



Science Magazine Podcast Transcript, 3 October 2008 show

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Music

Host -- Robert Frederick

Hello and welcome to the *Science* Podcast for October 3rd, 2008. I'm Robert Frederick. This week: how losing control increases peoples' false perceptions; the debate over distributing high-calorie, high-nutrition foods to relieve widespread malnutrition; and understanding the trans-Atlantic movements of the bluefin tuna. All this, plus our usual roundup of stories from our free, online daily news site, *ScienceNOW*.

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Host -- Robert Frederick

Why do people form superstitions, create conspiracy theories, and see patterns where none exist? In a paper in this week's *Science*, Jennifer Whitson and Adam Galinsky suggest that the answer may be because people are in situations where they do not have control. In a series of experiments, the team found that when participants lacked control they perceived more illusory patterns, such as seeing images in a random set of dots. I spoke with Whitson from her office at the University of Texas in Austin.

Interviewee - Jennifer Whitson

When we lack control we're going to see and seek out patterns, sometimes even false patterns, in order to regain our sense of control, and that these patterns appear in a number of different forms. And, I think one of the most exciting things this paper does is shows that a lot of different things that were previously studied in isolation, things like seeing images in static, or people perceiving trends in the stock market that did not exist, or people making superstitious connections, or seeing vast worldwide conspiracies where there were none – all of these, in the end, are people who are seeing a coherent relationship among a set of random or unrelated stimuli. And that, this research reveals that underneath, the same visceral need for control is affecting all of these things.

Interviewer - Robert Frederick

So, you and your co-author were investigating whether there is a broader phenomenon that connects not having control in a situation with an increase in pattern recognition?

Interviewee - Jennifer Whitson

Definitely. Yeah, my co-author, Adam Galinsky, at Northwestern, and I noticed there were a number of interesting examples of correlational research out there that showed things like baseball players were superstitious, everyone knows sort of the classic superstitious baseball player with their lucky t-shirt, and need, you know, the particular thing they have to do before they step up onto the plate. But, they discovered that actually the superstitions were only around positions that were more capricious, that were more vulnerable to chance. So, you saw, you know, pitchers and batters being very superstitious. But, you didn't see outfielders being that superstitious, because playing the outfield was pretty predictable, you had a lot more control over it, or as much control as you can have, anyway. And, we saw, you know, in this research and many others, that there seemed to be a correlation between this lack of control and this pattern perception. And, what we wanted to see is if there was actually a causal connection between them all.

Interviewer - Robert Frederick

How, in your experiments, do you place a person in an out-of-control context?

Interviewee - Jennifer Whitson

So, we manipulated control in a number of different ways. One way we did was to directly manipulate it. We had participants complete a task in which we either said, you know, "Complete this task to the best of your ability, we are not going to give you feedback as you do it, we just want to see what your instinctive responses are." And so, they felt, you know, pretty in control of things – all they had to do was say what they thought. And, the other half of the participants, we gave them randomized feedback, throughout the task, in which sometimes they were told that the information they'd given us was correct, and sometimes they were told it was incorrect – there was no correlation with the, you know, the actual correctness of the information that they had given us. And so, they felt a lack of control – no matter how hard they tried, they couldn't get a consistent correct response from the computer.

Interviewer - Robert Frederick

So, in these experiments then, what's an example where people, who were not in control, perceived patterns where there weren't any?

Interviewee - Jennifer Whitson

Well, one of the strengths of the research is that there's a number of different examples. But, one of the ones that was most striking to me was that we literally presented them with images in which there was no picture – it was just noise. And, participants who lacked control were significantly more likely to see images in the noise, whether it was, you know, circles or horses or trees or what have you. Even though it was completely randomized, it was just dots on a piece of paper, as if you were seeing static on a television screen, people said they saw something there when they lacked control.

Interviewer - Robert Frederick

Did you measure if people felt more control if they perceived a pattern, even when there wasn't one?

Interviewee - Jennifer Whitson

We haven't actually measured whether the perception of patterns increases the sense of control. What we did was we manipulated lack of control and showed that the need for structure increased. And one of the ways, of course, you can structure the world around you is to see patterns. And then, we also, by alleviating the need for control through self-affirmation, we showed that it eliminated the perception of these patterns.

