



## **Fossil Detectives**

*Megalosaurus in the Oxford museum*

### **Hermione Cockburn**

I'm really delighted to see so many of you here tonight, thank you so much for coming along. And I'm really glad to have this opportunity to talk to you about Fossil Detectives. Now, when I first heard about this series, back in May, 2007, it was, and was offered the job of presenting it, I was completely over the moon. And I just began to wonder why nobody had thought of this idea before, why hadn't there really been a really classy, BBC series dedicated to fossils in Britain.

And perhaps the reason for that is that not everybody I spoke to and told about the series initially shared my surprise or enthusiasm, that nobody had really done eight half-hour shows on fossils in Britain. And their reaction was really, you know, 'eight half hours, that's four hours of television, you're going to stay in Britain, you're not going anywhere else, and it's only about fossils. Hm, what are you going to talk about?' And the thing about fossils in Britain, or British palaeontology, is that as soon as you scratch the surface of this topic, you quickly realise that you are completely spoiled for choice for wonderful and incredibly varied stories that reveal not only remarkable scientific discoveries made by professionals, but also wonderful discoveries made by amateurs around the country. It also enables you to get really fascinating insights into ancient life and past environments of Britain.

And, tonight, what I want to do is just share a few of my favourite stories that we selected from the wealth that are out there to put in the series. Now, perhaps before I go on, a little show of hands, did anyone manage to catch any of the shows on BBC Four? Oh yes, quite a few hands going up, that's good, but then quite a few hands not going up, so that's good, we've got a bit of a split in the audience. So, some of you are going to know what I'm talking about more than others, perhaps, but everyone will get a chance to see what I'm talking about.

Before I start showing you and telling you my favourite stories from the series, we should probably clarify a couple of things. And the first thing I think it's important to clarify is what do we actually mean by a fossil? Well, a fossil can be very simply defined, as simply any evidence of ancient life that is naturally preserved. And fossils really, broadly – and this is where if you've got more questions about the details of palaeontology to direct them to Peter later on, but to my mind, fossils, as we handle them in the series, broadly fall into two different categories. We've got body fossils – and you might be able to guess from the name that a body fossil is perhaps the shell or the teeth or the bones, some actual part of the body of an animal that has been fossilised. And the way that a body fossil forms, again, we're talking sort of the majority of cases here, is that after an animal dies, its carcass needs to be quickly buried, out of reach of bacteria that might cause it to decay, or scavengers that might munch it up, you need to bury that dead animal and begin to compress under layer upon layer of sediment.

So, you might have an animal that dies by the side of a river and a flood event covers it with mud, for example, that could be the trigger that starts off a fossilisation process. And, after many millions, potentially, of years, that fossil, that animal, will become buried and compressed under layers of sediments, and gradually, as those sediments turn to rock, parts of that animal will also be preserved as rock, mineralised within the layers of sediment that have lithified or turned to rock. And then, in due course, perhaps millions of years later, due to earth movements at the surface, erosion, that little evidence that we have, that piece of fossilised bone or tooth, will suddenly be at the surface, for you or me to walk along the beach on the Jurassic Coast in Dorset, and pick up.

So, that's really how a body fossil comes to be there sitting on the beach for us. The other type of common fossil is what's called a trace fossil. Now, instead of being part of an animal

itself, a trace fossil is evidence of an animal's activity. So, in that category, we put fossilised footprints, for example, like the dinosaur footprints that you can find, in South Wales or on the North Yorkshire coast, they were stories that we featured in the series. Other trace fossils, things like burrows, nests, track ways, any evidence that animals or plants lived in the past.

And, together, the body fossils and trace fossils make up what we call the fossil record, and that's the collection and range of fossil evidence that can be traced through time, in the rocks, and that give us this tremendous insight we have into ancient life and the evolution of life on our planet. So, that's really, in a nutshell, what we are we talking about when we mean fossils. The second thing that you might be wondering by now, is why Britain is so good for fossil detecting? Why don't we need to go abroad to make an eight-part television series?

Well, to get a really good diversity of fossils from different ages, what you need is rocks of different ages. And the one thing that we have beneath our feet in Britain is a huge geological diversity. And, in fact, for a smallish country, we arguably have the most diverse geology anywhere on the planet, and that is particularly true in Scotland, where I live. And the rocks that we have in Britain, the reason they're so diverse is that we had a very dramatic, very intricate geological history, lots of movement of land masses across the surface of the Earth have been drawn together to build up our nation over millions of years. And the rocks in Britain represent almost all the geological periods of time dating from more than 3 billion years ago, some of the oldest rocks that you can find in the whole of Europe are up in Scotland, right up to the present day, where we have internationally significant sections of sediments that represent just the past half million years or so of geological time, relatively very recently geological past.

