



Science Magazine Podcast Transcript, 17 April 2009 show

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Music

Host – Robert Frederick

Hello and welcome to the *Science* Magazine Podcast for April 17th, 2009. I'm Robert Frederick. This week: improving minority student performance through a psychological intervention and using lasers to start a nuclear fusion reaction. All this and more, plus a wrap-up of some of the latest science news—including a story about why domesticated apple trees aren't as vibrant as their wild cousins—from our online daily news site, *ScienceNOW*.

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Host – Robert Frederick

Imagine all the stress of being in school. Now, suppose you're in a minority group—you may already be—that's commonly stereotyped as not doing very well in school. Okay, so it's time for a test. If you don't perform well, not only are you letting yourself down, but your poor performance reinforces that negative stereotype. Stressful, isn't it? Previous research has already shown that stress can undermine performance, and even more so in situations in which a negative stereotype is at play. But about three years ago, Geoffrey Cohen and colleagues reported that a small, simple psychological intervention could significantly improve minority students' performance in these circumstances. In a paper in this week's *Science*, Cohen and colleagues now report in follow-up study that the intervention has a lasting benefit. I spoke with Cohen from his office at the University of Colorado, Boulder.

Interviewee – Geoffrey Cohen

As we all know, too much stress can undermine performance, such as when we “choke under pressure.” And according to the stereotype threat logic, when one is under this burden of psychological threat it creates a double burden – now, in addition to all the normal stressors that I face when I'm in school and taking a, say, high-stakes evaluative test – I have to worry, I have this added, additional concern, that if I do poorly it could validate this stereotype that's out there about me or my group. And my colleagues and I were interested in whether or not we could intervene in a targeted way to reduce this psychological apprehension. And so, what we did – Julio Garcia, Valerie Purdie-Vaughns, Nancy Apfel, Patty Brzustoski, and I – we went into the schools, and we gave

children a stress-reducing intervention called a self-affirmation. And in previous research this has been found to reduce stress. It's also been associated with health benefits. And we were bringing the same sorts of ideas to an education setting where the idea was that if people are provided with an opportunity to reflect on some self-defining values – something that's important to them – it could reduce their stress and improve their performance, especially, if they're operating under conditions in which they are at a high – relatively high level of stress to begin with, as we thought ethnic minorities would probably be because of this stereotype threat process.

Interviewer – Robert Frederick

I'm going to play an excerpt now from the podcast from September 1st, 2006, in which you described the experiment to *Science's* online editor, Stewart Wills.

Interviewee – Geoffrey Cohen

What we did was we conducted two randomized double blind field experiments – the second one was just a replication – at a suburban middle northeastern public school. And we had seventh-grade teachers give their kids a stress-reducing exercise, and we called this exercise a self-affirmation. Kids with this exercise get to affirm their identity – what's important to them.

Interviewer – Stewart Wills

And this is a written exercise?

Interviewee – Geoffrey Cohen

Yeah, it's a written exercise – kids complete it at their desk in silence. They get the exercise in a packet, which they take out and then complete via a self-explanatory instructions in the packet. And in the treatment condition the kids are presented with a list of values on the page in the packet, and they're asked to pick the value that's most important to them. For example: relationships with friends and family, creativity, their interest in music and sports. And then, the kids write a paragraph about why that value is important to them. And this exercise essentially gives kids the chance to say, "This is what I believe in, and this is what makes me a good person." It takes the sting out of potential failure, so I feel like 'Even if I do poorly here on this test, or in school, I'm still fundamentally a good person' – it sort of anchors my sense of self-integrity – not as concerned with the specific outcome of a performance test. And our control kids, kids in the control condition, just wrote about a value that was unimportant to them.

Interviewer – Robert Frederick

So, that was from the September 1st, 2006 podcast, and there were benefits then for African American student achievement. Now, a few years later, how are the students doing compared to those in the control group?

Interviewee – Geoffrey Cohen

The intervention showed benefits or the effects persisted for at least two years. What we did was to follow the children in terms of their academic records from the beginning of seventh grade through their tenure through middle school to the end of eighth grade. And

we found that the benefits persisted across that time. And they were particularly apparent, primarily apparent, among low-achieving African American students – that is, students who were identified prior to having received the intervention as being relatively low in their academic performance. For these children, there was almost an increase of roughly half a grade point – about 0.4 grade points – in their overall GPA across two years – GPA, grade point average. And, this is something that was as apparent at the end of two years as it was apparent at the commencement of the intervention – this benefit. In addition, we also found that intervention-treated or affirmation-treated African Americans were significantly less likely to be enrolled in remediation, that is, assigned by their school to a remedial program, or held back in grade. So, there is evidence that the treatment benefits that were apparent in the first term of seventh grade, which we had reported initially, that those benefits persist over time.

Interviewer – Robert Frederick

How did the intervention affect high-achieving African American students or students who were not African American? Did it have any significant impact for them?

Interviewee – Geoffrey Cohen

We found no effect for European American students. There weren't in this school population sufficient number of Asian or Latino Americans to really do the analysis. But if you look at African American students the effects are primarily among low-achieving African American students. Among high-achieving African American students there is evidence of early benefit as their GPA benefits in the short term. But across the two years that effect was only marginal, and it seemed to be much weaker than the effect found for low-achieving African Americans. We found no effect of the intervention for European Americans, and we were open to the possibility that European Americans, perhaps low-achieving European Americans, might show some benefit, but we didn't find that.