Interviewer - Robert Frederick

Is this a way to improve people's ability to perceive patterns, or are people only going to be seeing patterns in these lack of control situations where there aren't any to be found?

Interviewee - Jennifer Whitson

Well, the research doesn't speak directly to that. I plan on, in the future, looking to see if people in lack-of-control situations are more likely to accurately perceive patterns, or if they're just more likely to see false patterns. Right now it does show that basically if you're feeling like you lack control, if you're in a situation where there's a lot of complexity, or it's just chaos, there really isn't any pattern to what's going on, then you're much more likely to see something that isn't there. Now, sometimes that can be useful – sometimes if the choice is just giving up and not engaging the situation, or perceiving something that isn't there and then engaging the situation, at least you're acting. And, I think that's part of the benefit that therapy can sometimes offer – is that if there's people who are incredibly emotionally distressed, you know, I mean in my own experience, when I've talked to people, you know, just friends or acquaintances who are having troubles, one of the strongest things that come through – people just say, "This is crazy, you know, I can't understand why this is happening." And so, sometimes just providing people a rationale, a structure to what's going on, gives them enough agency to engage with their environment and act to change things, or act to improve their situation, whereas otherwise they would just sit, you know, helpless and frustrated.

Interviewer - Robert Frederick

Is there some particular example where this might apply in a broader social context?

Interviewee - Jennifer Whitson

Well, one of the studies that we have in the paper actually has implications for how people process stock market information. And, what we found is that when people feel like there's a lack of control, or they're in a more volatile situation, they're more likely to form strong conclusions, even though there's no pattern between the data they see and the companies they evaluate. So we gave participants the same ratio of positive to negative information about different companies, yet those who lacked control were likely to make strong conclusions about which to invest in, when they were not warranted.

Interviewer - Robert Frederick

Jennifer Whitson, thank you very much.

Interviewee - Jennifer Whitson

Thank you so much.

Host -- Robert Frederick

Jennifer Whitson is lead author of a paper on how lacking control increases illusory pattern perception. Read the paper in this week's *Science*.

Music

Host -- Robert Frederick

Malnutrition affects some 20 million children in Africa and South Asia each year. And in the last few years, nutrition experts have introduced new therapeutic foods to treat malnutrition, and they appear to be much more successful than past treatments. But there's a growing debate over the use of these foods to keep kids from becoming malnourished in the first place. In this week's *Science*, contributing correspondent Martin Enserink writes about that debate and one group's effort to distribute these therapeutic foods to as many as 80,000 at-risk children in Niger. I spoke with Enserink from France after his return from western Africa.

Interviewee - Martin Enserink

Well, this story is about really the revolution in the way that malnutrition is treated, using basically sort of a peanut butter-like product – it really looks a lot like peanut butter, except it's a little sweeter, and it is roasted crushed peanuts with oil in it, a lot of sugar, and milk powder, and a lot of vitamins and minerals. The past couple of years this product has really taken off – many people who work in malnutrition, in developing countries, now say it's really an amazing way to help malnourished children. But, there is still a debate about it, and that's, in particular, the question is, "If it works so well in treatments, shouldn't you also use it to prevent malnutrition – shouldn't you be earlier, shouldn't you give these kids that are at risk of malnutrition, or just maybe slightly malnourished, should you give them the product as well?" And there's a whole scientific debate, there's a lot of scientific questions around that. And, it's also in part the question of, "Should you make malnutrition a medical problem, or is it also a socioeconomic problem? Is it something that has more to do with the way wealth is distributed or the economic development of a country?"

Interviewer - Robert Frederick

Is there good evidence that shows that these kinds of high-calorie, high-nutrition products work well in preventing malnutrition, not just treating it?

