LECTURE

Marie Stopes - Palaeobotanist and Coal Geologist

A lecture given to the Society on Saturday 12th January 2008 by Dr Howard J. Falcon-Lang of the University of Bristol.

Marie Stopes (1880-1958) was one of the most controversial women of the twentieth century. My mother tells me that that when she was growing up, it was even considered mildly indecent to utter her name. So how did Stopes come to acquire such extraordinary notoriety? First of all, in 1918, she wrote an early sex manual for women. *Married Love,* as she called it, was an instant bestseller. However, the manuscript was very nearly consigned to the dustbin because publishers thought that if women demanded too much in the bedroom they wouldn't get a man at all! If this wasn't bad enough, in 1923, Stopes set up the first birth control clinics in Britain. Death threats soon followed, and one Catholic doctor even argued that her clinics were tantamount to experimentation on the poor. Then, a decade later, as the storm of war was brewing over Europe, she courted the architects of the Third Reich. Together with many intellectuals of that era, Stopes embraced eugenics and Social Darwinism. Her commitment to this philosophy was such that she even disowned her only son after he married a girl who was short sighted. Stopes later wrote of her fear that her descendents would be disfigured by the necessity of wearing glasses!

Passionate about Palaeobotany

But it was none of these extraordinary events that first brought Marie Stopes to my attention, but rather our mutual passion for fossil plants. Marie Stopes, of course, started her career as a palaeobotanist and coal geologist, and spent nearly two decades of her life at the cutting edge of science. I suppose my connection to Stopes comes via Bill Chaloner, the Emeritus Professor of Palaeobotany at Royal Holloway. Bill was my great inspiration as young graduate student and he actually met Stopes himself, in 1952, about the time he was doing his own doctoral studies at Reading. The occasion was a meeting of Geological Society at Burlington House, and he was thoroughly embarrassed when the awesome Marie Stopes was introduced to him. "Ah, dear boy, this is wonderful!" she remarked when told her about his research on Carboniferous clubmoss spores. "Of course, palaeobotany was my *first* love!" That admission may come as a surprise, even to those with a good grounding in the history of geology. Therefore, perhaps it is in order to share something of the major contributions that the young Marie Stopes made to geological science.

Student Years

Stopes first introduction to science came at University College London (UCL) where she read Geology and Botany from 1900-1902. The death of her father at the end of that period of study saw the family fortunes plunge towards ruin. That event might have scuppered any thoughts of any scientific career, but fortunately Francis Oliver, her botany tutor, came to the rescue. Oliver engaged her as his research assistant for a year and what an exciting opportunity that proved to be! Oliver was on the verge of making a great discovery - none other than the recognition that the fern-like plants in the Coal Measures were not ferns at all, but seed-bearing plants. Together with D.H. Scott at Kew, Oliver named these new plants, Pteridosperms, or seed-ferns, and in doing so revolutionised our understanding of the early evolution of land plants. Stopes contributed to this work significantly, tracking down key specimens that proved the connection of seeds to the fern fronds.

That brief taste of research got Stopes hooked and, in 1903, she set off to Munich to undertake her PhD with Karl Goebel. Funded by a Gilchrist Scholarship from UCL, she completed her doctorate on the reproduction of living cycads in only ten months, the first women to graduate from Munich with such honours. How did she achieve this extraordinary feat? Stopes recorded how she typically laboured twelve hours per day, and at the weekend, sometimes worked thirty hours at a stretch with only a weak beef tea for sustenance. This arduous routine clearly took its toll and period photographs depict her in a semi-emaciated state. Probably she also got significant assistance in her work from Kenjiro Fujii, a Japanese expert on *Ginkgo*, who was visiting Goebel's lab at the time. Fujii and Stopes embarked on a romantic relationship that ebbed and flowed for several years, but eventually came to nought.

From Manchester to Japan, and back again

Back in Britain in late 1904, Stopes was engaged as Demonstrator in Botany at the Victoria University of Manchester, her first academic appointment. There she embarked on a study of plant-bearing nodules from the Lancashire coalmines. These 'coal balls' as the nodules were known contained beautiful anatomically preserved plants and everyone who was anyone in palaeobotany had made a study of them at one time or another. Always with the 'big picture' in mind, Stopes was interested in the origin of coal balls. Flying in the face of popular opinion, she eventually proved that these nodules represented mineralized peat, formed as seawater periodically flooded Carboniferous coal swamps. The research was undertaken with David Watson, who at the time was a nineteen-year-old undergraduate student, but later rose to become one

Marie Stopes (1880–1958), studying what appear to be coal ball slides. Although Bill Chaloner has suggested this photograph dates from her year in Munich (based on her Bavarian attire) she appears slightly older than well-dated images from that interval. The photograph was probably taken in 1905 during her time at the Victoria University of Manchester.

of the most influential vertebrate palaeontologists of his era.

