600 and 1900, some major transformations in thinking about the world took place. These included the evolution of the idea of “science," and the shift from amateurs to professional "scientists".

Victorian Experiments and Lectures

This involved the development of belief in natural laws, the beginning of science education, and growing international scientific cooperation.



This period also saw fundamental changes of belief about nature and the place of humans in the universe.

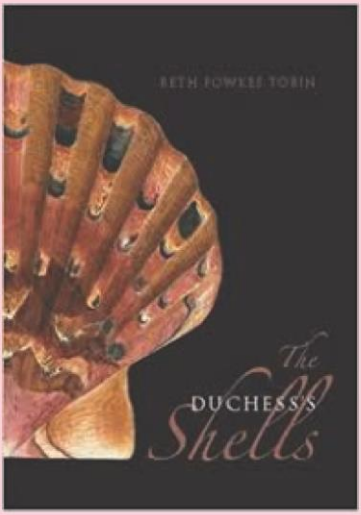
INTRODUCTION

Lady Margaret Bentinck grew up surrounded by books, paintings, sculpture and in the company of writers such as Alexander Pope and Jonathan Swift. As a child, she collected pets and natural history objects (especially seashells) and was encouraged by her father and grandfather. She had a famous scientific ancestor, Margaret Cavendish.

At 19, in 1734, she married the Duke of Portland; their six children were all born at Welbeck Abbey.

THE DUCHESS OF CURIOSITIES

Margaret, Duchess of Portland, employed her own curator and assembled the largest natural history collection in the country. Her ambition for her collection was for it to contain and to describe every living species.



She was not merely a collector of interesting objects but undertook with passion and brilliance a project of great ambition – in her own specialised fields to describe every unknown species in the world.

Named after her, Portlandia is a genus of flowering plants in the coffee family, endemic to Jamaica,

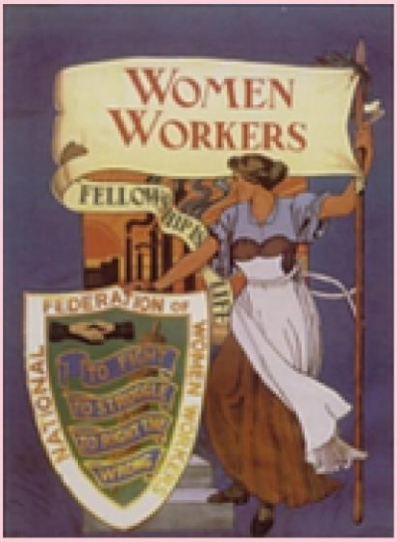
BREAK-UP OF THE COLLECTION

Margaret's natural collection was the largest and most famous of its time; it included objects from both Lapland and the South Seas (she bought shells from Captain James Cook). She drew and recorded its specimens, sorting them innovatively in type species and displaying them alongside ancient remains such as the Portland Vase, which she bought from Sir William Hamilton.

Sadly, her collection was broken up and sold after her death. If it had survived it would rank with that of the British Museum in London as a collection embodying the spirit of learning and hunger for knowledge which she represented. Natural history collections are essential for scientists, who use them to understand the geology of our planet and life on Earth.

CHALLENGES FACING WOMEN IN SCIENCE

During this historical period, there were three divergent views towards woman: that women were mentally and socially inferior to men, that they were equal but different, and that women were potentially equal in both mental ability and contribution to society. While philosophers such as Jean-Jacques Rousseau believed women's roles were confined to motherhood and service to their male partners, the Enlightenment (17th – 19th Centuries) was a period in which wealthy women experienced limited possibilities for expansion of their roles in science.



At the same time, millions of poorer women were working in domestic service, in factories from about 1800, and in mines, until 1842.

These four women scientists were fortunate enough to have opportunities for education, usually at home, and encouragement from their families, but were generally expected to marry, bear children and not achieve a scientific career. Margaret Cavendish was labelled 'mad' and Ada Lovelace's achievement was not widely recognised until long after her death.

INTRODUCTION

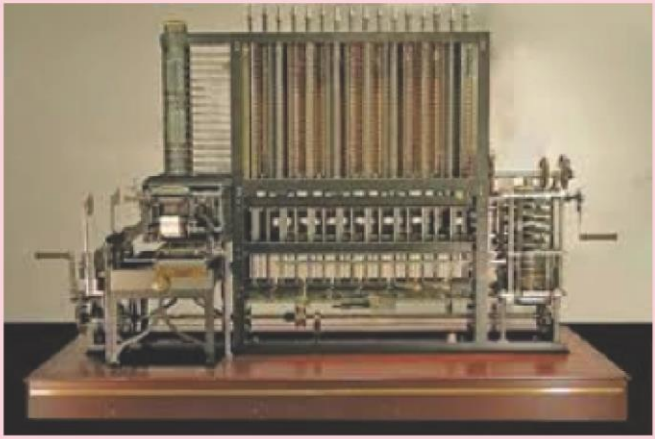
Ada Lovelace (1815-52) buried in the Church of St. Mary Magdalene, Hucknall, next to her father, Lord Byron of Newstead Abbey, is considered to have launched the Digital Age. She is a symbol of women who have contributed to science and technology, and of all those women who might have contributed if given the chance.