Interviewee - Martin Enserink

There isn't really. There are just a few studies. When it comes to treating, you know, most experts will agree that they've done a couple of trials and yes, this is really much better than what we had before. But, part of the secret there is that mothers can just give this stuff at home. It used to be that most kids were treated for malnutrition in special hospitals – and that was necessary because they used to give a milk, made out of milk powder with water. And that product, you can't really give at home, because it's very perishable. And so, they have to be very tightly controlled and given under medical supervision. But these peanut-based are really just, you know, mothers can take them

home, they're in little silvery bags that the kids can just squeeze and eat from. And, most experts agree that, if you do that, if you give these things at home you can, first of all treat many more children, and the recovery rate, that is, you know, the number of kids that get better, is really much higher than with those previous products, these milk based products. And last year, WHO and UNICEF and several other organizations issued a statement formally recommending that these things be used in the treatment of malnutrition. Now, when it comes to prevention, it's a different story.

Interviewer - Robert Frederick

I suppose it's quite difficult to design a randomized controlled clinical trial investigating the food's effects on mortality.

Interviewee - Martin Enserink

It is, yeah. If you think of it, it's very different from say, a clinical trial in a hospital in the U.S. or in Europe – we're talking about a population that lives mostly in the countryside, in very poor countries, there are all kinds of logistical challenges to deal with. There's also the methodological problems and sometimes ethical problems. For instance, you can't go to a village and say, "We want to give half of the kids this peanut butter, and, but the other half of the kids won't get anything." Because, you know, that would not be accepted, of course. So, I've been traveling to Niger with Doctors Without Borders, who are distributing these products, these peanut butter products, to malnourished children there, in Niger. And, I've accompanied the researchers who do these studies. It is difficult, but it is doable. And they've been doing a study now for several years looking at how well these things do in prevention. And, the other question is, you know, "How much evidence do you really need to do an intervention like this?" I mean, Doctors Without Borders says, "It's quite reasonable to think that if the kids do better on this stuff, if they're already malnourished, why shouldn't you just give it to them before that happens, before they're completely emaciated?" And they do have a point, of course. You can't always have very strong hard data. On the other hand, some people will say, "Well, we'd better know for sure that what we're doing is the best way, we can't just start giving this to millions of kids if we don't have the hard evidence that it's actually effective and a good thing to do." So there's a tension there between the people who just want to act, and the people who want to have strong evidence.

Interviewer - Robert Frederick

Simply adding the high-calorie, high-nutrition foods to the diet of all children has some problems, too, I imagine – cost, things like that?

Interviewee - Martin Enserink

Yes, and the problem of how do you show that that really works aside, there is the issue of cost. I mean these things cost about three euros, say four or five dollars per kilo – and that doesn't sound like a lot, but if you want to give that to hundreds of thousands of children, for instance in a country like Niger where the food shortages are almost chronic, it's a very difficult situation, that does add up, that is a lot of money. And, and so some people are also wondering, you know, "Should we really be doing that, or are there perhaps other ways to fight malnutrition?" People have many other options, the problem

is that none of them have really been a knockout, I mean, there have been other types of food supplements, there have been zinc tablets, vitamin tablets. People have also tried to teach mothers how to feed their children better or to keep breastfeeding for a longer time, to wash their hands to prevent diarrhea. But, none of that has really worked so well. Now people aren't really sure that giving these products on a massive scale is the solution either. Some people also wonder should you make an entire population dependent on these prepackaged foodstuffs, and that is a question that's hard to answer.

Interviewer - Robert Frederick

But right now it seems like the social problems are the ones...

Interviewee - Martin Enserink

Right, right. In fact, in Niger, Doctors Without Borders, which has a very large presence there, you see their white vans driving around everywhere, they have several buildings – they got, sort of, in a diplomatic row, I guess you could say, with the government of Niger. And, they were basically, all their activities were suspended. So, from one day to the next all of these programs, these food distribution programs, were halted. That happened on July the 29th. And, they're still talking with the government, but none of it has resumed. So, this is just another example of how difficult it can be to manage a program like that. More than 80,000 kids are actually not receiving the peanut butter that they'd gotten in the month leading up to this fight.

Interviewer - Robert Frederick

Martin Enserink, thank you very much.

Interviewee - Martin Enserink

You're welcome, nice to be with you.

Host -- Robert Frederick

Science contributing correspondent Martin Enserink on the debate over the widespread distribution of high-calorie high-nutrition foods. Read his article in this week's *Science*.

