Science Magazine Podcast
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Promo
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Music

Interviewer – Sarah Crespi
Finally today, we have David Grimm, online news editor for *Science*. He's here to give us a rundown of some of the stories from our daily news site. So Dave, first up we have something that I thought would be easy – detecting unconsciousness.

Interviewee – David Grimm
Easy and would give us a bit of piece of mind, especially for those of us who've had surgery, and one of the nightmares is you will somehow wake up during surgery but still sort of be under, so you'll experience, perhaps, the terror and the pain of surgery without being able to do anything about it. And believe it or not, about one in a thousand patients actually remembers something from their surgery, even though they are suppose to be completely under anesthesia the entire time.

Interviewer – Sarah Crespi
So right now we test blood pressure and pulse. What other steps could we be doing to prevent that from happening?

Interviewee – David Grimm
Well, researchers have a couple of things they rely on. One is something called the BIS index, which is short for the bispectral index. And this is readings from a single electrode connected to a device that calculates a number, which is suppose to give a sense of the patient's brain activity, but that hasn't proved terribly reliable. There's some other methods too, but none of them are 100% foolproof at really predicting when somebody's starting to come out of anesthesia or when at least they're starting to become conscience during surgery.

Interviewer – Sarah Crespi
So this new result is giving us some insight into that. Could you, kind of, go through their experimental setup?

Interviewee – David Grimm
Yes, what the researchers are looking for here is they are trying to figure out if they can come up with a much more foolproof signature of when somebody was going to come out of anesthesia or become conscious. And what they did was they worked with three epilepsy patients who'd had electrodes implanted in their brains in preparation for surgery, and they gave the patients an injection of the anesthetic propofol. And they

asked the patients to press a button whenever they heard a tone, and they were recording the activity of their neurons during this whole time. And doing this, they were able to follow a group of neurons that emitted a characteristic slow oscillation, which is a kind of ripple in the cell's electrical field. So they said, maybe this is a good signature of whether a patient is conscious. The next step that the researchers did was they actually recruited 10 healthy volunteers to actually go under anesthesia, and they used propofol again, but this time, they administered the anesthetic really gradually. Usually, you fall asleep in just a matter of seconds but this time, it took about an hour for the volunteers to completely go under. And again, they had the volunteers press a button about every four seconds in response to clicks or words, including their names, just to see, like, are they responding to stimuli in the environment, are they somehow conscious? This time, they used EEG readings so they wouldn't have to actually get electrodes into the brains. This could be taken, sort of, on the scalp. They were sensing very similar activity to what they saw with the epilepsy patients. They saw certain signals that were associated with relaxation, with drowsiness, with increase in consciousness, with loss of consciousness. And so what they think they are developing here is a more accurate warning system that will actually give anesthesiologists a much better sense of whether somebody's starting to come out of anesthesia.

Interviewer – Sarah Crespi
But is this ready for the OR?

Interviewee – David Grimm
Not yet. The main thing is they really haven't done this comprehensively in surgical patients, so they really haven't shown yet whether this will actually be a useful signal in real surgeries, and that's going to require more work.

Interviewer – Sarah Crespi
Great. So next up, we have giant camels that once roamed the Arctic.

Interviewee – David Grimm
Yes, it's a pretty interesting visual there. We don't really think of camels as living that far north or living in such cold climates. The camels of today tend to be in northern Africa and the interior of Asia, but about 3.5 million years ago, camels appeared to have lived in much more northerly latitudes in places that were much colder than the places they live today.

Interviewer – Sarah Crespi
And so what's the evidence for the existence of these guys way up north?

Interviewee – David Grimm
Well, the evidence comes from some fossils that were recovered from Canada's Ellesmere Island, which is just west of northern Greenland. The fossils were discovered in sediment that was laid down about three-and-a-half million years ago. And what the researchers found was basically fragments of a lower leg bone, and they are not exactly sure what animal this came from, at least by looking at the bone itself, but by analyzing

proteins in the bone that were still preserved in the bone, they found that the creature was most closely related to today's dromedary camel. That's the camel that just has one hump. But this wasn't really very similar to that camel. For one thing, it was a lot bigger. This camel probably stood about 2.7 meters tall and it was almost 30% larger overall than today's relative.

Interviewer – Sarah Crespi
That's a really big camel.

