

Ida Slater, a collection researcher in a male world at the beginning of the 20th century

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Ida Lilian Slater (1881-1969) was one of the first women to work as a geologist in a male world and, although her career was short, she made important contributions to the Early Palaeozoic of Wales and Scotland. Her main work was based on a group of fossil scyphozoan polyps not collected by her, but by another significant woman, Elizabeth Anderson, widely known as Mrs Robert Gray (1831-1924). The majority of this collection is kept at The Natural History Museum (NHM), London, and the Sedgwick Museum, Cambridge, where she worked for two years describing species and comparing specimens for her monograph on British conulariids. The NHM collection is considered the best in the world in terms of diversity and the second best in its number of specimens. Her work has been cited for over one hundred years and continues to be cited to this day by researchers on this group of fossils.

Ida Lilian Slater (30 June 1881-7 August 1969) (Fig. 1) was born and bred in Hampstead, London, England, into a wealthy family. She was the youngest daughter of an architect, John Slater (1847-1924), a Fellow of the Royal Institute of British Architects (FRIBA), and Mary Emily Wilkins (1846-unknown), who had settled temporarily in Hampstead by 1879, moved to Willesden in 1891 and back to Hampstead in 1901. She had two sisters, Winifred Marion (1876-1914) and Jessie Mabel (1879-1961), and one brother, John Alan (1885-1963). All of them were bright students, eventually studying at the University of Cambridge. Winifred had a very short career working as assistant mistress and then headmistress after she had finished her studies at Newnham College in 1899. Mabel was a scientist of physics and chemistry and one of the earliest women to earn a doctorate in science in 1906. Finally, John followed in his father's footsteps becoming an architect in 1909. When Ida married William Donald Lees (1879-1974), a solicitor in a London practice, on 11th September 1912, she gave up her career as a geologist. They had only one child, Ethel Monica (1913-1999).

[Figure 1 near here]

Ida's education started at South Hampstead High School for Girls, a school with a high academic standard and reputation, where she had a physical education (Webb, 2002) as well as an intellectual one. The school was popular in the art world, with a high proportion of girls attending whose parents were involved in the arts (Spencer, 2000) and merchandising (Harris, 2007) and where they were treated without any socio-economic distinction, and forbidden to wear jewellery (Pedersen, 1979). She continued her education at Newnham College (1900-1904), Cambridge, after gaining a scholarship of £50.00 in 1900 (equivalent to c. £ 16k nowadays). From 1900 to 1903, her time there coincided with that of her sister Mabel and she also met her geologist friend Helen Drew (1881-1927), both studying Geology as part of their degrees. She took the Natural Sciences Tripos, Part I (1903) and Part II (1904), gaining a Class I in both. She was honoured there as a Winkworth scholar, a Bathurst student (1904-1905), and awarded a Harkness Scholarship for Geology (1905-1906). She finally graduated from Trinity College, Dublin, with a *Baccalaureus in Artibus* (Elles & Slater, 1906) as women, although allowed to study at Cambridge, were still not able to graduate from there.

Part of her development as a geologist was gained at the Sedgwick Club in Cambridge (Fig. 2), where she was a member from 6th May 1902 until 1905, and was their Honorary Secretary from mid-1903 until 9th February 1904. During the later years of her degree she occasionally attended meetings as a visitor, until her final recorded attendance on 27th February 1906.

[Figure 2 near here]

Beginnings

In Ida's early career she was more interested in geology than palaeontology as can be seen from her first paper, presented on 10 November 1903 at the Sedgwick Club in Cambridge (Slater, 1903). Unfortunately, this paper was not published and is not preserved in the archival material of the Sedgwick Club, but there is a summary written by her as Honorary Secretary. In the paper, *On The Probable Origin of some Types of Valleys*, she considered and discussed the origin of U- and V-shaped valleys, concluding that the U-shaped ones are not always shaped by ice action.

