



## Science Magazine Podcast Transcript, 1 February 2013

[http://podcasts.aaas.org/science\\_news/SciencePodcast\\_130201\\_ScienceNOW.mp3](http://podcasts.aaas.org/science_news/SciencePodcast_130201_ScienceNOW.mp3)

### **Promo**

The following is an excerpt from the *Science* Podcast. To hear the whole show, visit [www.sciencemag.org](http://www.sciencemag.org) and click on “*Science* Podcast.”

### **Music**

#### **Interviewer – Sarah Crespi**

Finally today, David Grimm, online news editor for *Science*, is here to give us a rundown of some of the stories from our daily news site. So first up, Dave, we have my favorite of the bunch, which is new insight into how pigeons navigate.

#### **Interviewee – David Grimm**

Right. Well Sarah, you know, we know actually a lot about how birds navigate. We know that they use a variety of senses – sight, smell. Birds even seem to have an internal compass that helps them align with Earth’s magnetic fields. Now this new paper suggests that birds actually have an additional sense where they can sense something called infrasound.

#### **Interviewer – Sarah Crespi**

So what’s infrasound? Is it like infrared?

#### **Interviewee – David Grimm**

Kind of because the type of sound that actually is mostly outside of our hearing range is like, sort of, infrared is outside of our visual range. It’s very low level background noise in our atmosphere. Here’s an example. Here’s a clip of an earthquake. And mostly what you’re going to be hearing is earthquake sounds, but there’s actually a bit of infrasound mixed in there that’s within the range that we can actually hear. [earthquake clip]

#### **Interviewer – Sarah Crespi**

Okay, that give me the creeps.

#### **Interviewee – David Grimm**

Yes, and actually what they say about infrasound is it actually does give a lot of people the creeps and actually gives a lot of animals the creeps too, so be careful about playing this podcast near any pets.

#### **Interviewer – Sarah Crespi**

Do pigeons actually hear in the infrasound range?

#### **Interviewee – David Grimm**

That was the question that motivated this study and actually came about because a researcher was intrigued by the unexplained loss of almost 60,000 pigeons during a race from France to England.

**Interviewer – Sarah Crespi**

That's a pigeon race?

**Interviewee – David Grimm**

That's – I think it's a pigeon race. What was so interesting about the race was that the birds that became lost were on the same flight path as the Concorde, which had been flying at the time. And the Concorde actually laid down a sonic boom carpet, which masked the infrasound that the birds rely on, or at least what this researcher suspected the birds relied on. And that's why he believes they got lost, although he didn't have any proof beyond just that anecdotal observation.

**Interviewer – Sarah Crespi**

So, did he use the Concorde for his testing?

**Interviewee – David Grimm**

He didn't. He went to a few sites in upstate New York, and he modeled the infrasound of signatures that were generated around three sites where homing pigeons are released just to, sort of, get a sense of what, sort of, the background of infrasound is. And then he compared the flight data from the pigeons released to some sound wave diagrams that he had made of the infrasound. And what he found when he did a bunch of computer modeling was that the pigeons were orienting with the sound map, which suggested they were actually using infrasound as a way to navigate.

**Interviewer – Sarah Crespi**

Well, is this something that can be applied further? Will infrasound maps be useful to people?

**Interviewee – David Grimm**

Well, not sure about people, but what the scientists say is it may not just be pigeons that can hear infrasound. It may be other animals. We know dolphins, for example, use echolocation to find their way around and to find objects. Perhaps them, and other marine mammals because infrasound is something that's very present under water. Maybe they use infrasound as well, to navigate in addition to the other senses they use too. So it's something that's going to require a bit more investigation.

**Interviewer – Sarah Crespi**

Great. So next up, we have a story of the microbiome, again, making headlines. This time, we're talking about populations of bacteria in the sky.

**Interviewee – David Grimm**

Yes, this is one of my favorite stories, speaking of our favorite stories. This is definitely pretty wacky, and what this has to do with is researchers are saying that billions of bacteria and other microorganisms may actually be living up in the atmosphere.

**Interviewer – Sarah Crespi**

Wow, okay. So why would they do that?

**Interviewee – David Grimm**

Well, we already know that each year, hundreds of millions of metric tons of dust and water and other human pollutants make their way into the atmosphere. The winds and the pressure just has a way of, sort of, creating this escalator, if you will, that just lifts a lot of stuff from Earth's surface up into the atmosphere. So it's, in a sense, it's not a surprise that we would find microbes up there as well, and indeed, when researchers took part in nine NASA airplane flights that were aimed at studying hurricanes, the researchers actually grabbed some air samples as well. And what they found was that there were thousands and thousands of airborne microorganisms floating in the troposphere, which is about 10 kilometers above Earth. And they were specifically looking over the Caribbean.

**Interviewer – Sarah Crespi**

So that's what's new here is that there's more variety and more bacteria than expected?

