

Ask A Biologist Vol 074 (Guest Richard Fortey)

The Secret Life of the Natural History Museum

Natural history museums may not come to life as they do in a Hollywood movie, but they do have some amazing stories. They also have all kinds of cool stuff that many of us never get to see. Paleontologist Richard Fortey talks about the life and some of the treasures hidden behind locked doors at natural history museums that are also part of his book *Dry Store Room No.1: The Secret Life of the Natural History Museum*.

Transcript

[beeps – electronic lock and vault door opening]

Dr. Biology: This episode of "Ask a Biologist," is being pulled from our special collections that have been stored in our secret vault.

This is Ask a Biologist, a program about the living world and I'm Dr. Biology.

If you think of or maybe even have visited a science museum lately, you probably got to see some pretty cool stuff. The question is, "Who collects all that stuff and what else do they do with the stuff, other than put it out for the visitors to come see?"

My guest scientist should be able to give us a pretty good idea of what's going on behind the scenes of museums. Richard Fortey is paleontologist who calls the British Natural History Museum home. In fact, he's written a book about the topic called, "Dry Store Room Number One, The Secret Life of the Natural History Museum." Welcome to Ask a Biologist, Richard Fortey.

Richard Fortey: Well, nice of you to invite me.

Dr. Biology: Some of the people might have watched this movie called, "Night at the Museum," they're really rich in a lot of displays. They are almost like a wonderland to me. What I want to know is what's going on behind the scenes because there is more of than just these displays?

Richard: Oh yeah, most museums. What you actually see on display is just like the tip of the iceberg. The main part of the iceberg is the collections behind the scenes. Now they're not so glamorous as the ones on display. If it's a dinosaur, instead of being all rigged up looking like a dinosaur, it's a whole lot of bones laid out in a drawer.

What everybody should know is that is the scientific basis for all the dinosaurs that you see animated by Disney, and Pixar, or whatever it happens to be. It's all based out of the old bones. Those bones are, ultimately, hiding away in museum drawers. It's the truth about natural history in collections.

Dr. Biology: Who's collecting all this stuff?

Richard: People like me, out we go into the field, we always call it the field. Sometimes to rather remote parts of the world. If you're paleontologist, you have to do quite hard work. You have to bash rocks to find the fossils hidden away in the rocks. It's one of those great things where you never know what can turn up. Of course, sometimes nothing turns up, and that's a bit disappointing.

But sometimes, something really exciting turns up, and then, if you're an expert on it, you say, "Well, goodness! Nobody has ever seen them in the quiet like as before. I've actually got a new species, or maybe even a new type dinosaur," for example. Then there's a long period of time where those fossils are extracted from the rock and carefully, we always say they're prepared, which is rather like you're making dinner or something.

But when you get the bones or whatever they are out, you have to piece the creature together. Then you put the flesh back on it and then, ultimately, you've got something that can appear in a textbook or a film.

Dr. Biology: Or in a film. You keep mentioning dinosaurs because I think everybody remembers several movies that have come out and the paleontologists are all off looking for dinosaurs. But that's not what paleontology's all about. There's more than dinosaurs, right?

Richard: Oh yeah, dinosaurs, it's perhaps the glamour end of the industry, I don't know. But a lot of fossils are much less spectacular, but nonetheless just as interesting and just as varied. The ones I work on are called trilobites, and there are hundreds, no, actually, thousands of different kinds of trilobites, very variable in appearance, but only a very few people who actually study them, certainly fewer people than study dinosaurs.

Dr. Biology: Trilobites, interestingly enough, they are seemingly strange animals but only because it doesn't seem like we have any of them that are living. There is nothing around here that looks like a trilobite to me.

Richard: Well, they're extinct, sadly. They died out 250 million years ago, which is a long time. But, of course, they are related to some living animals. They're related to, well we call them the arthropods, those animals with jointed legs like crustaceans, spiders, and insects.

The trilobites were another major group of these joint-legged animals. They evolved from very, very early in the history of life, producing many different kinds. Sadly, they died out at a great extinction event that occurred at the end of the so-called Paleozoic era.

Dr. Biology: When you go out and break rocks, as you said, or bash rocks, do you look for any particular kind of rock that some are better for finding these fossils?

Richard: Oh yes, after a while if you're a paleontologist, you get an instinct for where it's going to be good. It's sometimes quite hard to explain. But, in the US for example, a huge area is where you get nice limestones and a few have trilobites preserved in limestones. They're very handsome creatures preserved in their full relief.

Sometimes, you get them preserved in shales where they look a little sadder in there, squashed down. If they're preserved in shales which have been included in ancient mountains belts and squeezed and stretched, then the trilobites can look very sad indeed.