So, we have this huge diversity of rocks and, hidden in those rocks, waiting to be discovered, are a huge diversity of fossils. Now, the fossil record in Britain doesn't date back to the oldest rocks. It dates back to about a billion years. And every programme in the series starts with the line, 'life began in Britain more than a billion years ago.' And what I'm talking about when I say that, perhaps are not the most exciting fossils you've ever seen or heard of, but I'll explain in a moment, but we are still talking about life, evidence for life, of over a thousand million years ago. The older rocks that we have in Britain are a type of rock that don't contain any fossil evidence, but from dating from about a billion years, we do have fossils. And you find them up in the far north-west of Scotland, in rocks called the Torridonian Sandstones. And these fossils that we have, dating from this time, are really nothing more than a few little wrinkles that, to the trained eye, can be picked out in some very ancient sandstones out there. And what they are is that they're evidence that microbes, tiny microscopic creatures, once lived on the sandy sediment that formed these rocks.

And sadly, to my mind, this story wasn't deemed visual enough to make the cut for the Scottish programme, because it really is touch-and-go whether, you know, it would have made an exciting story. But, although those fossils are simple, it is worth remembering, I think, that those microbes were the precursors to the staggering array of life that we see around us today. And we really can trace the history of life back a staggering length of time in Britain.

Now, in Fossil Detectives, the series takes a regional approach, so, each programme looks at a specific region of the country, but we wanted to do more than simply, say, travel to the north of England and say, 'oh, look, these are the fossils you can find here,' or 'down in the south-west of England, these are the fossils you can find.' We wanted to really bring together a great diversity of stories, reflecting major discoveries, both old and new, places to visit to find your own fossils, as well as to demonstrate how fossils inform us about ancient life, and to surprise you, the audience, as much as entertain you. And I've chosen a few clips tonight that represent the different types of stories that we've put together for the series.

Now, I've mentioned that we're so spoiled for choice for stories, because of the huge geological diversity that we've got in Britain, but another reason why there are so many stories to choose from is that major steps in the history of the development of palaeontology as a science, took place in Britain, especially in the early 19<sup>th</sup> century, when it was just emerging as a scientific discipline. And ever since then, really, British scientists have

continued to be a major force in palaeontological research, and they've often not had to venture very far afield to make new discoveries at the cutting edge of the discipline, right over the last 150, almost 200 years. So, that's another reason why there were just so many stories to choose from. And it's back to the early, pioneering days of palaeontology that I want to go first, to talk about the discovery of possibly the best known and best loved of the extinct creatures, of course, the dinosaurs.

Now, I don't want to pre-empt too much what's in the clip, but it's likely that what we now know to be dinosaur bones have been turning up in places all over the world for centuries. And one of the earliest written attempts to account for what these mysterious giant bones that have been turning up in the landscape might be, dates from 1677, when the then keeper of the Ashmolean Museum in Oxford – not too far away from here – called Robert Plot, proposed that a large bone fragment that had come from a local quarry around near Oxford – out of there, the rock types are shales and limestones, sedimentary rocks that date from Jurassic times. You've all heard of Jurassic Park, I would imagine, one of the periods where the dinosaurs roamed, we now know, but, of course, at the time, they a) didn't know when the Jurassic was and, b) that these were dinosaurs.

But Robert Plot sort of made an attempt to account for this giant bone that he found. And he proposed initially that it could be that a bone from an elephant that the Romans had brought to Britain – which I think was a pretty good guess, you know, if you find a giant bone and the only giant animal you know is an elephant, so you think, 'oh, possibly an elephant'. The Romans, we know that they brought elephants, so possibly an elephant bone. But he also thought that it was perhaps more likely to be the thighbone of extremely large man dating from the past.