She continued studying the geology of Shropshire, close to the Welsh border (Elles & Slater, 1906), a unique area in the UK due to the exceptionally diverse range of geological strata and its position at former plate boundaries. As Gertrude Elles (1872–1960) and Slater (1906) recognised, Ludlow is a classic site that had been studied from the time of Murchison (1834; 1839; 1853; 1854; 1857; 1859) and had provided exceptional finds which were placed in the local Ludlow Museum. They revised Ludlow's geology based on the latest geological advances of the early 20th century. Their focus was on the Ludlow-Downton district, particularly the deposits between the Ayræstry Limestone at the base and the Old Red Sandstone at the top. After studying the stratigraphy and palaeontology of those layers, they subdivided them and re-allocated them to different groups, remarking that future work would decide, when extended topographically, if those divisions could have more relevance. This work would help Ida be awarded with a grant that would allow her to continue her research. Elles & Slater (1906) wrote: [*Dr. A. Smith Woodward (Keeper at the British Museum (Natural History) expressed the hope that the Authoresses would extend their researches to the Llandovery area in the Cwm Dwr, where the section of Upper Ludlow and Lower Old Red Sandstone was particularly clear. He anticipated that the succession of faunas there would prove to be the same as that in the Ludlow district.*] This work contains detailed stratigraphic columns and geological sections. It was communicated at the Geological Society of London on 20th December 1905 by Prof. T. McKenny Hughes (1832 – 1917). The reason why Elles and Slater could not read their own paper is because they were not fellows (women could not join the Society until 1919).

While she was an active member of the Sedgwick Club, attending meetings, doing fieldwork and writing papers, she started to also be present at the Geological Society of London where women were admitted to general meetings from 1904. She alternated this activity with her increasing interest in the stratigraphy and palaeontology of invertebrates of the NW of England, Wales and SW of Scotland. During these meetings she learnt about conulariids, a group of fossils not uncommon in the Shropshire area and which were the object of numerous discussions concerning their affinities. At the turn of 19th to 20th centuries, these organisms were thought to be pteropods by outstanding palaeontologists of those times such as Gustaf Lindström (1829-1901) and Gerhard Holm (1876-1948), the latter whom she visited in Stockholm. Other palaeontologists created a new group of molluscs where they could include conulariids, such as Miller & Gurley (1896) who established the order Conularida. On the other hand, there was a German palaeontologist, Rudolf Ruedemann (1864–1956), who thought conulariids were worms.

Her main body of work

When Ida was 24 years old and looking for new opportunities, she noticed that although conulariids had been widely studied outside the British Isles, none of the numerous British species had caught the attention of any palaeontologist. This was her opportunity. Henry Woods (1868-1952), a lecturer in palaeontology at Cambridge, encouraged her work and directed her steps.

The first thing she needed to do was to find out where the best collections of these fossils in the British Isles were kept, in order to study them. These collections were housed at: the Geological Survey of London, Edinburgh, and Dublin; the British Museum (Natural History); the Sedgwick Museum; the Museum of Practical Geology; and the private collections of Mrs Robert Gray. The most recent specimens were purchased by the British Museum (Natural History) in 1920, forming the largest part of the current Conulariid Collection. Later, in 1988, the Museum of Practical Geology became part of the Natural History Museum (NHM), London. Therefore, most of the specimens that Ida studied separately are now in the same museum, the NHM.

During the time she was researching at what is the present Natural History Museum, London, she became friends with Dr. Arthur Smith Woodward (1864-1944), then Keeper of the Geological Department of the British Museum from 1901-1924, who also directed her towards the Conulariid Collection, asking her to prepare a monograph for the Palaeontographical Society (Slater, 1907). Woodward wanted the conulariid collection identified and she would be the right person to do it. When Ida studied the specimens, she left labels or written notes with her identifications.

Whilst she was busy studying and comparing the NHM specimens to those from other institutions, such as the Vetenskaps-Akademi in Stockholm (Sweden), Woodward was her main supporter in gaining the Daniel Pidgeon Fund of the Geological Society of London (Natural History Museum Archives DF PAL/100/44/224) and continued offering her more opportunities assisting her in her work (Fig. 3). Ida's skills at drawing fossils were well known by her colleagues, which gave her the opportunity to prepare plates, not only for her own work, but also for the Franco-British Exhibition that was held in London between 14th May and 31st October 1908 to celebrate the Entente Cordiale. This last work took her 25 hours and she obtained enough income to continue with her research (Fig. 3). She was also paid, as documented in her letters, for the plates she published in her monograph on conulariids (Fig. 4).

[Figure 3 near here]

Ida had the opportunity to travel and meet the renowned palaeontologists of the time, but although she was still very young, she was not easily influenced by these contemporaries, such as Holm who considered conulariids to be pteropods. Ida thought that conulariids resembled cephalopods, but were not similar to the present-day species. She reflected that they derived, along with cephalopods, from a common ancestor. However, after this consideration, she classified the British taxa after Holm, considering his method convenient.

Ida was eager to learn about conulariids, although this was to be both her first and, unfortunately, last real palaeontological research. She was very keen on studying all the collections that were available to her, as well as other foreign collections for comparison, also requesting loans and discussing identifications with other palaeontologists. She was one of the few 'fortunate' women who were allowed to enter the world of geology where most of the researchers were men. If we consider that she travelled around Europe to study the conulariid collections and also did fieldwork before women were even allowed to vote in parliamentary elections, we can appreciate that she was very ahead of her time.