Music

Host -- Robert Frederick

Atlantic bluefin tuna populations are in steep decline. Regulations have been in place to conserve this important source of seafood now for four decades. And these regulations are based, in part, on the assumption that there are two discrete populations of the bluefin on either side of the Atlantic, and that there is little mixing between them. But in a paper published online by *Science*, Jay Rooker and colleagues report new isotopic evidence from the tuna's otoliths, or ear bones, that suggests far more trans-Atlantic mixing of the populations than previously thought. I spoke with Rooker from just outside Houston, Texas, where he works at Texas A&M University in Galveston.

Interviewee - Jay Rooker

Atlantic bluefin tuna are managed as two discrete populations of spawning areas centered in the Mediterranean Sea and the Gulf of Mexico. And currently, the population structure and connectivity of the Mediterranean and North American population is poorly understood. And, understanding the degree of mixing is critical and actually quite a contentious issue because individuals moving from one management zone to the other, will encounter different rates of fishing mortality or exploitation. To address this issue, we examined the chemistry of a bluefin tuna's otolith, or ear bone, and we found that the chemical composition of this carbonate structure, which is found in the inner ear of a fish, was unique between the two regions, and thus, the chemical signatures, in the otoliths, served as a birth certificate that we could use to determine the origin of bluefin tuna collected from different spawning and foraging areas.

Interviewer - Robert Frederick

How does this bone change over time or location?

Interviewee - Jay Rooker

Each day a new layer of material is added to the otolith - I often say think of layers on an onion. And the chemistry of the water mass, where the bluefin tuna resides, will influence the chemical composition of new material being deposited on the otolith. If we look at surface water, carbon, and oxygen stable isotope ratios, we see that they vary between North American and Mediterranean waters, and this is a function of oceanographic conditions in hydrology. Thus, we expected to pick up differences in the isotope ratios of otoliths, particularly the oxygen isotope ratio, which is higher in the cooler, more saline waters of the Mediterranean, relative to the Gulf of Mexico.

Interviewer - Robert Frederick

So the isotopic composition of the water is pretty consistent, year-to-year, they're just different depending on which region of the Atlantic you're looking at.

Interviewee - Jay Rooker

In terms of stable isotopes they were relatively consistent, and our baseline of age 1 of yearling blue fin tuna, that we used to compare our milled otolith cores to, was based on a data set of six years combined. And, even with those six combined years we were still able to have good success classifying individuals from one region or the other.

Interviewer - Robert Frederick

Is this a unique approach, or have others attempted to capture this same...

Interviewee - Jay Rooker

The approach is quite common in the field of fisheries ecology, using otolith chemistry, and it's gaining, there are more and more programs and labs that are using the approach to look at pelagic fishes. But this is the first study to use the approach to understand connectivity and natal homing of bluefin tuna.

Interviewer - Robert Frederick

How have others attempted to track the movement and distribution of the Atlantic bluefin tuna?

Interviewee - Jay Rooker

There are two other approaches that compliment what we're getting from the otolith chemistry data. One would be archival tagging, or electronic tagging, and the other would be genetics. And findings from both of these approaches support this idea of the two-stock theory, and both actually, specifically electronic tagging data, has shown that there does appear to be greater mixing occurring between the two stocks. But what we're finding here goes well beyond what we currently know from the other two approaches, and provides actual rates of homing and stock composition, on both spawning and several foraging grounds in the Atlantic.

Interviewer - Robert Frederick

Do those differences suggest a different management strategy for helping the Atlantic bluefin tuna population recover?

Interviewee - Jay Rooker

I would say, yes. The recovery of the North American, or what we're referring to here as the Western population, will depend on our ability to protect Western bluefin tuna adults that return to the Gulf of Mexico to spawn. Based on our natal homing rates, it's clear that we cannot expect to be rescued from Mediterranean adults that stray over from the east, to supplement our adult spawning stock biomass in North American waters. The current assessment framework does assume that there's limited mixing, and we feel this must be modified to ensure population mixing is accurately characterized. Clearly, controls must be put in place to reduce adult bluefin tuna in U.S. and Canadian commercial fisheries, and the same actually applies to the Mediterranean population.

