



Science Magazine Podcast Transcript, 15 November 2013

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Promo

The following is an excerpt from the *Science* Podcast. To hear the whole show, visit www.sciencemag.org and click on “*Science* Podcast.”

Music

Interviewer – Sarah Crespi

Finally today, David Grimm, editor for our daily news site, *ScienceNOW*, is here to talk about some recent stories. I’m Sarah Crespi. First up we have a story on the mating habits of the sand flea. Sand fleas are native to the Caribbean, but they have been hopping rides on people's feet for centuries, and now they can be found on tropical beaches around the globe. Despite their long-standing interactions with our feet, there are still some mysteries out there about these little hoppers like where they have sex.

Interviewee – David Grimm

Right. Where does the sand flea have sex? And it turns out that the answer to that question came about from a researcher actually letting a sand flea burrow into her foot.

Interviewer – Sarah Crespi

So what...how did that come about?

Interviewee – David Grimm

Well, this was a researcher. She was studying an infection that the flea causes as she was doing some on-site research in Madagascar. And she noticed one day that a sand flea had burrowed into her foot. Now, most of us would pick that flea right out, which is actually the only treatment for these fleas right now; there's actually no drugs that will get rid of these fleas. But she said, you know, I'm studying these guys anyways. Why not let it live in me for a little while, and I can study it more up close and personal.

Interviewer – Sarah Crespi

So how long did she expect this sand flea to actually hang out in her foot?

Interviewee – David Grimm

Well, these sand fleas actually don't live very long; it's only the females that burrow into the skin, and they only live a few weeks. But this flea hung on for a couple of months. And the researcher's feet were starting to get itchy and painful, and she said you know what probably a good idea to take this flea out. So she did take the flea out, but she continued to investigate the biology of this disgusting little insect. You can actually see a picture of it on the site. It doesn't look so disgusting; it looks actually kind of cool. It's a very tiny insect; it swells to about 10 millimeters in diameter after it feasts on your blood for a while.

Interviewer – Sarah Crespi

Why do they think it stayed in her foot so long?

Interviewee – David Grimm

Well, that was the big question. And it turns out what they hypothesized is that these females are actually hanging out waiting for a male to mate with them. There had been this speculation whether these fleas actually mate outside of their host or when one of them is inside the host. And again, the males don't actually enter the host. And so, what the researchers think is happening here—or at least happened in this case—is the female was never fertilized so she kept on hanging out and living waiting to be fertilized. And that suggests that the males actually fertilize the females while the females are embedded in their host, not when the two of them are not in the host. So this researcher had put socks on and shoes on after she got infested, which means that no male was able to fertilize the female.

Interviewer – Sarah Crespi

So this is only one case of one researcher and one sole sand flea that maybe just had some issues. Is there any way to generalize this?

Interviewee – David Grimm

Well, we could let ourselves get infected by a lot more sand fleas and see what happens. But short of that researchers will definitely want to confirm that this is happening on a larger scale than just with the one flea. Implications? Not much.

Interviewer – Sarah Crespi

Next up we have a story on rearranging the big cat tree. According to DNA evidence, big cats, or pantherines, have been around for 10 or 11 million years and at some point since then they diverged into lions and tigers and snow leopards and other large cats. But some new evidence is pushing these dates around. When does the DNA evidence say that the large cats diverged?

Interviewee – David Grimm

Well, Sarah, the DNA evidence suggests that animals—or at least the ancestors of animals like tigers—didn't really arise until about a couple of million years ago. So this is a very recent, at least in evolutionary terms, divergence of the big cats. But as you mentioned, that's actually being contradicted or challenged, at least, by this new finding. The problem was that all this evidence is based on DNA, even the idea that the first pantherines emerged around 10, 11 million years ago. That's all based on DNA evidence. That's because the fossil evidence is pretty recent. The oldest pantherine fossil researchers have had up to now has only been about 3.8 million years old. And when you consider that these cats have been living up to 10 or 11 million years, that's not that informative. And that's where this new study comes in. Researchers that were digging around an area called the Tibetan Plateau, this team found some fossils that seemed sort of unusual and they analyzed them. And they concluded that they were pantherine fossils. And what was even more interesting was that the fossils dated back from about 4 to 6 million years ago. So a lot older than any of the previously known pantherine

fossils. And these fossils importantly came from Asia, not from East Africa where the previous record-holding fossils had come from. That's important because scientists had thought that these big cats originated in Central Asia; but again, the fossil evidence up to now hadn't really supported that.

