



Science Magazine Podcast Transcript, 11 January 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 – Kerry Klein

Finally today, I’m here with online news editor David Grimm who’s here to give us a rundown of some of the recent stories from our online daily news site. So Dave, our first story offers new insight into the effects of a mission to Mars.

Interviewee – David Grimm

Well, that’s right, Kerry. One of the big problems about traveling to Mars is it takes such a long time. Researchers estimate that a mission to Mars would take about 520 days. That includes the several months to get there, the time that the astronauts would actually spend on the planet itself, and then the journey back home. And the most amount of time a human has spent outside of Earth was 437 days. That was a Russian cosmonaut in 1994 to 1995. So very little is known about what impact such an extended mission would have on the human body, and that’s what this new study is all about.

Interviewer – Kerry Klein

So we can’t just send people to Mars in a practice mission, so how are we studying that from down here on Earth?

Interviewee – David Grimm

Well, the researchers utilized an experiment that’s already ongoing. This is the Mars500 mission. This is a simulation that was going on in Moscow. It just ended in 2011. And like the real Mars mission, it lasted 520 days. It involved six crewmen who spent the entire time in this, sort of, mock spaceship that had a, sort of, series of tunnel-like chambers. It wasn’t the most comfortable environment. When the crew members wanted to speak to the outside world, they had to use things like video and other technology that would be on a real mission. And the point was to really replicate an actual Mars mission as well as possible.

Interviewer – Kerry Klein

And so what did we find? How did these crew members fare?

Interviewee – David Grimm

Well, what happened was the crew members suffered from something called hypokinesia, which is sort of a complicated way of saying they moved around a lot less. They moved less while they were awake and while they were asleep. They spent more of their waking hours engaged in restful activities – playing video games, reading books, watching

movies. They even wore these wrist watches that were equipped with light sensors that showed just how lethargic they became, and actually the more lethargic they became, the more they shunned the lighted parts of the ship. And this got worse and worse as the mission progressed. In fact, the crew members only started to perk up when they were about 20 days from the mission ending, and the researchers say that's probably because they were just really excited to get the heck out of there.

Interviewer – Kerry Klein

Right. So what does this mean for future space missions then?

Interviewee – David Grimm

Well, researchers say, actually, this is really important. You can imagine if you got in a mission and something goes wrong, you really want your crew to be alert, to be on top of things. If everybody is starting to get really, sort of, slothful, and a lot of these crew members, they were starting to sleep longer. They were not synchronized as well with each other's schedules as they had been at the beginning of the mission. Little things like this start to really break down the group cohesion, the ability of a team to respond to dangers, to the important parts of the mission. So researchers say we really need to find a way to keep crew members more active, you know, whether it's changing the lighting in the ship or doing something else that will really sort of keep them at the top of their game throughout the entire mission.

Interviewer – Kerry Klein

Okay. And up next, what carrion flies can tell us about biodiversity.

Interviewee – David Grimm

These are flies that go after dead bodies. The researchers in this study looked at a couple of different flies. One was called the blowfly, and the other one very sumptuously called the flesh fly. And the whole point of this study is how do you track the biodiversity of a forest. That's actually a very difficult thing to do. If you can imagine, forests are full of just lush vegetation, hidden places. When an animal dies, it's very hard to find it. And researchers, you know, will spend years going through a landscape and really just scratching the surface of the number of species that live there, the kind of species that live there. And this study is really all about can we get these flies to do the work for us.

Interviewer – Kerry Klein

Tell me how that would work.

Interviewee – David Grimm

Well how it works is these flies actually feed on dead animals. Anybody who has seen a dead animal in the street knows they tend to attract flies. Well the animals in these forests – and the specific forests that the researchers looked at were actually forests in the Ivory Coast in Madagascar. And the researchers said, "Well, look. There's animals dying left and right that we're not seeing. But we know the flies are going after them. What if we just captured the flies, took the DNA out of the flies to figure out what these

flies have been eating, and use that DNA to figure out which sort of animals are out there in the forest.”

Interviewer – Kerry Klein

So how did this work?

Interviewee – David Grimm

Well, it actually worked pretty well. The researchers in this study, they trapped 115 flies at random in these two forests, and they found that 40% of the flies contained identifiable DNA fragments from a total of 20 mammal taxa and two bird species and an amphibian. And in fact in one of the forests, the catch represented 13% of the documented mammal community. Now that may not sound like a lot, but it just means that just based on this one, sort of, simple experiment, the researchers were able to account for 13% of the kinds of animals that were out there, which is actually pretty impressive. And what the researchers say, which is also kind of cool, is that this technique that it actually even helped them find animals that they weren't even aware of. They all of a sudden find DNA that matches an animal that they didn't even know existed. All of a sudden, these flies are helping us find potentially new species out there.

