Science Magazine Podcast

Transcript, 07 December 2012

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Promo

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Music

Interviewer – Kerry Klein

And to finish off our final podcast of 2012, online news editor David Grimm is here to run through the 10 most popular *Science*NOW stories of the year. Now Dave, I've got the list in front of me. I'm noticing some not-so-surprising themes here. So we've got some stories with the ick factor, we've got mummies – everyone loves mummies. There's the physics of everyday occurrences, and no list would be complete without animals having sex.

Interviewee – David Grimm

Right, I think every year we've done this, there's been a sex story. I don't know what it is, but sex sells. And in science, when you add science and sex together, it's often a lot of fun, and this story is no exception. This is a story about turtle sex. But it's not about today's turtles having sex, it's about turtles having sex 47 million years ago, and how these turtles, and in fact, nine couples actually, were preserved *in flagrante delicto* as they say. The fossil record preserves a lot of animals, and we've had a lot of very cool creature discoveries because of the fossil record. But it rarely preserves behaviors, and this is one of the rare examples, in fact, the only example in vertebrates where the act of copulation was actually caught, frozen in time, in the fossil record.

Interviewer – Kerry Klein

I guess my question is how did these turtles all die?

Interviewee – David Grimm

Well, that's one of the big mysteries here. You know, they found these turtles – there's been a lot of hypotheses thrown out to suggest how the turtles died. Some people suggested that maybe the lake that they were found in (they were sort of found at the bottom of this lake or former lake in west-central Germany) was polluted. Maybe there were toxic algal blooms in the lake. One of the ideas floated by the authors of this study was that the bottom of the lake was actually very oxygen poor, and the turtles sank, as turtles often do actually while they're copulating. And when they sank to the bottom, they essentially suffocated. Turtle sex takes a long time, and it took too long in this case and a lot of turtle couples died during the act.

Interviewer – Kerry Klein

So then on another continent, scientists were also piecing together another animal's history, but in this case, the researchers had to get a little bit dirtier.

Interviewee – David Grimm
Right, well a lot of the stories that we cover on the site involve researchers doing interesting field work. They go out to Africa, say, and observe some animals in the wild. This is field work but not field work that's very pleasant. This involves digging through a pile of bird excrement that's two meters deep that had been collecting for 48 years in a chimney.

Interviewer – Kerry Klein
What could motivate scientists to want to dig through this?

Interviewee – David Grimm
Well, the scientists knew that the poop belonged to the chimney swift, which is this migratory bird species. And the interesting thing about the chimney swift is that these birds have actually begun to disappear, and scientists don't know why. And they were hoping – the assist team was hoping – that this pile of poop would hold clues, and indeed, it did. They found the deeper they dug, so the farther back they went in time, the more beetles there were. And beetles are a very important component of the chimney swift's diet. But as they went more recent in time towards higher in the pile, they found a lot less of these beetles, and that sort of led them to suspect that it may be a chemical pesticide, a relative of DDT, that was killing off the beetles. And with fewer beetles around, the chimney swifts began to disappear.

Interviewer – Kerry Klein
Very interesting. So while some scientists wish to disentangle the past, others, of course, want to look towards the future. And so some European scientists think they found a way to encode information for further generations.

Interviewee – David Grimm
Yes, this is one of my favorite stories of the year, and it's not a very fun topic. It has to do with nuclear waste, and how do we store it. And how do we store it in such a way that not only does it not harm us, but it doesn't harm future generations? And when you talk about looking into the future, we're talking about looking at the way, way future – thousands, tens of thousands of years into the future. If we bury all this nuclear waste, what if archeologists or extra terrestrials or whatever come down to Earth and they start digging around and they come upon this nuclear waste, and it kills them. We want to prevent that from happening. And one way scientists have proposed (this came out of a meeting in Dublin earlier this year) was creating a hard disk that would last for a million or more years.

Interviewer – Kerry Klein
So what kind of material would work for this sort of thing?

Interviewee – David Grimm
This is actually – what they propose is a sapphire disk, and the information inside is engraved using platinum. And the information is encoded in such small characters you

actually need a microscope to read it, but the researchers say that the prototype they developed, you could theoretically read 40,000 miniaturized pages. The best part is that this is a very durable storage medium. It's not like our CDs or our memory sticks of today where information can start to degrade over time. They think that the disk can last one million and potentially up to 10 million years. Now that presents one problem. If a human or a post-human or an alien comes across this disk 10 million years from now, chances are they won't speak the same language that we do. So, although researchers have tackled a large part of the problem here creating information that can be stored for a long, long time, the question remains, what language do you write it in?

Interviewer – Kerry Klein
Indeed. Well, at least we have, you know, quite a bit of time to figure that out.