But they're still useful even the sad-looking ones because, if you know your trilobites you can say exactly how old those rocks were just from the kinds of trilobites you find in them.

Dr. Biology: When you go looking for them, do you find the entire trilobite fossil in them or you just find in pieces? Because I've heard that they're not always easy to get a complete trilobite.

Richard: No, whole trilobites are a bit of a treat. If you find a really nice whole trilobite, you know, your heart begins to sing. Mostly they were fragmentary, they fell into bits. Because like most arthropods, when they grew they molted. So most of the things you find are molts. But when they molted, they came into various as bits and then the currents could move its bits around. So, quite a lot of my life we spent doing rather difficult jigsaw puzzles with various bits of these animals to try and put them back together again.

Participant: Right. So, when you talk about molting you can talk about some crabs for example. When they grow larger, they have to shed their outer skeleton.

Facilitator: That's exactly right.

Participant: Then they walk out of it, and so though what you are finding are those. Let's talk just a little bit about what a trilobite looks like.

Richard: Well, I suppose the nearest analogy that you'll all know are the little pill bugs or roly-polies [Armadillidiidae] that you see when you lift up a rotting log for example, except of course the trilobites were living under the sea. But they had that kind of set of three-lobed appearance, hence their name. Indeed some of them, perhaps the majority of them, were capable of rolling up in to a ball just like a roly-poly for protection, presumably.

Some of them were beautifully designed to make perfect spheres, even with a locks to lock the head and tail together. But some of them are much more exotic-looking, because they're covered in spines, and warts, and strange lumps, and so on. So they're a more varied group than the pill bugs.

Dr. Biology: Right, and the pill bugs are, you know...

[crosstalk]

Dr. Biology: Yes, well the pill bug's tiny, and usually we find those of course upon land or moist areas. Trilobites, where did we find those?

Richard: They were only found in the sea, and some of them grew to the size of a large lobster, so quite considerable animals. People still argue about which is the biggest trilobite in the world, but there are some that are not far from meter in length.

Dr. Biology: Wow, a meter?

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Richard: Getting very large, indeed. Others were quite mature when they were a couple of millimeters long. So, there was a huge size variation.

Dr. Biology: Right, a lot of variations.

Richard: Of course the bigger they are, the harder they are to find as whole specimens, and the longer they take to dig out of the rock.

Dr. Biology: When I look at the fossils of trilobites, especially these really beautiful ones, the ones that aren't so sad, they really are just works of art, almost to me. Have you been drawn to trilobites on pure looks?

Richard: Oh yeah, I think they're objects of beauty. But of course some of these spectacular ones, are the prickly ones covered in spines have now become objects of value as well. So, if you go on to another big fossil fairs, you'll find these things on sale now for a couple of thousand dollars, which is good in a way because it means people are going to look after them. But, it's bad for us poor old museums because as anybody that works in a museum knows, we don't have very deep pockets. So it's harder to get sight of the important specimen sometimes.

Dr. Biology: You're talking about the museums again. In this day of digital technology and the web, do we need to pick ourselves up and literally go out to the museum, or can we see things on the Web nowadays?

Richard: There are many virtual tours you can do around these visits and they are good things, too, because you don't have to leave your home if you don't want to. But for me, the real business is to go and see actual specimens. I mean, you can't through your television screen, get an idea of just how big some of these things are, or in some places you can handle specimens as well. So I don't think there's any substitute for the real thing.

We're not seeing signs that people have stopped in going to museums. If anything, the attendance has gone up in this age of virtual visits. But, no, come and see the real thing for goodness sake.

Dr. Biology: Do you think with the use of digital technology that they would, actually a slight change the way natural history museums are presented because we have the ability to do both the digital world and get them to come?

Richard: Yes, I think there will be changes in museum culture where as far as the curators are concerned, because it means that you can take people behind the scenes, virtually, in to the collections. Normally you'd have to come and make an appointment with the curator, and unlock the cupboards, and do all this kind of stuff before you could get near the specimens. That's going to do a lot for the study of these things, of the specimens.

It means that visiting scientists can answer their questions much more quickly probably. So yeah, the World Wide Web has made fantastic difference to the way people have used museum collections, and I might say all for the good.

Dr. Biology: In your talk you mentioned you had, how did you say it? Did you say you had nine lives and you'd used some of that up, I was trying to figure out how many...?

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Richard: A cat, as you know, is legendarily supposed to have nine lives.

Dr. Biology: Right. How many have you used up?

Richard: Eight and a half.

[laughter]

Richard: I can't afford any more risks, I think.

Dr. Biology: OK. So what was your worst risk?

