Life (500 million years ago)

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Intro VO: *Welcome to the Ideas Lab Predictor Podcast from the University of Birmingham. In each edition we hear from an expert in a different field, who gives us insider information on key trends, upcoming events, and what they think the near future holds.*

Lucy: We're joined today by Dr Imran Rahman who is NERC Research Fellow in GEES, which is the School of Geography, Earth and Environmental Sciences.

Imran: Yes, that's right.

Lucy: At Birmingham University. Welcome, Imran.

Imran: Thank you.

Lucy: So tell us about your work as an NERC Research Fellow.

Imran: So I'm a Paleontologist and that means that I study the ancient life of this planet, so I look at fossils from millions of years ago and try and work out what life was like when these animals were still alive.

Lucy: So how many million years ago?

Imran: So we're talking hundreds of millions of years ago. The particular fossils that I work on are over 500 million years old.

Lucy: So to give us an idea what is around about 500 million years ago, no dinosaurs, what -

Imran: No dinosaurs, no. Just marine things. So actually around the period of time I'm interested in we have a massive explosion of life which is actually called the Cambrian Explosion and that happened about 510 million years ago and we suddenly get an appearance of diverse and many, many different species of animals where we'd previously had very little. So we've gone from relatively simple, relatively low numbers of organisms to sort of huge diversity of animal life in a sort of geological blink of the eye really.

Lucy: And when we say 'animal life', these things don't actually look like anything that we would recognize now as being animals.

Imran: No, no, and that's part of the challenge really for my work, trying to work out how they relate to what's alive today because they are so very different, as you pointed out. I work on some fossil echinoderms which are sort of ancient ancestors of sea urchins and starfish and things like that and the fossil forms from the Cambrian, from 500 million years ago, are bizarre. I mean there's ones which look like tennis rackets, there's ones that look like shaving razors. All sorts of weird and wonderful things – shoes – it's basically anything..

Lucy: So they don't look like a hamster or a fish!

Imran: No, they def don't look like anything you would think was an animal but they were in fact animals, we know, so trying to work out exactly how they relate to other things just based on these weird fossils is quite challenging but also very exciting.

Lucy: And where are these fossils from that you look at?

Imran: I primarily have looked at material from America, Spain. I've looked at some material from Spain, France, the UK as well has actually got quite a large number of echinoderms from this kind of period of time. Part of the enjoyment of my job is being able to travel around the world to look at some of these different creatures and to borrow the material and then study it back in Birmingham.

Lucy: So this explosion of life was going on all over.

Imran: Oh yeah, yeah. I mean you get certain windows into it in different parts of the world but we believe that the explosive radiation was going on everywhere.

Lucy: And you've brought in some, what are they, scans? Some scans of some of these fossils.

Imran: Yeah, so these are computer reconstructions based on CT scans. So obviously CT is a technique which is used in hospitals for medical treatment but it can also be used for research as well. So yeah, I've brought in a few 3D computer models.

Lucy: And we're going to make these available on Twitpic (http://twitpic.com/photos/ideaslabproject) so if you want to look at these at the same time that you're listening to the podcast you can go to our Twitter account which is @ideaslabproject (http://twitter.com/#!/ideaslabproject) and have a look at the scans. Ok.

[The moving images of each fossil can actually be found on **Twitvid (http://www.twitvid.com/videos/ideaslabproject)** .]

Imran: The first one I want to show you is Ctenocystis utahensis. This is an American early echinoderm and it looks a bit like a shaving razor.

Lucy: It does look like a shaving razor.

Imran: A little bit like a shaving razor.

Lucy: It's amazingly mutlicoloured. Where do those colours come from?

Imran: The colours are largely from my imagination, I must admit in this case.

Lucy: OK.

Imran: But they serve a useful purpose because we can pull apart different coloured bits of the fossil basically.

Lucy: So the colours are actual different body parts?

Imran: Yeah. So in echinoderms they have lots of different skeletal plates so the skeleton is made up of all these different plates. So each of the different coloured parts is a different plate. So by pulling them apart, virtually dissecting the fossil, we can then look inside it. So I'll show you if I pull away one or two bits of some of the stuff we can start to see.

Lucy: OK.

Imran: So if I take away the surface of the fossil there you can see some interesting internal structure here. This is possibly equivalent to a body chamber inside the animal. Normally paleontologists have no idea what was actually inside the fossil because the soft parts if you will are not preserved, but sometimes from the skeleton we can get an idea. So one of the advantages of the technique is that we can take apart what's on the outside and then see stuff on the inside.

Lucy: So that CT scan means you can actually take away the plates if you like virtually.

Imran: Exactly, yeah.

Lucy: So you can see the cavities inside.