Interviewer – Kerry Klein

Right. So it sounds like a really valuable tool.

Interviewee – David Grimm

Exactly.

Interviewer – Kerry Klein

But it also totally makes sense. So has this technique ever been tried before?

Interviewee – David Grimm

Well, researchers have actually shown something similar with leeches. They found that leeches, because they suck blood, also contain the DNA of a variety of species, although they feast on far fewer species than the carrion flies do. But what's kind of interesting is you can imagine that the biologist would sort of have this toolbox that they could use. They could have the flies for something, the leeches for something, and maybe another, maybe bats or, you know, another animal that feasts on other animals for something else. And by combining all these different animals, they actually basically have this virtual search party that goes out into the forest for them. All they have to do is capture these animals and take their DNA and figure out what's living out there.

Interviewer – Kerry Klein

How cool. And I love it when researchers investigate the science behind everyday occurrences. And this last story takes a look at the puckered skin that we get after a long bath.

Interviewee – David Grimm

Right. One of the downsides of taking a long bath is your fingers start to look pretty gross and wrinkly. For a long time, scientists thought that this was caused by osmosis. The idea was that the water from the tub was actually getting into the cells of your skin causing your skin to sort of deform a little bit. But actually, it turns out that it has nothing to do with osmosis. It actually has everything to do with your nervous system. There's something about the nerves that trigger the constriction of blood vessels beneath the skin, which reduces the volume of the tissues, which actually gives you that wrinkled appearance. In fact, people that have had the tips of their fingers cut off and reattached often can't form wrinkles on their fingers anymore, which is really weird. But we already knew all that. We knew that the nervous system was involved, but what we didn't know was what's the purpose of wrinkles? Do they actually have a purpose? Why do they form in the first place? And that sort of what this new study is all about.

Interviewer – Kerry Klein

So I imagine the experimental part of this research could be really fun. Did everyone just sit around in a tub?

Interviewee – David Grimm

No, not exactly. Unfortunately, the volunteers in this study didn't sit in a tub. They soaked their hands for about 30 minutes in water, and then the researchers had them do some manipulation with their hands. They basically had the volunteers pick up 45 submerged objects – things like glass marbles and lead fishing weights – from a bin one at a time with their right hand and passed it through a postage stamp-sized hole in a barrier with their left hand and then dropped them through another hole in a box. And when the subjects did this with wrinkly fingertips underwater, they completed the task about 12% faster than they had when their fingers hadn't been soaked. And what was even more interesting was that when their fingers were wrinkled and they tried this task outside of the water, wrinkly fingertips didn't confer a performance advantage.

Interviewer – Kerry Klein

Wow. So the wrinkles actually helped to grasp things underwater.

Interviewee – David Grimm

Exactly.

Interviewer – Kerry Klein

Why would that be?

Interviewee – David Grimm

Well, that's a great question, and the researchers aren't quite sure. There is a few hypotheses floating around – no pun intended. One is that perhaps the wrinkling gives our fingers more surface area, which allow us to get a better grip on things. Maybe it's just that the water washes away some of the oil on our hands, and that gives our hands more friction, which enables us to pick up objects a little bit better. Nobody's really sure why this works. Nobody's also really sure if this is actually something that was conferred by evolution or if it's just some sort of curious side effect of our nervous

system. You know, did we actually evolve wrinkly fingers to be able to pick up things underwater? It seems unlikely because it doesn't seem like that's an important thing for us, although maybe our ancestors were trying to, you know, grab a lot of fish underwater. Who knows, but all these mysteries remain to be solved.

Interviewer – Kerry Klein

Alright. Well sounds like an experiment I'll have to do at home. So what else have we had on the site this week?

Interviewee – David Grimm

Well, Kerry, for *ScienceNOW*, we've got a story on the science of skipping. This is the actual skipping you do with your feet. Also, a story about restoring hearing in mice with deafness. And for *ScienceInsider*, our policy blog, we've got a story about the future of science in India. Also, a story about the author of a blog that has been accusing various scientists of fraud. This author has finally revealed himself. You can figure out who that is on the site. And finally for *ScienceLive*, our weekly chat on the hottest topics in science, this week's *ScienceLive* is about conflicts of interest in science. What pitfalls do researchers face when they interact with industry? And next week's *ScienceLive* is about greenhouse gas emissions. What would it take to phase out these emissions and potentially put a clamp on climate change? So you can check out all these stories on the site.

Interviewer – Kerry Klein

Great. 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 new.sciencemag.org including daily stories from *ScienceNOW* and science policy from *ScienceInsider*. While you're there, be sure to check out *ScienceLive*, a live chat on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.