Richard: Well I can tell you the officially worst risk was probably falling into the Arctic Ocean surrounded on all sides by icebergs. The textbooks say you have four minutes before your body system shuts down. It was my own foolishness that did it. But fortunately there was a geologist standing near me who pulled me out. I held onto his geological hammer, but I can still remember the sheer appalling cold had spread through me.

This is right on the high Arctic you know, so you weren't going to warm up just by getting out of the water. That's certainly one life. I was also caught in a bush fire in Australia. Well, those of you who see the news recently will know just how dangerous that can be, and terrifying. I guess that's another of my nine lives.

Dr. Biology: Wow, fire and ice!

Richard: Fire and ice, yes, yes.

Dr. Biology: You mentioned that your trilobites went extinct millions of years ago, so we can't see them running around today, but is it possible or is it already been done where there are computer models, you can actually see them, what they might have been like in the ocean?

Richard: There are animations, of greater or lesser plausibility, because we know quite a lot about their limbs now and how they moved from very exceptionally preserved animals that preserve lots and lots of fine details. Actually you can have a pretty good idea of how they did move, what they looked like when they were alive. Of course it's not the same as having living ones sitting in the palms of your hand, I wish we could.

Dr. Biology: What are the most fantastic trilobites that you've come across?

Richard: I think the most amazing are ones that'd been discovered just a few years ago in Morocco, one of which has a structure which I'd never seen on any other organism. I'm always looking out for biologists who might offer suggestions.

This thing carries on its nose a huge fork or trident, which must have stuck out in front of the animal, as long as the animal itself. Seems like a most implausible thing, but it's real enough and I've no idea what it was for. When I first saw it, it was so bizarre that I thought somebody was playing a trick and it was a fake. By the time I'd seen three or four of them, I knew of course it was the real thing, but I still don't know what the trident was for.

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Dr. Biology: Or maybe there's a young paleontologist out there that will take up the challenge and find out what it is. Did trilobites have vision? Did they have very good vision or did it vary?

Richard: Trilobites are remarkable because they had the first really well-preserved eyes in the fossil record, and yes they're compound eyes like an insect eye, made of a number of lenses. They're also unique because they use calcium carbonate the same material as their shell to make their eye lenses. A surprising amount is known about the optics of this and how it would have worked for them to see the world. The study of trilobite eyes, as one scientist of my acquaintance, he's actually spent most of his life just studying trilobite eyes. So there's a lot that I haven't heard about him.

Dr. Biology: If someone wanted to go and look at a bunch of images of trilobites, and they weren't able to go to the local museum, or maybe they don't have a natural history local museum, where do they go on the Web? Where is the best place?

Richard: You can find a trilobite website called, I think called just trilobites, it's compiled anyway by the man who lives farthest to any trilobites I can think of. His name is Sam Gon III, G-O-N. If you Google him you'll find the site and he lives on Hawaii. Now if you wanted to get as far away from any trilobites as is physically possible, you go to Hawaii where the rocks are very young and the nearest trilobites are thousands of miles away. But Sam has set up this wonderful website for the trilobites.

Dr. Biology: That is curious, isn't it? You spent a little bit of time in Eureka, Nevada.

Richard: Yes, yes. As it says as you enter the town, the loneliest town on the loneliest road in North America.

Dr. Biology: So why go to Eureka, Nevada?

Richard: Around Eureka, Nevada there are a lot of rocks of Ordovician age, which is the one age I'm particularly interested in, about 450 million years old, and I had reasons to believe there were trilobites to be collected there which had never been discovered before. This meant driving way out into the desert to find the localities and, well, there's hard work involved because it gets kind of hot out there as you can imagine and there you are breaking rock in the heat.

That's one of those moments when you think I must be mad to do this.

[laughter]

Richard: But when you find a really got trilobite it makes it all worthwhile and we did around Eureka, Nevada.

Richard: Besides your science career, you've been doing a lot of writing, and it's more of a popular science writing. Do you find it different or is it something that just complements the science you've been doing?

Richard: Well it's quite different. It's quite a different thing to do. You see, if you are a scientist a lot of your life is spent writing scientific papers. The scientific papers are for your colleagues. If

you work on trilobites, well I have colleagues, but not huge numbers of them, but if you're writing a popular science book or a science book for the general reader, then you're writing for not just these small groups of colleagues, you're trying to write for everybody.

The way you do it is all important. If you are writing a technical paper actually the details of how you write doesn't matter, but for writing a book it's the most important thing. For me it's quite a different feeling sitting down trying to write for everybody than writing my technical scientific papers.

Dr. Biology: But you mentioned in your talk yesterday, that one of the things that scientists have that a lot of people don't realize is, at least a good scientist, is imagination. It seems like your popular science writing plus the scientific side that really is quite rather shared.