Imran: It's also obviously non-destructive so we don't have to break the fossil or damage it in any way.

Lucy: Quite crucial I imagine.

Imran: Very crucial.

Lucy: If you're dealing with 500 million years old fossils.

Imran: Yeah, kind of one of a kind samples.

Lucy: Yeah.

Imran: And it generally makes you more popular with museum curators if you don't destroy their material. I'll show you another example now.

Lucy: Yeah, ok.

Imran: This one I want to show you is from Spain and this is a tennis racket looking creature.

Lucy: Ok. Wow, that's really different to the other one. I mean totally different.

Imran: Yeah, completely different but those two are actually very closely related we think. So despite the fact that they look kind of superficially dissimilar, they share quite a number of characters in common and one of the goals of my research is to try and work out how these other weird fossils are related to each other and then when we know how they're related to each other, how can we then fill in the gaps in our knowledge of the Tree of Life?

Lucy: Yeah, so that's the kind of importance or where this research fits into the wider scheme of things is that there was whole loads of processes of evolution that we just don't know.

Imran: Exactly and the fact that we have this sudden explosion of fossils in the Cambrian, that's been debated for a long time and we know that doesn't happen generally in the evolution of life so why did it happen now and why do we have all these weird and wonderful things? So one of the ways we can try and understand this event is by looking at the fossils and trying to work out how they're related to each other and how these animals have evolved into what we see today, basically.

Lucy: So does this tennis racket one have a name?

Imran: Yeah, it does. This is called Protocinctus and it's one I've been lucky enough to name myself.

Lucy: So you actually get to name some of these new life forms?

Imran: There's a variety of different ways of naming them. I went for the safe option based on what it looks like but in the past people have named them after their favourite pet or wife or favourite rock band or whatever.

Lucy: Play it safe for now.

Imran: Yes, so I'm going to play it safe until I've, you know, established myself then start coming up with the crazy names I think.

Lucy: And we've got one more to look at haven't we?

Imran: Yes. The last one is from near Birmingham actually. This is from the Wenlock limestone in Dudley and this is called Placocystites. This one's a little bit younger, 400 million years old.

Lucy: OK!

Imran: Probably not really that young compared to what most people would think as young. This one's kind of unique because it's got so many different parts to it, so many different plates.

Lucy: It looks a little bit like a cross between a turtle and a football.

Imran: Yes, yes.

Lucy: It's got almost kind of hexagonal plates that you've coloured in different colours across its shell.

Imran: Yes. We can call them shells or skeleton or whatever you want to call it but the idea is that it's got all these different parts to it and this is a particularly interesting one actually because it's got a lot of weird internal bits which I'll show you. So hopefully you can see there we've got a very odd rod running in the side, the middle, of the animal.

Lucy: Yeah.

Imran: And a ridge as well and this is all part of the skeleton of the animal and actually in living animals there's very few things that have a complicated internal skeleton like this. So I guess there is no analogy in terms of living echinoderms. The closest thing is probably humans in a way, or vertebrates in terms of our thoracic cavity or ribcage. One of the ideas is that this may have performed a similar function in terms of supporting different internal parts of the animal.

Lucy: And when you do your CT scanning, whereabouts do you do it?

Imran: I have been doing most of my scanning in Dentistry. They've got a very small CT scanner there which they normally use for teeth.

Lucy: So you're the fossil man when you turn up!

Imran: Yes! I'm the fossil man over there.

Lucy: So what's next? You're a recently joiner at the University.

Imran: Yes. So I started in January and I'm going to be here for three years at least and the idea is to basically scan a large number of these weird and wonderful fossils and then try and work out what's inside them. I'm also hoping to do some more biological things, so I'm looking at the development of living echinoderms as well as the fossil record of the group, seeing how basically baby echinoderms, baby starfish or baby sea urchins, turn into grown up starfish and sea urchins and what sort of changes happen in that transition and then relating that back to the fossil record. The idea is to then have a combination from a fossil record and from modern specimens in order to best understand the early evolution of this animal group.

Lucy: So you're shedding light on what happened 500 million years ago.

Imran: Yes, exactly and then working out how they turned into what we have today.

Lucy: Absolutely fascinating. Dr Imran Rahman, thank you very much indeed.

Imran: Thank you.

Outro VO: *This podcast and others in the series are available on the Ideas Lab website:* ***www.ideaslabuk.com (http://www.ideaslabuk.com)*** *. On the website, you can find out how to e-mail us with comments, questions or suggestions for future topics for the podcast. There's also information on the free support Ideas Lab has to offer to TV and radio producers, new media producers and journalists. The interviewer for the Ideas Lab Predictor Podcast was Lucy Vernall, and the producer was Andy Tootell.*

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