WHERE ARE THE WOMEN IN SCIENCE? A CASE STUDY USING WOMEN IN THE HISTORY OF GEOLOGY TO DEVELOP A EUROPEAN CURRICULUM

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SETTING THE SCENE

By examining the following 2 ideas

- the impact of science on women
- the impact of women on science

It is possible to explore the question 'Where are the women in Science?'. It is important however, to recognise the following facts

1. Women have been involved to some degree in science for centuries but as a minority...
2. Science had particular impacts on women but these were relatively unexamined until women gained a voice in society...
3. Once this had begun, the specific contributions of individual women to science could be identified and the effects science had on women and their position in society could be explored.

The turn of 20th century brought the changes highlighted in points 2 and 3. Later, the feminist movement saw women moving into scientific professions en masse (point 1).

Only then was it possible to examine how women did/do science and identify any gender specific differences in their approach.

Three perspectives can and have been used, but only the first one is applicable to history of science:

1.Historical examples of how science has been to manipulate women's role in society and therefore science.

2. More contemporary science - theories in evolutionary biology (not covered here).

3. Objectivity in the language of reporting science? (only marginally covered here).

Introduction

Science is often seen as a male dominated subject and to try to encourage more female participation is seen as a good thing.

This can be accomplished through several approaches, one of which is a role model scenario. Indeed when studying the History of Science biography is one of the ways of accomplishing this. However another is by looking at the advancement of the discipline and the third is the affect of society on science. However a different approach entirely is by asking the question "Where are the women in science?" The question can be addressed in different ways - geographically, chronologically or academically. This particular question is embodied within a European initiative (Penelope) to develop a history of science curriculum at secondary school level with a view to raising the profile of science and mathematics through a historical perspective. This approach is often regarded as an easier way for female students to relate to science and especially geology, a subject often neglected at secondary level education throughout Europe. However the number of female geologists is few within the history of science (Burek 2000), so a role model approach might be regarded as difficult. In a recent American publication of the 100 greatest women of all time, within the top ten only one female *scientist* emerged - Marie Curie. She was certainly not a geologist although of course her discoveries had far reaching consequences within that science as has already been shown when looking at the Age of the Earth.

Further research on this aspect is being undertaken from a European perspective and work so far has shown that European knowledge of female scientists fares no better than our American counterparts. You yourselves have already taken part in part of that research.

In order to raise public awareness of female scientists and in particular female geologists, it was decided to look at the lives of two women born at the end of the 18th century and within 2 years of each other but into very different circumstances. They both made a significant contribution to the field of geology at the time but in different ways. Many females then and indeed later, were the unsung heroes of geology, supporting male relatives with their work, unacknowledged but to the few.

Mary Morland and Mary Anning were born in 1797 and 1799 respectively. They were born in Southern England when the rest of Europe was in turmoil following the French Revolution. By looking at their lives it is possible to deduce something about their similarities and try to determine why they succeeded in their own ways. They were both aiming at the same target (to understand fossils), at the same time but from different backgrounds. Could either of these two women provide a role model either today or back at the beginning of the 19th century when they were active? It is necessary to remember that at this time, women were expected to carry out their daughterly, wifely and motherly duties in addition to their scientific exploits. In this respect, they contrasted with their male colleagues.

MARY ANNING

Mary Anning is known as the mother of palaeontology. She was born in Lyme Regis in Dorset and remained single all her life. She died when she was 48 years old.

Her life started within the artesian class, her father being a carpenter. She always hoped to advance up the social scale but circumstances dictated otherwise. To make ends meet when her father died at the age of 11, her brother, mother and Mary extracted, collected and sold fossils from the beach in their little shop. Her fame was set in concrete when she found and extracted a complete skeleton of an ichthyosaur, which was sent to a London Museum at the age of 12. Lyme Regis is famous for its Jurassic ammonites and dinosaur remains. For a while they were very poor and had their income

supplemented by the Parish. She also found a nearly complete skeleton of a pleiosaur and in 1823 made her third great discovery a pterodactyl.

Mary was an accomplished palaeontologist, largely self educated but a highly intelligent woman even teaching herself French so that she could read George Cuvier's work in the original. As such Mary encountered many famous geologists from an early age. Her powers of observation were great and her knowledge of anatomy was reportedly better than some eminent professors.