Interviewee – David Grimm
It's a big camel. It's about the size of a moose, and it probably also had much, sort of, shaggier fur than today's camels, because even though the Arctic regions three-and-a-half million years ago were much warmer than they are today, average temperature was only about -1.4°C so it's barely below freezing – not the most comfy of environments – but still about 18°C warmer than that region is today.

Interviewer – Sarah Crespi
Is that where they think the camel originated from, or was it just passing through on its way to Asia?

Interviewee – David Grimm
Well, they think the camel may have actually spent a fair amount of time there. It wasn't just camels. Some other fossils that the researchers discovered not too far away suggest that this landscape these camels lived in was actually an open forest, punctuated peatlands, and it may have even been inhabited by bears, rabbits, beavers, and a pony-sized, three-toed horse. So this wasn't just, sort of, like a random camel found in a random place. This was a place where a lot of other mammals were living. And there's some evidence from the teeth of this camel that it was possibly in the process of evolving into something similar to the camels that we see with us today, so an important location and also an important time point for this group of animals.

Interviewer – Sarah Crespi
Wow. So last up, we have how volcanoes contribute to modifying global temperatures.

Interviewee – David Grimm
Right. Well, you know, we don't think of volcanoes as really cooling the world, but actually they can because volcanoes belch a lot of particles into the atmosphere. And these particles block sunlight and actually helps cool the planet a bit. We don't talk a lot about the planet cooling these days because the Earth is warming, but the interesting thing is it's not warming as much as it theoretically should be. For example, between 2000 and 2010, the atmosphere concentration of carbon dioxide, which was one of the major greenhouse gases, rose more than 5%. And if that was the only factor driving climate change, global average temperatures would have risen by about 0.2°C over the last decade. But that's not what happened. So scientists say the reason must be that a lot of these aerosols are getting into the atmosphere. That's helping to block sunlight; that's reducing how fast the world is warming.

Interviewer – Sarah Crespi
So there's an imposing force in this case in the form of aerosols, but how do they target volcanoes as the potential source for that?

Interviewee – David Grimm
Right. And actually, a lot of people didn't think it was volcanoes. A lot of scientists thought it was actually pollution from Asian smokestacks. During this period, 2000 to 2010, there was a big ramp up in pollution, not only from Asia but also from India, and so they said, "Well, it must be this source." But when the researchers ran a computer model, they found that it didn't seem like these Asian or Indian sources – pollution sources – were really contributing at all to the cooling. In fact, the best signature was really coming from volcanoes.

Interviewer – Sarah Crespi
Now that they've targeted volcanoes, how do they seal the deal? How do they figure out that that actually was the source?

Interviewee – David Grimm
Well, they ran these simulations, and they estimated the effects of all the known volcanic eruptions that occurred during this period. And what they found was really that the variations, the timing of what they were seeing in the simulations, really matched up very well with volcanoes and not with these particles coming out of smokestacks in Asia and India.

Interviewer – Sarah Crespi
Okay. What else has been on the site this week, Dave?

Interviewee – David Grimm
Well, Sarah, for *Science*NOW, we've got a neuroscience story about how we focus in on a particular conversation at a crowded party. It's called the cocktail party problem. Also, a story about transplanting human brain cells into mice and how that makes mice smarter. A couple of interesting stories from *Science*Insider, our policy blog, one about the continuing impacts of the sequester in the U.S. in scientific research. We're calling it the sciquester, and we still have a page up where if you have tales from your own research about how the sciquester is impacting your life, you can share your thoughts. Also, use the sciquester hash tag on twitter. We will pick that up. Also, a story about the state of science in India and where it's going in the next few years. For *Science*Live, our weekly chat on the hottest topics in science, this week's *Science*Live is about open access publishing. How does that stand to change academic publishing in the near future? And next week's *Science*Live is titled *Arts and Smarts – The Intersection Between Culture and Science*. So be sure to check out all these stories on the site.

Interviewer – Sarah Crespi
Sounds great. Alright, thanks so much, Dave.

Interviewee – David Grimm
Thanks, Sarah.

Interviewer – Sarah Crespi
David Grimm is the editor for *Science*'s online daily news site. You can check out the latest news and the policy blog, *Science*Insider, at news.sciencemag.org where you can also join a live chat, *Science*Live, on the hottest science topics every Thursday at 3 p.m., U.S. Eastern time.