Once she had made an exhaustive taxonomic study of more than 74 specimens belonging to 32 forms, including those in open nomenclature, she gathered them into 3 groups ranging chronologically from the beginning of the Ordovician (485 Ma) to the end of the Carboniferous (298 Ma). Already in Ida's times the NHM collection was very diverse compared to other abundant collections, such as at the Národní Muzeum, Prague, which has a larger, but less varied, number of specimens (Sendino, 2007). The Conulariid Collection at the NHM is the best in the world in terms of diversity and second best in number of specimens. Therefore, this is a key collection that will always be referenced in the study of the conulariids, not only for British specimens, but also worldwide.

In her monograph (1907), Ida wrote detailed systematic descriptions of the different forms, with site location, stratigraphy, diagnosis, dimensions, registration number of the specimen and collection to which the specimen belonged. She also drew the first archetypal conulariid with morphological elements that were copied by many subsequent authors. Finally, she drew figures of the most characteristic species on five plates at the end of the

monograph, that took her 60 hours and for which she was paid £4 (Fig. 4), a sum that would be equivalent nowadays to about £467. For these plates she used 56 specimens, of which 50 are currently in the NHM collections (26 from the British Museum [NH]; 12 from the Mrs Robert Gray Collection; and 12 from the Museum of Practical Geology).

[Figure 4 near here]

Unpublished letters kept at the NHM refer to Ida as a key reference in the study of conulariids in the UK at that time. This knowledge was recognised and is the reason why, for instance, Mrs Robert Gray (1831-1924), the renowned fossil collector of Ordovician and Silurian rocks from the Girvan district of Ayrshire, sent her specimens for identification. In this letter, dated 3rd April of 2008, she reflects that one of her monograph's plates is "misleading" interpretations. She wrote that, in order to identify some specimens sent by Mrs Robert Gray, she needed to compare them to the museum specimens. She understood the importance of the collections.

When Ida finished this work, she was still only 26 years old and had already established her name as an authority for the study of this group, not only in the UK, but globally as well. This is the first time that the British conulariids species had been described and a monograph written on them. She was the first woman in the world to study conulariids (Sendino & Darrell, 2009) and this was carried out thanks to the NHM conulariid collection. She would never have been able to collect so many specimens herself for a monograph on this group of fossils.

Any study regarding the former palaeocontinent Avalonia and Laurentia and conulariids should cite her as the first researcher who established sixteen new species, the following, with updated taxonomy: *Metaconularia punctata*; *Paraconularia tenuis*; *Paraconularia maculosa*; *Archaeoconularia coronata*; *Metaconularia microscopica*; *Mesoconularia globosa*; *Ctenoconularia hispida*; *Ctenoconularia triangularis*; *Ctenoconularia hastata*; *Conularia plicata*; *Conularia crassa*; *Mesoconularia complanata*; *Conularia planiseptata*; *Conularia vesicularis*; *Conularia breviconventa*; and *Conularia elegans*. All these species were studied in the collections currently kept at the NHM .

Her name was acknowledged by Cowper Reed in 1933 who devoted a species to her, *Conularia slateri*, in recognition of her monograph on the British conulariids.

Her later career

Before finishing the monograph, Ida had new plans for her research. She wanted to study hyolithids (Fig. 4), a group of animals with cone-shaped shells which, for some palaeontologists such as Walcott (1884) and Miller & Gurley (1896), had been previously considered to be related to conulariids but she did not achieve enough research for a publication.

She also decided to study the Lower Palaeozoic of Llandeilo (Wales) (Geikie, 1908; Geological Society of London. Reference: GSL/COM/SP/3/4), this time with Helen Drew. They would use the money they received from the Daniel Pidgeon Fund from the Geological Society that Drew was awarded in 1906 and Slater in 1907 (Drew & Slater, 1910). This annual grant is for researchers not more than twenty-eight years of age, in order to promote original geological research and it was sent to Ida rather than collected personally.