As time went on, Stopes became increasingly restless at Manchester. In 1907, she convinced the Royal Society to fund an eighteenth month excursion to Japan. Her stated aim was to locate the earliest remains of flowering plants, but her correspondence shows that another intention was to reignite her affair with Fujii (he had returned home the year before). It must have been an amazing experience to explore the uncharted wilds of Japan and her published diary of the experience makes for entertaining reading. When visiting the northern island of Hokkaido, the British Government insisted that a large entourage of porters and policemen accompany her to protect her dignity. As not one of these had more than a few words of English it must have been an entertaining trip. Later on, she managed to give her entourage the slip and explored rural Japan on bicycle, alone. In the course of her work, she found what were then the earliest known flowers (beautifully preserved in nodules) as well as stunning insect fossils. All these Cretaceous fossils can still be viewed at the Manchester Museum, where she deposited them on her return to Britain in 1909.

The beginning of the end in Canada

In some ways Stopes's return to Manchester was not a straightforward one. Although the University welcomed back the intrepid Japanese explorer and indeed promoted her to Lecturer in Botany, she felt unsettled in this smoky industrial city. She was kept very busy during her first year home, giving lectures about her trip, writing up her diaries, and embarking on a major new palaeobotany textbook, *Ancient Plants,* to accompany her university courses. However, once the dust settled and she had finished organizing at major international palaeobotany conference in May 1910, Stopes decided to depart Manchester for UCL. Ever since her famous work on Pteridosperms with Oliver, she had long held this to be her true "scientific home". However, she had no job lined up and the decision to move much have been a difficult one. Perhaps given that her mother and sister lived in London and she had many local contacts there, she thought work would be easy to come by.

In fact, she didn't have to wait long for the next job opportunity because within a few weeks of arriving in London, Reginald Brock, the Director of the Geological Survey of Canada, got in touch. Brock had a major headache. He was preparing a new set of geology maps for Atlantic Canada but his staff had radically different ideas about the age of some of the key rock units. Brock needed an independent expert to date the rocks using fossil plants and he'd met Stopes on her homeward journey from Japan as she'd crossed North America. Stopes jumped at the chance and by end of 1910, she was rummaging through old museum drawers in Ottawa and Montreal. However, she got more than she bargained for when, at a conference in St Louis, Missouri, she fell in love and got married. The lucky man was Reginald Gates, a Canadian geneticist. Married or not, Stopes still had a job to do, and after a month of fieldwork in Saint John, New Brunswick in 1911, she was ready to give Brock her opinion on age of the contentious rocks. Her major monograph that resulted from this work still stands as one of the enduring classics in systematic palaeobotany and biostratigraphy. It proved once and for all that the rocks were Carboniferous and not Devonian or Silurian as others had earlier argued.

Back in Britain in late 1911, all was not well with the newly weds. Both were continuing to struggle to find meaningful work in London. Stopes did some

contract work for the British Museum, producing a catalogue of their extensive collection of Cretaceous plants. Although a few gems turned up in dusty old drawers, it was mostly uninspiring work. Meanwhile, Gates was forced to lecture to biology students at St. Thomas's hospital, a post far below his academic potential. These difficulties alone would have put strain on a young married couple, but a short time later, they took in a lodger, Alymer Maude. Maude was well-known expert on Tolstoy, and almost immediately Stopes began openly flirting with him. By early 1913, Stopes's marriage to Gates had more or less collapsed. A large part of the problem seems to have been that Gates was impotent and Stopes, sexually frustrated. Little could Stopes have realized that this first marriage would have signalled the beginning of the end of her geological research. However, it was her experiences with Gates that inspired *Married Love*, and eventually took her career off in such a radically different trajectory.

The four visible ingredients of coal

However, there was still one final chapter in Stopes's geological work yet to unfold. During the Great War, Stopes developed a renewed interest in coal. This work was not focused on its botanical make-up so much as on its material properties. Coal was the fuel that drove the twilight years of the British Empire and in wartime it was especially important to understand more about its combustion properties. Stopes set to work, studying hundreds of polished blocks, before writing her seminal paper on the "four visible ingredients of coal" and, in doing so, coined the now familiar terms, clarian, vitrain, durain and fusain. The last of these materials is of especially significance to me because I spent my doctoral years studying fusain (or fossil charcoal) and learning what it could tell us about the role of wildfire in Carboniferous coal swamps. Whenever I pick up a lump of fusain-rich coal and it leaves a dusty mark on my hand (just like modern charcoal), I always think of fires raging through the first rainforests to evolve on our planet, and of course, of that great palaeobotanist who laid the foundation for my own work – the infamous Dr. Marie Stopes!

Further reading

Falcon-Lang, H.J., 2008. Marie Stopes: Passionate about Palaeobotany. *Geology Today*, **24**: 132-136.

Falcon-Lang, H.J., 2008. Marie Stopes and the Jurassic floras of Brora, northeast Scotland. *Scottish Journal of Geology*, **44**: 65-73.

Falcon-Lang, H.J., 2008. Marie Stopes, the discovery of pteridosperms, and the orgin of Carboniferous coal balls. *Earth Sciences History*, **27**: 81-102.

Falcon-Lang, H.J. & Miller, R.F., 2008. Marie Stopes (1880-1958) and the Fern Ledges of Saint John, New Brunswick. In: Burek, C.V. (ed) *Women in Geology*. Geological Society of London, Special Publication, **281**: 227-245.