**Interviewee – David Grimm**

Well, first of all, they are confirming that these microorganisms are actually up there, and there is a lot of that variety. And what was actually the most surprising was that 60% of these microbes were still alive, so they weren't just, sort of, microbe detritus that was sort of wafted up into the atmosphere. These guys were actually alive 10 kilometers above Earth's surface. And what was the most interesting was that the researchers kept on finding a lot of the same bacteria, a lot of the same types of bacteria, in their samples. And that suggested there may be types of bacteria that actually evolved to live in the sky. In fact, some of them seemed to feed on oxalic acid, which is one of the most abundant chemical compounds in the sky. So one of the suggestions was maybe there's even this ecosystem in the sky where you've got these bacteria up there, they are floating up there, they are feeding up there, they are maybe even reproducing up there. You can imagine that this whole, sort of, world happening up in the clouds that we were previously unaware of.

**Interviewer – Sarah Crespi**

So do they actually have anything to do with us, though? Are they making us sick? Are they, you know, are they just, you know, transplanting from continent to continent?

**Interviewee – David Grimm**

First of all, this idea has a lot of skepticism. Some researchers say researchers just happened to find them while they've been lifted up in the air. They actually aren't spending a lot of time up there. And what they are really doing is just, sort of, moving from place to place. So they are either getting lifted up into the troposphere, they are landing, maybe, on another continent, and then they are landing back on the ground and

doing whatever they do down there. And the air is just, sort of, a transport for them; it's not actually a destination.

**Interviewer – Sarah Crespi**

That would be really hard to test.

**Interviewee – David Grimm**

One would think. And one thing they actually might be doing, as amazing as it sounds, is actually seeding clouds up there. These microbes are about the right size and texture to cause water vapor to condense or even form ice around them, which would mean that these things aren't just living in the clouds. They may actually be making the clouds themselves.

**Interviewer – Sarah Crespi**

Yes, this one might actually be my favorite.

**Interviewee – David Grimm**

I'm glad I could convince you.

**Interviewer – Sarah Crespi**

So last up, we have another adaptation story. In this case, adapting to the severe weather of Siberia.

**Interviewee – David Grimm**

Well, Sarah, Siberia is probably not a place you'd want to hang out in it for a long time. Only about 0.5% of the world's population lives in Siberia, and that's with good reason. In January, the temperatures average -25°C.

**Interviewer – Sarah Crespi**

That's cold.

**Interviewee – David Grimm**

But people live there, and this new study is trying to figure out, how have humans adapted to live in these very, very cold climates.

**Interviewer – Sarah Crespi**

As you say, a really tiny portion of the planet actually lives in Siberia. Well, who do they get to participate in their study?

**Interviewee – David Grimm**

Well, there are a lot of native people that actually live there. These people, a lot of them, can trace their ancestry back up to 25,000 years ago, so these are populations that have been in this area for a long, long time. And that means that their DNA, hypothetically, has a chance to evolve over time to make them more adaptable to this very cold climate. What this new study is trying to show is can scientists sort of see evolution in action?

Can they see changes in the genes of these people that would suggest that they really have adapted over these thousands of years to this very frigid region of Earth?

**Interviewer – Sarah Crespi**

So what kind of adaptations did they find?

**Interviewee – David Grimm**

Well, they found mutations in three genes. One was a gene called *UCP1* which is previously been shown to help the body's fat stores directly produce heat rather than producing chemical energy for muscle movements or brain functions. It sort of sidesteps those processes and goes straight to generating heat, which if you can imagine, is very important if you're freezing to death. And they found a couple other mutations in genes called *ENPP7* and *PRKG1*. And *PRKG1* is involved in the contraction of smooth muscle, which is key to shivering, the constriction of blood vessels, which helps us avoid heat loss. The other gene, *ENPP7* is implicated in the metabolism fats, especially those in meat and dairy products. And that's interesting because a lot of the people that live in this area have diets that are very rich in fat. So this gene might really help them digest that food.

**Interviewer – Sarah Crespi**

So were all of these genes found in all these populations?

**Interviewee – David Grimm**

Some of the differences were more prevalent in certain populations versus other populations.

**Interviewer – Sarah Crespi**

Another group that might actually share these mutations are Neandertals and Denisovans.

**Interviewee – David Grimm**

And even actually Native Americans because all these groups lived in, what is today, Siberia at one time, which suggests that they actually may also have indications in their DNA that showed that they, like the native people that live there today, evolved to live in this very harsh climate.

**Interviewer – Sarah Crespi**

Wow. So what else is on the site this week, Dave?

**Interviewee – David Grimm**

Well, Sarah, for *ScienceNOW*, we've got a story about whether humans are built to be lazy, speaking of evolution in action. Also, a story about how fish think. For *ScienceInsider*, we've got an item about a U.S. team that has retrieved samples from a buried lake in Antarctica. Also, a story about the fate of America's last atom smasher. And finally, for *ScienceLive*, our weekly chat on the hottest topics in science, this week's *ScienceLive* is about the science of gun violence. What are we learning about the impact of guns on society and the role of scientific research in learning more about guns and gun

violence in the United States and elsewhere? So be sure to check out all these stories on the site.

**Interviewer – Sarah Crespi**

Thanks, Dave. David Grimm is the editor for *Science*'s online daily news site. You can check out the latest news and the policy blog, *ScienceInsider*, at [new.sciencemag.org](http://new.sciencemag.org) where you can also join a live chat, *ScienceLive*, on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.