The two friends were encouraged to study the north of Llandeilo, South Wales, and discover the possible junction between the Hartfell and Birkhill Beds (Ordovician-Silurian) (Drew & Slater, 1910). They used Geological Society funding to research to the north of the area that had previously been studied by geologists Thomas Crosbie Cantrill (1867-1931) and Herbert Henry Thomas (1876-1935), of the Geological Survey of Great Britain. After finding graptolites from the Early Silurian that seemed to be repeated in the Late Ordovician, they decided to establish the succession of the Silurian rocks. They found three stratigraphic series that they described in detail. The establishment of these graptolitic horizons marked another advance in the subdivision of Central Wales, according to Watts (President of the Geological Society of London in 1910). This work was carried out thanks to the encouragement and assistance that they received from Owen Thomas Jones (1978-1967). The publication, as well as another cited above by Slater and Elles (1906), contains detailed stratigraphic columns and geological sections plus a geological map of the area. It was published in the Quarterly Journal of the Geological Society in 1910, and presented by a former

colleague of theirs, John Edward Marr (1857-1933), at the Sedgwick Club on 13th April 1910. On the day of its presentation, they received numerous congratulations for their work and praise for the difficulties that they had had to cope with. Ida was almost 29 years old.

Finally, she participated in working on the plates of their friends and colleagues, Gertrude Elles and Ethel Wood's (1871–1945), monograph work on British graptolites (Elles & Wood, 1911). This is the last work of hers for which we have secure information. It was published by the Palaeontographical Society and she and Ethel prepared the six plates on graptolites that figure at the end of the publication. By this point, Ida had reached 30 years of age.

This final piece of work was carried out at the same time as she started her career as an educator/researcher at Bedford College, London, where she was demonstrator in Geology for Catherine Raisin from 1910 to 1912 (Burek, 2007). She was employed to help run the department and laboratories, at the new laboratory rooms for Geology and Botany (established 1897). Her acceptance letter to the College is shown as Figure 5. She was one of the two demonstrators appointed from 14 applicants, her salary being £30 per annum for two half days per week (Burek, 2007). She also undertook additional coaching of individual students (Fig 6).

Figures 5 and 6 near here

Ida's name for posterity

Ida was ahead of her time. She was a geologist, a male profession at that time, and, able to seek funding opportunities to pay for her research, travelled around Europe and finally became a lecturer. Although she was active for only eight years, she left an important legacy for paleontologists and geologists. In her short career, she managed to publish three papers, one monograph and drew plates for other publications and exhibitions as required.

Her authority was noteworthy when her work was presented at the Geological Society of London, a Society that she visited periodically to attend their meetings as part of the Council, as is recorded in the proceedings from 1905. She was one of nine women who attended the first Centenary of the Geological Society in her own right, out of 34 women among 263 guests (Burek, 2009) in 1907. However she never became a Fellow of the Geological Society as by 1919 she had left the world of geological research.

She made a significant contribution to Welsh geological research (Burek, 2014) and was one of the pioneers in advancing knowledge through collections, drawing specimens, editing manuscripts, educating students and providing field assistance. Undoubtedly, Ida will be remembered by her work on the NHM collections and her monograph on British conulariids published by the Palaeontographical Society, work that has been widely cited (Burek, 2014) and continues to be cited to this day. Her descriptions and drawings on the extinct group of scyphozoan Conulariida collected abundantly by Mrs Robert Gray in Wales and the south west of Scotland (Sendino, 2007; Sendino & Darrell, 2008) will be a reference for any work on that area and/or the study of the group. Nowadays her monograph covers almost 35% British material. Slater is one of the outstanding figures among conulariid researchers (Sendino & Darrell, 2009).

Once married (on the 11th of September 1912) she retired from teaching and researching as was sadly the normal procedure at those times. The 1919 census shows her living in Brighton Sussex with her husband and daughter (Census 1922).

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Figures

Figure 1. Ida Slater in 1904. Photo taken at the Sedgwick Club. University of Cambridge, Sedgwick Museum of Earth Sciences, Reference: SGWC 04/2a/1904

Figure 2. Sedgwick Club members in 1905. First row, seated on the ground: Elliot (left) and Burden (right). Second row, from left to right: Ferrar, Elles, Hurst, Potts, Slater, Fearnside and Kastell. Third row, from left to right: Longbottom, Pocock, Bailey, Smith, Marr, Schön, Laird-Clowes, and Flews. Standing on the stairs is Prof. McKenny Hughes. University of Cambridge, Sedgwick Museum of Earth Sciences, Reference: SGWC 04/2a/1905

Figure 3. Above: original letter to Dr. Smith Woodward. Natural History Museum Archives DF PAL/100/46/347. Below: its transcription.

Figure 4. Above: original letter to Dr. Smith Woodward. Natural History Museum Archives DF PAL/100/46/348. Below: its transcription

Figure 5. Ida Slater's acceptance letter to Bedford College dated 1910.

Figure 6. A payment slip from Bedford College to Ida Slater dated 1912.