Interviewee – David Grimm
That's right.

Interviewer – Kerry Klein
So then, one story that really jumped out at me when I read it initially online is one scientist's attempt to get to the bottom of a mysterious phenomenon happing in Africa. And I guess since it's on this list, it also caught the eye of many, many other people as well. Tell me about these fairy circles.

Interviewee – David Grimm
Well, fairy circles are these bare patches of soil. They are about 2 to 12 meters in diameter in the freckle grasslands from southern Angola to northern South Africa. Their perimeters are often marked by a tall fringe of grass. They really are sort of unusual looking. You can actually take a look at them on the site. But they are also, as you said, Kerry, they are a big mystery, because scientists don't know where they come from, like how they form. And there's been a lot of hypotheses put forward – maybe termites caused them, maybe the land has somehow grown toxic and it forms these circles – but none of those hypotheses have really been shown to be true. So there's this big mystery, and this is sort of another example of somebody actually going out and doing some interesting field work. The researcher that led this study, in fact, I think he was the only researcher on this study, actually went out to Namibia to check out some of these fairy circles for himself.

Interviewer – Kerry Klein
And so where did his technique depart from these unsuccessful attempts to understand these in the past?

Interviewee – David Grimm
Well, he actually looked at satellite images over a four-year period, and by doing this, he noticed something that nobody had really noticed before - which is that these circles are "alive," meaning they are dynamic. They disappear and appear at sort of regular intervals. Some of the circles he saw vanished every 24 years, some lasted as long as 75 years and then disappeared. Even though he was only looking over a four-year period, he

was able to extrapolate from the satellite images he saw. And so he hasn't really solved the mystery. But at least he's shown something that we didn't realize before - that these are not just static phenomenon, but they are very dynamic. And potentially, that could lead to an answer for what the heck these things actually are.

Interviewer – Kerry Klein
Great, someday.

Interviewee – David Grimm
Someday.

Interviewer – Kerry Klein
Now of all the stories on this top ten list, and there are six more that we haven't talked about yet, what surprised you the most? Were there any stories in here that you weren't expecting to be quite so popular?

Interviewee – David Grimm
This story was popular and also surprised me in the fact that there's a lot of very tricky and complicated science that we cover, and we try to make it as accessible as possible to the general public. But it's very rare for researchers to come out and say, "this type of science is hard." You don't usually hear scientists saying that. They just go ahead and try to figure it out. But this story is all about how physics is hard and specifically, a type of physics that involves finding an equation that describes how a system changes over time. These are the types of equations that researchers might use to track the motions of planets. And you can imagine that's very difficult, because it's not just the planet you're talking about, it's maybe the moons that orbit it. It's the planet that's orbiting the sun. It's what's happening in the solar system. It's what's happening in the galaxy and potentially, even the universe as a whole. So these are very, very complicated equations with a lot of variables. And it turns out, the more variables you add, the equations become exponentially harder and harder and harder, and according to computer theory, these equations are actually so difficult, that computer theory actually defines them as "hard."

Interviewer – Kerry Klein
So then what new information does this give to scientists?

Interviewee – David Grimm
Well on the one hand, it might say something like - don't waste your time, because you're never going to figure this out. Although other scientists sort of - as scientists will do - take this as a challenge. They're saying, well we think it's hard now, but we're eventually going to crack this. We're going to find a way to, as we say in this story, tenderize these equations a little bit – make them a little bit easier to digest. There's things that we've thought have been hard or and insurmountable in the past that we've managed to overcome, but still, I love it just because it's an example of scientists sort of throwing up their hands in the air, at least for the moment, and saying, this stuff is really hard.

Interviewer – Kerry Klein
Well, I'm glad that they are finally admitting it. So we've had quite a bit of variety here in all these stories, so I think we're all dying to know, what was the number one most popular story on *Science*NOW this year?

Interviewee – David Grimm
Well, I'd love to tell you, Kerry, but you're going to have to take a look at the site to figure out not only what was our number one story of the year, but was also our most popular story of the year. And they are the same story. I'll give you a hint – it's a very silly story.

Interviewer – Kerry Klein
Alright, and what is that website, Dave?

Interviewee – David Grimm
That is news.sciencemag.org. And in addition to the top story of the year, you can also check out the four stories that we didn't cover here today.

Interviewer – Kerry Klein
Great, will do. Thanks, Dave.

Interviewee – David Grimm
Thanks, Kerry.

Interviewer – Kerry Klein
David Grimm is the online news editor of *Science*. You can check out all of our news at news.sciencemag.org, including daily stories from *Science*NOW and science policy from *Science*Insider. *Science*Live will be taking a hiatus for the next two weeks, but be sure to check back in 2013 for live chats on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.