Interviewer - Robert Frederick

Jay Rooker, thank you very much.

Interviewee - Jay Rooker

You're welcome.

Host -- Robert Frederick

Jay Rooker is lead author of a paper on understanding the trans-Atlantic movements of bluefin tuna. Read the paper online www.scienceexpress.org.

Music

Host -- Robert Frederick

Finally today, David Grimm, editor of *Science's* free, online daily news site, *ScienceNOW*, joins us to talk about the latest science news. Hi David.

Interviewee - David Grimm

Hey, Rob.

Interviewer - Robert Frederick

So what stories do you have for us today?

Interviewee - David Grimm

Well, Rob, we're going to talk about how to eat a very nasty ant; a planetary collision that happened in our own galactic neighborhood; and finally, how the oceans are getting noisier.

Interviewer - Robert Frederick

Well, let's start with how to eat a very nasty ant. Is this advice for humans eating ants?

Interviewee - David Grimm

No, Rob, this story actually has to do with horned lizards, which subsist on a diet of harvester ants, which are pretty nasty.

Interviewer - Robert Frederick

Why are they nasty?

Interviewee - David Grimm

They have a very venomous sting, and they have powerful mandibles for biting. And, one would think that anything that ate these ants would be in for a lot of trouble, but these lizards live in a very tough environment. They are in an arid region of the American west, and there's just not a whole lot to eat. So, they've kind of gotta eat these ants. And so, they've had to adapt a special way of eating these ants. And, thanks to two teams of researchers, scientists now know how they do it. One team used high speed video to show that the lizards eat these ants in sort of one fell swoop, whereas most lizards sort of chew on ants for a little while, before they swallow them – the tongue of these horned lizards just darts out at these harvester ants, and they swallow their prey in one gulp. That's the first thing that makes these lizards unusual, in how they eat these ants. And the second team cut open some of these lizards' stomachs, and what they found is that the ants inside a stomach were all encased in these nice little round balls of mucous. And on further examination, the researchers noticed that these lizards have a shag carpet type of tissue at the back of their throat that seems to secrete mucous. So the trick seems to be these lizards grab the ants very fast, shove them to the back of their throat, coat them with mucous, and then swallow them whole – it's a very quick process. And by encasing the ants in this mucous, it prevents the ants from doing anything, so they can't be trying to chew their way out of the lizard's stomach because they're trapped, basically. And they're eaten so fast that they really can't do any damage on the way down.

Interviewer - Robert Frederick

Well, from the uniqueness of the horned lizard's eating style to what may turn out to be not so unique in the Milky Way. Tell me about this planetary collision – where did that happen?

Interviewee - David Grimm

Well, Rob, this collision happened in a binary system called BD+20 307, you know, it just rolls off the tongue.

Interviewer - Robert Frederick

So to speak, Dave.

Interviewee - David Grimm

Right. But it's actually not that far away. It's about 300 light years away, in the constellation Aries. And, a few years ago scientists found, in this area, what they thought was one very young star surrounded by a huge cloud of dust. But recently, using more advanced telescopes, they were actually able to see that there were two stars here. And they were actually old stars, about the same age as our Sun, but they were locked in very close orbit, which is why earlier the teams had suspected that there was just one star here.

Interviewer - Robert Frederick

And so the dust cloud was the remnants of some collision of planets?

Interviewee - David Grimm

Right, that's what astronomers think. They think that there was two large bodies, potentially as large as Earth, but at least as large as the moon, that collided and annihilated each other, creating this dust cloud. And, what's even more interesting is astronomers think this happened relatively recently, and that's because if you have a big cloud of dust like this, over time it will either fall into the stars and disappear, or the solar winds will blow it away. And, based on that astronomers think this collision may have happened no more than 100,000 years ago, and potentially even more recently. And, that's interesting because astronomers don't think that these types of collisions happen much anymore. Planetary collisions happened a lot when the universe was very young, because you had a whole bunch of thing flying around and knocking into each other. But, astronomers think things have sort of stabilized over time. So, it's really unusual to see evidence of a big collision like this that happened so recently, at least in relative terms.