Now, less likely, however, he actually called this fossil specimen 'Scrotum Humanum,' because if you imagine the shape of the end of the thigh bone, it curiously resembled certain male body parts. So, it was a good name, but he wasn't, sadly, along the right lines. It took three really brilliant minds from the early 19<sup>th</sup> century, to correctly deduce what these giant bones were. Now, of these three people, the first person to get a mention in the discovery of dinosaurs is not my favourite character from palaeontological history but, nonetheless, a very important one, a man called Professor Richard Owen, who later founded the Natural History Museum in London. And it was Owen who really invented the idea of dinosaurs, by putting three particular extinct giant reptiles that had been previously recognised – and we'll come to that in a minute – from their fossils, into a new group of animal, that he termed 'Dinosauria,' back in 1841, and that literally meant 'the terrible lizards.'

Now, the first of the three original dinosaurs that Owen put into this new category, or, should I say, the first of the original giant reptiles that Owen put into this new category, was called Megalosaurus. And it was formally scientifically described by a man called William Buckland, a colourful character from the University of Oxford. As well as that bone, that Scrotum Humanum that Robert Plot had found, Buckland, the Professor of Mineralogy at Oxford at the time, also was collecting bones from the countryside around Oxford, from the quarries to the north, a particular quarry to the north of the city, and he puzzled over these bones and he finally decided that this was actually a giant reptile, that he called Megalosaurus.

And the first clip I'm going to show you is my encounter with the original Megalosaurus fossil that Buckland's named, that you can see by visiting Oxford University's Museum of Natural History. And I'm in the company of another quite colourful character, called Phil Manning, who is a dinosaur expert from the University of Manchester, who is a regular contributor to the Fossil Detectives series and an expert on dinosaurs. So, let me just line this clip up for you. So, the clip begins with a kind of montage of the various fossils that you can find in the museum before we get onto the story of Megalosaurus.

And here it is, the Megalosaurus that inspired Charles Dickens, the world's first ever scientifically-identified dinosaur. It was found in Oxfordshire in the 1800s. Identified as a giant lizard-like creature, fossil hunters back then estimated it would have been 12 metres long. One of the founders of palaeontology, William Buckland, added it to his collection and named it Megalosaurus.

Phil Manning is a modern-day dinosaur hunter.

*Clip from Fossil Detectives*

**Hermione Cockburn**

Buckland had a few more bones to go on, though, didn't he?

**Phil Manning**

Yeah, but he didn't have a complete animal. Here you can see, he's just got the hips, the right leg, and a bit of skull. It really is hard painting a picture of what the animal would have looked like, for Buckland. And 150 years ago, this is what the sort of state of the art of palaeontology said that Megalosaurus looked like. And, of course, our view of this animal has changed a great deal now. If we start with the tip of the nose of the animal, working our way back through what are very narrow jaws, backwardly curved serrated teeth, typical of a predatory dinosaur, up to a really muscular neck, a bulldog shaped neck. Quite a big torso, actually, but very small forearms, quite unusual looking, but big powerful hind legs and a big backside. And on the back of that backside, a very long tapering tail, a typical predatory dinosaur.

**Hermione Cockburn**

Why is it that people talk of Megalosaurus as the first discovered dinosaur? When, presumably, for hundreds, maybe even thousands of years, people must have been digging up bits of dinosaur bone.

**Phil Manning**

Yes, but these were interpreted with myth and legend. The Victorians brought order from the chaos of this to reconstruct these animals and bring them back to life, using science.

**Hermione Cockburn**

Well, here, Phil, we have arguably the world's most famous dinosaur, Tyrannosaurus Rex, towering above us. How would T Rex have compared to Megalosaurus?

**Phil Manning**

Well, at a distance, you could be forgiven for mistaking one for the other, because they look pretty much the same, but get close up and there are subtle differences. One, this is much bigger, at 12 metres long, whereas Megalosaurus is only 9 metres long. Megalosaurus, quite skinny, this is a heavyweight boxer. There's at least 100 million years between Megalosaurus and Tyrannosaurus Rex. We are closer to T Rex than Megalosaurus was, because there's only 65 million years for us to travel, to meet T Rex.

**Hermione Cockburn**

So, there's no chance that Tyrannosaurus and Megalosaurus would ever have met then?

**Phil Manning**

Absolutely none whatsoever.

*End of clip*

**Hermione Cockburn**

So, that was Megalosaurus, just a few bones, but nevertheless the first scientifically-described dinosaur, by William Buckland. So, Buckland, together with Richard Owen, who later coined the term 'dinosaur,' go down in history as two of the academic elite from the Victoria era, as the discoverers of dinosaurs. But, there is a third man in the story, perhaps lesser-known, but who's work and ideas were absolutely crucial to the discovery of dinosaurs.