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The Alfred Leeds Collection of Fossil Vertebrates: Past, Present and Future

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Abstract
Alfred Leeds was a gentleman farmer who lived close to the City of Peterborough. He was a born collector, and for the majority of his life amassed fossils, both vertebrates and invertebrates, from the Jurassic Oxford Clay which crops out around the City. Alfred Leeds collected at a fortuitous time, starting at the beginning of the mass excavation of clay for the production of bricks, and ending just as mechanisation began to lead to the destruction of much of the fossil heritage contained within the clays. The Leeds Collection of fossil vertebrates includes fish, ichthyosaurs, plesiosaurs, pliosaurs and marine crocodiles which opened up, for the first time, an entire fossil ecosystem. The Leeds Collection is thus of major international significance, and archive material related to the Collection is beginning to throw new light on the man and his outstanding fossil collection.

Introduction
Alfred Nicholson Leeds (1847-1917) was born, raised and lived at Eyebury, a farm just a few miles to the northeast of the city of Peterborough. He was an avid collector from an early age; he was educated, like his brother, at Warwick Grammar School, and took over running of the family farm when he reached the age of majority (his father had died when he was just four years old). He was married in Glasgow in 1875 to Mary Ferrier Fergusson (Liston 2006), with whom he had five sons, all of which, at various times, assisted with the processing of the bones in his collection. However, the Leeds Collection did not begin with Alfred Leeds, but was initiated around 1865 by Charles Edward Leeds, Alfred Leeds elder brother, when he went up to University at Oxford where he attended the lectures of John Phillips, Professor of Geology. Charles Leeds probably co-opted Alfred and began collecting fossils from the local Oxford Clay (Leeds 1956). Charles Leeds retained an interest in the collection as it grew, but work away from Eyebury, and later emigration to New Zealand, meant his input was probably limited after about 1870. Hence it was Alfred Leeds, later with the help of his family, who developed the collection into an internationally renowned resource. By the end of his life, the Great War had reduced labour supply, severely limited brick production, and mechanical clay extraction predominated in the pits thereby considerably reducing the possibility of finding fresh fossils.

Sources, Clay Extraction and Fossil Collecting Techniques
The fossils in the Leeds Collection were derived from excavation of brick clays in the Peterborough area. Peterborough has a long history of brick making, probably extending back to Roman times. However, with the growth of the cities, particularly London, following the Industrial Revolution demand for bricks outstripped the old hand-making techniques. However, machinery sped up brick production and the introduction of the Hoffmann kiln from Austria permitted rapid and continuous firing. In addition, agricultural depression following the Free Trade laws led to the sale of a number of farms, often through auction, perhaps most notably the Fletton Lodge Estate (Hillier 1981). This estate lay on thick brick-clay deposits to the south of Peterborough and the land was rapidly snapped up by entrepreneurs wishing to invest in new brickworks. Developing rail links with London provided a ready market for the bricks from many of the Peterborough brick manufacturers.

The Oxford Clay Formation from which the Leeds Collection is principally derived is an organic rich, silty mudstone of Callovian (middle Jurassic) age (Hudson and Martill 1994), now known to have been deposited some 150 million years ago (Hudson and Martill 1994; Gradstein, Ogg et al. 2004). Early brick pits exploited the callow or weathered surface clays close to where bricks were needed. These shallow 'borrow pits' were dug, the clay allowed to puddle (break down in the frost of winter) before being 'wire cut' prior to firing in small, specially constructed kilns. However, the industrial expansion of brick making required a constant supply and greater volumes of clay, leading to the opening up of the deeper Oxford Clay deposits. Although brick production had been mechanised, the arduous task of obtaining the clay was still undertaken by hand.

The clay was hewn by 'clay getters', men working with a six-foot long, 36 pounds weight crowbar. Once the pit was opened up, the clay was cut into a concavely curved, stepped 'amphitheatre' with a chute down the middle (Anonymous 1924). Each terrace was cut back in turn, and the clay directed down the chute into a wagon, usually on rails, below. The full wagons would then be transported, in the early days by hand, to the grinding mills and presses to produce green (unfired) bricks. However, these deeper layers of clay were generally more fossil rich than the surface clays, however the fossils accorded a problem for the brick maker. If incorporated into the green bricks, the fossils would explode upon firing, causing damage not just to the brick containing the fossil, but also those surrounding it, considerably reducing production and increasing costs. Hence the fossils were a waste product to the brick-making industry.