Interviewer - Robert Frederick

So, it's something about the binary star system, or a third large body, that came by that made this collision happen?

Interviewee - David Grimm

Right. The idea is that the stars are so close together, and potentially there was something strange about the orbits of the planets around these stars, or the influence the stars was having on their orbits, that caused these orbits to be very unstable, and eventually cause the planets to smack into each other. Or another possibility is, as you said, there may be a third star there that astronomers just haven't spotted yet, which also may have contributed to destabilizing these planetary orbits.

Interviewer - Robert Frederick

Well, from collisions in space to potential collisions under the sea – is that how the ocean is getting noisier, things are bumping into one another more and more?

Interviewee - David Grimm

Not exactly. This story has to do with the oceans becoming more acidic, which causes the things, under the ocean that are making noise, whether it's whale sounds or sonar or things bumping into each other, to travel further and seem noisier. And, the reason this is happening is because as carbon dioxide levels increase in the atmosphere, because of greenhouse gas emissions, some of this carbon dioxide seeps into the ocean, which turns the ocean more acidic. And, that's already a problem for a lot of marine animals because these acidic waters tend to dissolve corals or shells, things like that. But, researchers also know that acidic seawater makes sound travel faster. And they're really not sure why that happens, they think it has something to do with the way water and salt molecules interact with sound waves. And a team of researchers found that this problem is going to get worse over time. What they did was they looked at predictions from the U.N. Intergovernmental Panel on Climate Change, and this is the panel that, over the past couple of years, has predicted what's going to happen, in terms of global warming due to human activity. And, the panel predicts that by 2050 the pH of seawater is going to drop by about 0.3 units. And, as pH drops, water is getting more acidic. And, factoring that into their test, and the researchers did some field studies with actual ocean water and also some studies in the lab, they found that by 2050 some parts of the ocean will relay sound up to 70% farther than they do now, especially areas in the Atlantic Ocean.

Interviewer - Robert Frederick

Well a lot of creatures depend on noise, sonar, things like that, in order to live. How is that going to affect them?

Interviewee - David Grimm

Right. Well, whales and dolphins, for instance, depend on sound for hunting and communication. And, studies have already shown that military sonar can really disrupt whale activity, and potentially even cause them to get the bends. And so, if you can imagine military sonar traveling even farther, then it has the potential to impact even more whales. Also, any creature that uses sound for communication, if they're getting a bunch of other signals and a bunch of other noise in the water that they normally wouldn't get, it's going to disrupt their communication, potentially disrupting their breeding habits, or even their migratory habits. So, there could be a large potential impact on marine animals.

Interviewer - Robert Frederick

Is this just something that the animals are going to have to learn to live with, and we're just going to have to see these changes happen, or is there something that can be done about it?

Interviewee - David Grimm

Yeah, it's a good question, and something the researchers didn't address in this study. So, we'll just have to wait and see.

Interviewer - Robert Frederick

Okay. Well, thanks, Dave.

Interviewee - David Grimm

Thanks, Rob.

Interviewer - Robert Frederick

So, what other stories are you looking into for *ScienceNOW*?

Interviewee - David Grimm

Well, Rob, we're looking into stories about how HIV evolved in Africa; how a fungal battle is going on on the backs of some beetles; and finally, we'll be covering the Ig-Nobel Prizes, which are sort of a funny version of the Nobels. So, be sure to check out the site.

Host -- Robert Frederick

David Grimm is the editor of *ScienceNOW*, the free, online daily news site of *Science*. You can catch up on the latest science news at sciencenow.sciencemag.org.

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Host -- Robert Frederick

And that wraps up the October 3rd, 2008, *Science* Podcast. If you have any comments or suggestions for the show, please write us at sciencepodcast@aaas.org. The show is a production of *Science* Magazine and of AAAS, the Science Society. The content is provided by the news and editorial staff of *Science*, and Jeffrey Cook composed the music. I'm Robert Frederick. On behalf of *Science* Magazine and its publisher, the American Association for the Advancement of Science, thanks for joining us.

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