Despite serious illness as a child, she developed her mathematical and technological skills and, at the age of twelve decided she wanted to fly. Ada Byron went about the project thoughtfully, with imagination, first constructing wings and investigating different materials. She examined the anatomy of birds to find the right proportion between the wings and the body and finally planned to integrate steam power with the "art of flying".

THE FIRST PUBLISHED COMPUTER PROGRAMME

Science has not always treated women as equals with men, but a close friend who encouraged Ada was Mary Somerville, renowned as a mathematician and scientist. Lovelace believed that intuition and imagination were critical to effectively applying mathematical and scientific concepts. She valued poetry and mathematics, viewing both as tools for exploring "the unseen worlds around us".

In 1833 Ada started work with Charles Babbage on the difference engine, a mechanical calculator. Babbage, impressed by her intellect and analytic skills and called her "The Enchantress of Number".



In 1842–43, Lovelace translated and developed an article on Babbage's new Analytical Engine. With the article, she attached notes, including what is probably the first published computer programme.

VISION OF THE FUTURE OF COMPUTING

Lovelace emphasised the difference between the Analytical Engine and previous calculating machines, particularly its ability to be programmed to solve problems of any complexity using, for example, what is called Ada's Algorithm. She realised the potential of the device extended far beyond mere number crunching. This anticipated the implications of modern computing one hundred years before they were realised.

Ada Lovelace Day is celebrated on the second Tuesday of October, to "... raise the profile of women in science, technology, engineering, and maths," and to "create new role models for girls and women" in these fields.

INTRODUCTION

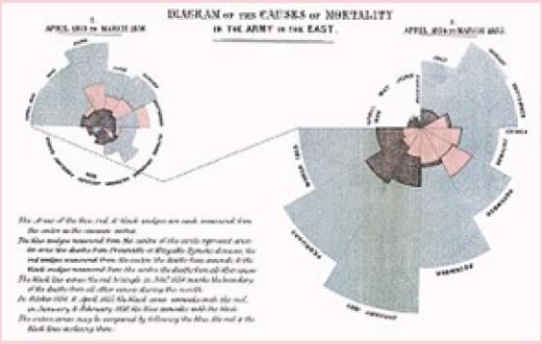
Florence Nightingale is considered the most passionate and determined woman of the Victorian Age. She was a British social reformer and statistician, and the founder of modern nursing.

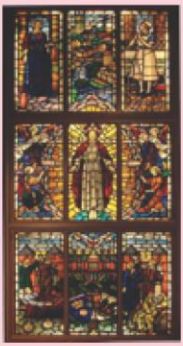
She was born on 12 May 1820 in Florence, Tuscany, Italy, and was named after the city of her birth. She was brought up in the family's home at Lea Hurst, Derbyshire. As a young woman, Nightingale was described as attractive, slender and graceful with a radiant smile.

She was 'home-schooled' by her father, who had an excellent library, and travelled as far as Greece and Egypt. She became a close friend of Mary Clarke, who spent her time with male intellectuals and was convinced that women could be equal to men.

ACHIEVEMENTS IN PUBLIC HEALTH

Nightingale arrived in 1854 at a base hospital in the Crimean War. Her team found that poor care for wounded soldiers was being delivered by overworked medical staff. Medicines were in short supply, hygiene was being neglected, and mass infections were common, many of them fatal. It has been estimated that Nightingale reduced the death rate from 42% to 2%. For example, Nightingale implemented handwashing and other hygiene practices in the war hospital.





Achievements in Statistics

Florence Nightingale exhibited a gift for mathematics from an early age. She became a pioneer in the visual presentation of information and statistical graphics. She used methods such as the pie chart, which is taken for granted now, but was then a relatively new method of presenting data.

LONG-TERM EFFECTS OF HER WORK

Nightingale's lasting contribution has been her role in founding the modern nursing profession. She set an example of compassion, commitment to patient care and diligent and thoughtful hospital administration. The Florence Nightingale Medal is the highest international distinction a nurse can achieve and is awarded for "exceptional courage and devotion to the wounded, sick or disabled or to civilian victims of a conflict or disaster" or "exemplary services or a creative and pioneering spirit in the areas of public health or nursing education".

The Florence Nightingale Declaration Campaign works to create awareness about the important issues highlighted by Florence Nightingale, such as preventive medicine and holistic health. It has received over 25,000 signatures in 106 countries. The Covid-19 hospitals have been named after her.

FUTURE OF WOMEN IN SCIENCE

Women have engaged with and contributed to science despite all the social barriers, from Hypatia of Alexandria (c.360-415), a great philosopher who was also a mathematician, to Marie Curie (1867-1934), winner of two Nobel prizes.

STEM (Science, Technology, Engineering and Mathematics) is absolutely crucial to the future wellbeing of our world and to support sustainable development.

Trailblazing female scientists, who have changed the world with their pioneering discoveries must not be overlooked in schools and by the public.

"It is time to have more inspirational female role models and celebrate those who support girls to continue their interests in STEM subjects. Let's break down those archaic gender barriers and create a country where every girl can achieve anything she puts her mind to." (Konnie Huq)

Exhibition and presentation by Teversal Heritage Group, 2020.