Richard: Yeah, I think so. Well, I think best quality of human beings is probably their imagination and I think that scientists exercise it in their own way, novelists in another way, it's just the aspect of being creative. So it's not impossible to turn from one to the other, although quite often people feel they can't.

Dr. Biology: It's interesting because am asked about this, a lot of my scientists have been doing writing, not particularly popular science writing. With your books, especially the popular science writing, who are you trying to reach? Who are you writing them for?

Richard: What am trying to do is to infuse people, that's the most important thing to me. People who probably never really thought so about the history of life on this planet, if they read one of my books I hope they would be stimulated to go further. Well, we always have to reach somebody that's called, I think, the intelligent layman is how my publisher always describes it, but as far as I'm concerned, that's an awful lot of people.

Dr. Biology: The phrase I like using nowadays is "science savvy."

Richard: Science savvy, yeah.

Dr. Biology: Yeah. On this show, I'll ask three questions of every scientist. The first one is when did you first know you wanted to be a scientist or biologist?

Richard: A lot of scientists of my kind, I think, are sort of born and so I was very young indeed. I mean, I was interested in birds from a very young age. I'd soon learn the common wild flowers. I moved from one group of organisms to another, and when you're young, of course, your memory is good and you think you can know everything, but you can't. I think I was probably destined to move in that direction early on.

Dr. Biology: What if I took it all away from you? You can't be a scientist and I'm going take away archeology, and a lot of the things that are peripheral, and if you had to do it again and you weren't allowed to do the science side, what would you be or what would you do?

Richard: Well, I think I would probably have been a writer because I always liked writing, which is why I write books, of course, which people enjoy reading I hope. I guess I might have been some kind of novelist.

Dr. Biology: What if someone's out there that wants to become a biologist, better yet a paleontologist interested in trilobites, what's your advice?

Richard: It would be great to have some more trilobite people, that's the first thing to say. The second thing to say is it's a rather long journey because you've got to do your first degree, and then you got to get the right person to supervise you for a doctorate, and then these days, you have to be patient after that before you get a job in a museum or a faculty in a university. It is a long journey. Of course, it's worth it when you get there, but it does require persistence, I think, more than anything else.

Dr. Biology: Did you ever want to throw it all in, just give it up? Was there ever a moment that you were doing it and you thought, "There's got to be a better way."?

Richard: No. I don't think so. A part from the occasional time in the field where I panicked in some slightly precarious situation where I thought, "Why am I doing this? I must be mad!" But that doesn't happen very often.

Dr. Biology: Before we close the show, could you read from a page from your book, *Dry Storeroom No. 1, The Secret Life of the Natural History Museum.*?"

Richard: Yeah. Thank you. I'll read a little passage about several of the characters and how they came to resemble the organisms they worked on.

"I have speculated from time to time as to whether researchers come progressively to resemble the organisms upon which they research. There's a certain amount of evidence from my thesis although I doubt whether it would survive rigorous statistical examination. For example, I have come to resemble a trilobite as I got older, particularly as regards the middle lobe of my anatomy.

"A former Keeper of Zoology, Collin Curds, worked upon very small organisms that lived in sewage and he did indeed resemble some kind of obscure microorganism such as one might observe on a slide, being a little man with a pointy beard who jaunted around in a manner rather like paramecium.

"Gordon Corbett, who worked on small mammals, was a Scotsman with a hesitant manner and a nervous way of speaking. For some reason, he reminded me of a vole, the way these animals pause momentarily, whiskers twitching.

"But there were some particularly striking examples in the Entomology Department. WNP Barbellion, his diary entry 20th of April 1914, had noted such resemblances when he remarked, 'An entomologist is a large hairy man with eyebrows like antennae.'

"Ian Yarrow worked on bumblebees, particularly the genus *Bombus*, and he was a man with a very comfortable rounded middle. He had a fondness for furry jumpers, which gave him a thoracic look, and on one occasion, I saw him wearing a wooly sweater with broad horizontal stripes. Furthermore, he used to hum to himself. Once, I followed him down the front steps of the museum as he bounced from foot to foot, going 'buzz, buzz, buzz' quietly."

Dr. Biology: [laughs] Love it.

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You've been listening to Ask A Biologist and my guest has been paleontologist Richard Fortey from the British Natural History Museum. The Ask A Biologist podcast is produced on the campus of Arizona State University and is recorded in the Grassroots Studio, housed in the School of Life Sciences, which is a division of the College Liberal Arts and Sciences, and remember even though our program is not broadcast live, you can still send us your questions about biology using our companion website, the address is AskABiologist.asu.edu or you can just Google the words "Ask A Biologist." I'm Dr. Biology.

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