An experienced clay getter grew to recognise the sound of the thump of the crowbar on the clay. They could not only distinguish clay from fossil, but from the 'ring' of the crowbar could also distinguish between belemnites, by far the most common fossil, other invertebrates, and bone, thereby giving warning of a fossil lying beneath their feet. The clay getters were provided with 'bolt buckets' (named after the belemnites or 'Devil's thunderbolts' which were so common) and paid a bonus for filling them. However, this method of discovery meant that the fossils were excavated as they were found, sometimes with a long intervening period before the rest of a skeleton was revealed (Leeds 1956), depending how the work of excavating the clay in the pit progressed. In addition the bones were usually broken into many fragments or had to be reconstructed from bolt buckets rather than collected intact in the ground. Indeed a specimen of the fish *Lepidotes* in the Hunterian Museum, University of Glasgow, was reconstructed from the contents of a bolt bucket (Leeds 1956) – a challenging task considering the many thousands of scales that made up the entire fish.

Alfred Leeds got to know the pit owners and would constantly visit the pits. He would pay the workmen to notify him by telegram when significant vertebrate fossils were found and would pay a premium to excavate the bones himself. When collected by Leeds, the clay was removed using household table knives, and quickly and carefully wrapped for later cleaning and reconstruction. During this work Leeds was always keenly aware that he could not interrupt brick manufacture. Once back at Eyebury, Leeds and his family would work for many hours cleaning the fossils of the adherent clay, sorting and ordering the remains, and carefully gluing together and reconstructing the bones. It was the patience and skill required to reunite the thousands of bone fragments that was Alfred Leeds remarkable skill (Leeds 1956).

Leeds Collection

During his lifetime, Alfred Leeds collected, cleaned, and reassembled elements from literally hundreds of skeletons. Charles Leeds, due to his university education, had made a number of scientific connections, most notably Harry Govier Seeley who described some of the collection in 1874 (Seeley 1874). However, as Charles Leeds has less time for the collection, Alfred Leeds continued to collect for his own interest and more than 10 years elapsed before he made contact with the men of science, and even this seems to have been at the behest of his brother prior to leaving for New Zealand. When Henry Woodward, Keeper of Geology at the British Museum (Natural History) in South Kensington, London (the BM(NH) - now the Natural History Museum, London), visited the collection in around 1885 he was utterly amazed at the quality and quantity of the material it contained. This initial visit subsequently led to visits by numerous scientific men of the day, including: J.W. Hulke, Charles Marsh, C.W. Andrews, and A. Smith Woodward, and a lifelong friendship with Woodward himself.

An article in the Peterborough & Huntingdonshire Standard for 7th April 1888 described the Alfred Leeds and his Collection: "It is probable that he has the finest collection of Oxford Clay fossils in the kingdom" and "He has received several requests for it from the authorities of the South Kensington Museum, but refuses to part with it, as it supplies him with some entertainment in the winter evenings" (Anonymous 1888). Indeed the Leeds Collection was so much in excess of material in the national museum that the BM(NH) eventually agreed to purchase the entire 'First Leeds Collection', comprising all material collected up to May 1889, for £1,500 – a huge sum of money at the time. The consignment of fossils that was sent from Eyebury to the museum weighed more than five tons.

Following the sale of his First Collection, Alfred Leeds continued to amass fossils and develop a 'Second Leeds Collection'. Leeds was always keen for others to see his collection, particularly the workmen in the brick pits to encourage them to contact him when bones were first discovered. In March 1896 Alfred Leeds presented a lecture in the local village hall at which he was astonished at the interest shown in his 'old

bones, dry subject'. Significant specimens from the developing collection continued to be offered to the BM (NH), but by now Alfred Leeds and his collection had become widely known across Europe and those specimens not accepted by the BM(NH) were donated, exchanged or sold to institutions across Britain and the World, including Kendal, Liverpool, Cardiff, Edinburgh and Dublin; Bonn, Frankfurt, Tübingen, Paris and Uppsala; and Yale and Washington. Following Alfred Leeds death in 1917 the majority of his remaining collection, consisting of well over 600 specimens, was passed to the University of Glasgow's Hunterian Museum, although some low grade material was disposed of at Eyebury. A small number of choice specimens, retained by his widow were sold to the BM(NH) in 1921.