Interviewer – Sarah Crespi

What kind of cat did they find? How big was the cat that these fossils came from?

Interviewee – David Grimm

They think it's a pretty close relative of today's snow leopard, but it was about 10% smaller, but otherwise a lot of its features were very similar. And then, when they combined the features of this animal with what they already knew about the big cat family tree, what that showed them is that this tree really had to be reshaped a bit. And, in fact, this indicates that if this creature had emerged 4 to 6 million years ago then big cats themselves may have emerged as long ago as 16.5 million years ago, which is millions of years earlier than scientists had thought. It also indicates that these big cats had begun to diverge a lot earlier than scientists had thought. And that may be because during this time in the Himalayas, the Himalayas were just starting to come upward thanks to a shifting of tectonic plates. And this would have created a very diverse environment, and the type of environment that you would expect would potentially cause one or a couple of species to split into many species; you have this diversification that's eventually going to lead to a lot of the big cats that we know today.

Interviewer – Sarah Crespi

Finally, we have a story on insights into the gambler's mentality. At base, addicted gamblers can't stop playing the game. What makes someone a pathological gambler?

Interviewee – David Grimm

Some of us gamble, and some of us gamble a lot! But gambling a lot doesn't make you a pathological gambler. What makes you a pathological gambler is not being able to stop. And that usually leads to pretty disastrous consequences. You lose your house, you lose your family. There was a recent story about a guy who charged into a casino with an axe and tried to destroy a slot machine. These are the kinds of behaviors that are considered pathological. And, in fact, they are so pathological that the DSM-5, which is sort of the bible of psychiatry, has recently recognized pathological gambling as its first behavioral addiction. So this is a pretty serious addiction. The question for a long time has been do gamblers gamble because they're hypersensitive to the rewards of money, like they just want money over all else? Or are they maybe less sensitive to some other rewards and gambling is just taking primacy over some other basic needs that we all have?

Interviewer – Sarah Crespi

In this study, they used gamblers, and they had them do more than just self-reporting; they tried to capture this preference for gambling in their behavior. How did they do that?

Interviewee – David Grimm

Well, they stuck them in an fMRI scanner—and this scans brain activity—and they basically had them push a button really rapidly. And the more rapidly they pushed this button they could either see pictures of money or sexy pictures of women (I guess these were probably all guys in this study; they were actually). And what they found was that the gamblers versus the controls were much more motivated to see those pictures of money than the sexy pictures. And what else they found when they looked at the fMRI scans was that these gamblers, these pathological gamblers, actually had diminished responses to the erotic pictures than they did to the pictures of money, which suggests there's something in their wiring of their brain, which actually makes them less sensitive, less seeking this desire to see erotic pictures what the researchers sort of equate with a desire for sex, a very basic need, versus a desire for money.

Interviewer – Sarah Crespi

They found these brain differences in the people who gamble at addictive levels. Could this potentially help with treating that?

Interviewee – David Grimm

Well, right. And one potential treatment might actually be to boost these people's sensitivity to other basic needs—whether it's food or sex—and potentially have that override the desire for money, which could potentially curb the pathological gambling behavior.

Interviewer – Sarah Crespi

Okay, what else is on the site this week, Dave?

Interviewee – David Grimm

Well, Sarah, for *ScienceNOW* we've got a story about how planting roadside trees can help curb air pollution. Also, a story about the evolution of Little Red Riding Hood and other folktales. For *ScienceInsider*, our policy blog, we've got a story about biology's answer to the Physics Archive. This is a preprint server of physics papers. Biologists want to create something analogous for biology papers. Also, a story that deals with the fallout from *Science* magazine's sting operation conducted last month that outed some open access publishers for less than rigorous publishing practices. It turns out a few publishers are now feeling the brunt of that sting, and you can learn what is happening to them on the site. And finally, for *ScienceLive*, our weekly chat on the hottest topics in science, this week's *ScienceLive* is about neuroprosthetics, the interface between mind and technology and where that is going. And next week's *ScienceLive* is about splitting water to store energy. So be sure to check out all of these stories on the site.

Interviewer – Sarah Crespi

Thanks, Dave.

Interviewee – David Grimm

Thanks, Sarah.

Interviewer – Sarah Crespi

David Grimm is the editor for our online daily news site, *ScienceNOW*. I'm Sarah Crespi. You can check out the latest news, our upcoming live chats, and the policy blog, *ScienceInsider*, at news.sciencemag.org.

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