However, Mary only left Lyme Regis once to go to London. She was never allowed to join the prestigious Geological Society of London, because she was a woman, but she was eventually made an honorary fellow of the society. Lord Melbourne as Prime Minister awarded her a research grant from the government to help with her work. However, she published nothing of her work but mixed freely with leading scientists of her time having many visitors to her home such as Richard Owen, William Buckland and even the King of Saxony. During her lifetime, she had two fossils named after her by Louis Agassiz, the famous Swiss palaeontologist and exponent of the Ice Age theory. That Mary contributed in no small way to the advancement of understanding of dinosaur anatomy is not disputed nowadays. However, she was a woman operating in a man's world in the 19th century. After her death she was recognised by the Geological Society of London as a unique enigma. At any other time she would have been President of the Geological Society!

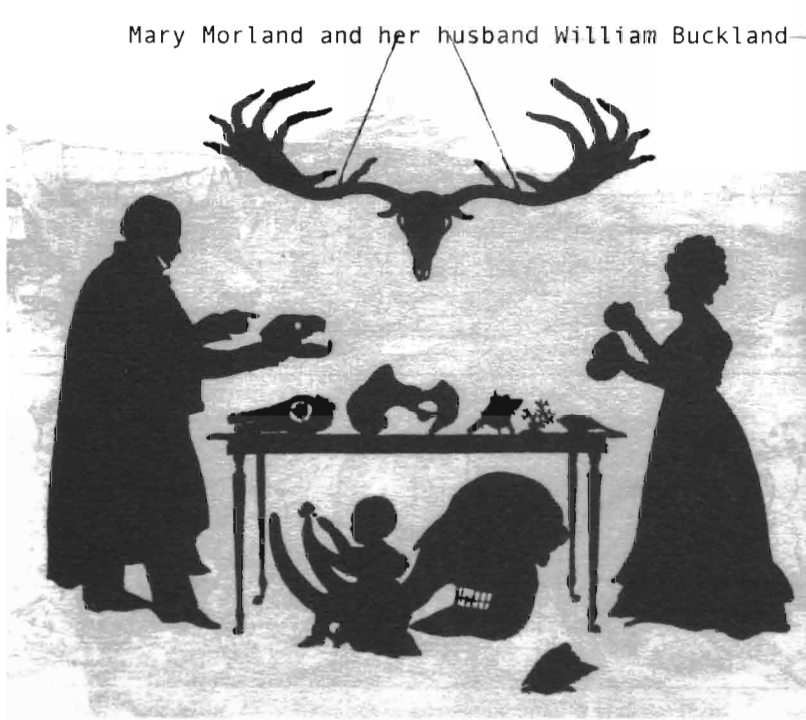
Mary Morland

Mary Morland was born in 1797, the same year that Charles Lyell was born and James Hutton died. She was born in Abingdon, Berkshire into a solicitor's family, being the eldest daughter. Her mother died when she was still a baby and she spent much of her time in Oxford living with a childless couple, the Professor of anatomy, Sir Christopher Pegge and his wife. Thus, she was exposed to the culture and activity of that city.

She became an accomplished draughtswoman and fossil collector contributing to the published works of William Conybeare and George Cuvier while in her early twenties.

In 1825 at the age of 28, she met and married William Buckland, the dynamic professor of geology and mineralogy at Oxford.

It is interesting to note that he was 13 years older than she was. They met on a coach trip to Dorset both reading Cuvier's latest work and



subsequently respected each others palaeontological abilities. Their wedding tour to the continent lasted nearly a year and they visited many famous geologists and geological locations. In particular they visited Paris where she met Cuvier with whom she had only corresponded before. However, she found the visit disappointing and Cuvier himself to be "so cautious that he never utters an opinion in company, but though cold in appearance, he is very friendly in his conduct". Perhaps this former trait was a remnant of having lived through the French Revolution and the subsequent years of Terror. Certainly as a younger man this has not been levied against him. Later, Mary accompanied her husband on many trips both within England e.g. British Association meeting in Cambridge in 1833 and abroad e.g. Switzerland at the invitation of Louis Agassiz in 1838 and to the landslide at Axmouth, Dorset in 1839. She also supported him in his publications by sketching and drawing, indeed much of the last Bridgewater Treaties was illustrated by her over the five years of production. To the relief of the Geological Society of London, she also acted as amanuensis to Buckland as her writing was legible. "Not

only was she a pious, amiable and excellent helpmate to my father: but being naturally endowed with great mental powers, habits of perseverance and order, tempered by excellent judgement, she materially assisted her husband in his literary labours and often gave to them a polish which added not a little to their merits", a quote by her son Frank Buckland, (Mozans, H., 1974). Murchison also wrote that she was " a truly excellence and intellectual woman, who aided her husband in several of his most difficult researches. However, none of this work was actively acknowledged until after his death.