Present

Today, Alfred Leeds is best remembered for his finds of substantially complete and wonderfully three-dimensionally preserved marine reptiles that once swam in the warm Oxford Clay seas,: the ichthyosaurs, plesiosaurs, pliosaurs and crocodiles (e.g. Andrews 1910; Andrews 1913; Tarlo 1960; Brown 1981; Noè 2001). One of the most impressive Leeds Collection specimens is the tail and other remains of the giant filter-feeding bony fish *Leedsichthys problematicus* (see Martill 1986; Liston and Noè 2004). Leeds also recovered the remains of land living dinosaurs, parts of a rare flying pterosaur and the earliest putative dinosaur egg, all of which went to the BM(NH) (Chapman and Liston 2008; Liston and Noè 2008), with perhaps the single most impressive dinosaur the partial skeleton of the sauropod *Cetiosauriscus leedsi*. Alfred Leeds name lives on, attached to the fossils he found and in the genus and species named in his honour, an enduring testament and a fitting tribute to a man who dedicated his life to revealing the ancient, and until then largely unknown, world of the British middle Jurassic.

Future

In addition to the fossils themselves, there is a huge volume of untapped archive material held at various institutions and by the Leeds family, which adds significant value to the Leeds collection. Data from this archive is beginning to fill in details of, for instance, dates and places of discovery (the brick pits from which the specimens were collected), the materials used to unite the bones, and the prices for which the specimens were sold. These details are being, or will be, published elsewhere. Hence, The Leeds Collection archive, taken together with the fossils contained in the Leeds Collection are, and will continue to, allow us to delve deeper into this unique palaeontological resource, and take study of the Leeds Collection on from its late nineteenth and early twentieth century roots forward into the twenty-first century.

References

Anonymous (1888). A palæontological museum. Peterborough and Huntingdonshire Standard. Peterborough: 2.

Anonymous (1924). Bricks without straw. Old Fletton, Hicks and Co., Ltd.

Andrews, C. W. (1910). A descriptive catalogue of the marine reptiles of the Oxford Clay - based on the Leeds Collection in the British Museum (Natural History), London, part I. London, British Museum (Natural History).

Andrews, C. W. (1913). A descriptive catalogue of the marine reptiles of the Oxford Clay - based on the Leeds Collection in the British Museum (Natural History), London, part II. London, British Museum (Natural History).

Brown, D. S. (1981). "The English Upper Jurassic Plesiosauroidea (Reptilia) and a review of the phylogeny and classification of the Plesiosauria." Bulletin of the British Museum (Natural History), Geology Series 35 (4): 253-347.

Chapman, S. D. and J. J. Liston (2008). Immortal Clay II: a first for Alfred Leeds - but is it a reptile egg? [poster abstract]. Dinosaurs (and other extinct saurians) a historical perspective. Abstracts booklet. R. Moody, E. Buffetaut, D. M. Martill and D. Naish. London, Geological Society of London: 59.

Gradstein, F., J. Ogg, et al. (2004). A geologic time scale 2004. Cambridge, Cambridge University Press.

Hillier, R. (1981). Clay that burns, a history of the Fletton brick industry. London, London Brick Company Limited.

Hudson, J. D. and D. M. Martill (1994). "The Peterborough Member (Callovian, Middle Jurassic) of the Oxford Clay Formation at Peterborough, UK." Journal of the Geological Society London 151: 113-124.

Leeds, E. T. (1956). The Leeds collection of fossil reptiles from the Oxford Clay of Peterborough. Oxford, BM(NH) and Basil Blackwell.

Liston, J. (2006). "From Glasgow to the Star Pit and Stuttgart: a short journey around the world's longest fish." Glasgow Naturalist 24(4): 59-71.

Liston, J. J. and L. F. Noè (2004). "The tail of the Jurassic fish *Leedsichthys problematicus* (Osteichthyes: Actinopterygii) collected by Alfred Nicholson Leeds - an example of the importance of historical records in palaeontology." Archives of Natural History 30(2): 236-252.

Liston, J. J. and L. F. Noè (2008). 'Old bones': the dinosaurs of Alfred Nicholson Leeds [paper abstract]. Dinosaurs (and other extinct saurians) a historical perspective. Abstracts booklet. R. Moody, E. Buffetaut, D. M. Martill and D. Naish. London, Geological Society of London: 59.

Martill, D. (1986). "The world's largest fish." Geology Today 2(2): 61-63.

Noè, L. F. (2001). A taxomomic and functional study of the Callovian (Middle Jurassic) Pliosauroidea (Reptilia, Sauropterygia). School of Environmental and Applied Sciences. Derby, University of Derby.

Seeley, H. G. (1874). "On *Muraenosaurus leedsii*, a plesiosaurian from the Oxford Clay, part I." Quarterly Journal of the Geological Society of London 30: 197-208, pl. 21.

Tarlo, L. B. (1960). "A review of Upper Jurassic pliosaurs." Bulletin of the British Museum (Natural History), Geology 4(5): 147-189, pls 20-27.