As the wife of a professor at Oxford and mother, she also had other duties not least bringing up the five out of nine children that survived to adulthood . She suffered poor health because of four pregnancies in the first five years of marriage. However, she made it her responsibility to see to the children's education as well as organizing the extensive household that merited their station in life.

She also helped in the village school of Islip during the summer months that they spent there, teaching the children geography and other science subjects. This was expected and her scientific work was an addition rather than an equal. In this respect, she was unlike Mary Anning who had no children of her own and only looked after her mother.

After her husband died in 1856, she continued with scientific work on marine zoophytes and sponges until her own death in 1857 at the age of 60.

Mary was an intelligent and educated lady but one of the unsung female heroes of the early 19th century. When she married she effectively gave up her independence. Like Mary Anning before her, she was not acknowledged widely during her lifetime and indeed the first scientific paper written about her was in German in 1997.

The two Marys can be contrasted but also compared (Table 1). They both contributed significantly to the palaeontological area of research but each in their different ways. Mary Anning was unique. She struggled against poverty, social class, religious views, background and sexism. That she achieved what she achieved is a credit to her. She was the right woman in the right place at the right time, which could also be said of Charles Darwin. Mary Buckland nee Morland followed convention becoming a wife and mother although she did marry late to a man several years her senior. The strict social code of the early Victorian age dictated to both their positions. Any movement up but not necessarily down the social scale was difficult. They must have known of each other even if they never met. Their social standing would have prevented their

close friendship but their professional accomplishments would have been appreciated by each other. Both lost a parent at an early age, which dictated that they must fend for themselves to a certain extent. Perhaps it is this early independence that made them the female geologists they were, strong-minded women in a man's world.

Table 1
A comparison of Mary Anning and Mary Morland

	MARY ANNING	MARY MORLAND
Dates	*1799-1847*	*1979-1857*
Life span	*48 years*	*60 years*
Death of parent	*Father at 11*	*Mother while baby*
Religion	*Non conformist to start but evidence towards the end of her life possibly Anglican (church window)*	*Anglican*
Marital status	*Single*	*Married 9 children*
Abode	*Lyme Regis, Dorset*	*Oxford, and Islip*
Profession	*Palaeontologist*	*Palaeontologist*
Social standing	*Working class*	*Upper middle class*
Travel	*Only once*	*Extensive*
Contribution	*Actual fossil remains Understanding of anatomy*	*Extensive illustrations Understanding of anatomy*
Scientific circle	*Extensive*	*Extensive*
Influence of Louis Agassiz	*Named 2 fossils after her*	*Friend and colleague*
Influence of Cuvier	*Considerable read original texts*	*Employer and colleague*
Publications	*None*	*Illustrations in scientific publication of colleagues before marriage and husband afterwards*
Honoured at death	*Yes*	*No*

This table summarizes the similarities between two remarkable early 19th century female geologists but also highlights the significant differences.

CONCLUSIONS

Two talented women both interested in the science of palaeontology but from very different backgrounds, contributed to the advancement of the geological science but in a different way. One was

single and able to devote her relatively short life to study. The other Lady had to juggle a family, its commitments and social standing with her science. As so often happened at this time her contribution is subsumed within her husband's contribution.

As role models, neither can provide the necessary competition required for today's female geologist. However, they did overcome massive obstacles in one case financial and in the other family commitments. By looking back in time it is possible, to use female examples to encourage today's women to undertake seemingly impossible tasks.Lack of female companionship in science for intellectual stimulation, lack of efficient transport, suitable clothes, suitable employment, equal treatment in professional institutions and strict social etiquette did not deter those strong willed enough to carry on then and should not deter female geologists today.

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