Interviewer – Robert Frederick

And all of this change was just because of one 15-minute assignment given a few times during the seventh grade year?

Interviewee – Geoffrey Cohen

No, it was roughly three to five interventions given across the seventh grade, and so in addition to that first intervention – or the first one or two that we reported in the first report of our research – there were roughly one to three additional interventions given throughout the year – or two to three interventions given throughout the year in the seventh grade. And each one was about 15 minutes in duration.

Interviewer – Robert Frederick

Did you control for this sort of booster condition, I guess, in which students would get sort of this reaffirmation several times versus students who only got it once or twice?

Interviewee – Geoffrey Cohen

Well, in the beginning of the second year – that is eighth grade – we broke our treatment condition – the affirmation condition – in two, and randomly assigned children to receive either the affirmation condition, subsequent doses of the affirmation throughout eighth grade, or to a control condition where the benefits cease. And what we found was that there was no incremental benefit to receiving additional interventions in that second year in eighth grade. That is to say that simply getting the interventions during the first year at seventh grade was both necessary and sufficient to produce these long-term performance benefits.

Interviewer – Robert Frederick

What's your team's hypothesis for why this intervention seems to be so effective for low-achieving African American students?

Interviewee – Geoffrey Cohen

Well, our best hypothesis, working hypothesis, is that it involves a recursive process in school and in other chronically evaluative situations, like work. Performance is self-perpetuating and recursive – these psychological processes can feed off their own consequences and produce worsening performance over time. And so what we think is occurring is that with a recursive cycle if you interrupt the process sufficiently early you can redirect the trajectory of performance. So, small changes to initial performance or initial psychological state can have surprisingly large effects over time if they alter the angle of people's trajectory, performance trajectory. And we provide evidence in our report that suggests that indeed the intervention – what it did was to alter the angle of children's initial performance trajectory, so it wasn't as steep a linear decline. And that benefit, that early benefit, simply compounded over time.

Interviewer – Robert Frederick

Do you think or will you be testing in future studies if student knowledge of this affirmation technique for boosting performance makes a difference. That is, students know what you're trying to do with this psychological intervention and become cynical?

Interviewee – Geoffrey Cohen

That's a great question. One of the dilemmas in scaling up any intervention is that knowledge of its purpose becomes widely disseminated, and so we treat that as a theoretical and empirical question, and we don't know the answer to that yet.

Interviewer – Robert Frederick

Will you be studying it, then?

Interviewee – Geoffrey Cohen

Yes, we will be studying it. We're currently studying this very issue in some work that we have underway at the university here, where we're studying the effects of giving people scientific information about the nature of the intervention and assessing its effects on the intervention's effect.

Interviewer – Robert Frederick

Geoff Cohen, thank you very much.

Interviewee – Geoffrey Cohen

Thank you.

Host – Robert Frederick

Geoffrey Cohen of the University of Colorado, Boulder, is lead author of a study on the an intervention to close the minority achievement gap.

Music

Host – Robert Frederick

The peculiar intricacies of the patent system in the United States makes it more advantageous to some types of businesses and more frustrating to others. That's prompting potential reform. Here with more about it is *Science* deputy editor Barbara Jasny.

Deputy Editor – Barbara Jasny

The U.S. Patent Reform Act of 2009 still has significant hurdles to overcome. But it is one step closer to reality now that it has passed the Senate Judiciary Committee. If the Act does become law, it would mandate that U.S. patents go to those who are first to file for a patent, rather than those who are first to invent the object of the patent. This would bring the United States in line with many other developed nations. Proponents also say that this and other provisions within the Act would foster a more efficient patent system. In general, high-tech companies who want to reduce litigation and limit damages for infringement have rallied behind current patent reform efforts. On the other hand, pharmaceutical companies have raised concerns that proposed changes might diminish the value of patent protection and promote infringement. To satisfy both sides and ensure the bill would make it out of committee, Senate Judiciary members hashed out a compromise that gives judges a gatekeeper role in determining damages.

In Europe, there has been a long effort to harmonize the patent process. A step forward occurred at the end of March in that the European Commission has asked member states for a mandate to establish a unified court system for patent litigation. This should simplify the system and reduce costs. The single litigation system is one component of a patent reform package that, the European Commission plans, will eventually include a single community patent rather than the diverse national ones now in use.

Host – Robert Frederick

That was deputy editor Barbara Jasny with a policy update from *Science* and the AAAS Center for Science, Technology, and Congress.

Music

Host – Robert Frederick

Today's nuclear power plants use fission, providing energy by splitting atoms of uranium or plutonium. Fusion, on the other hand, is the process that stars use, combining hydrogen atoms at great pressure to create helium – and, in the process, unlocking huge amounts of energy. But so far, scientists have not been able to create a stable fusion reaction that generates more energy than is used to produce it in the first place. Now, in this week's *Science*, news writer Dan Clery reports on how the National Ignition Facility proposes to do just that, by using an enormous laser to make tiny stars from hydrogen, one after the other. I spoke with Clery from his office in England.

Interviewee – Daniel Clery

The largest laser in the world, which has been built in California, and it's the size of three football fields and 10 stories high – or that's the building that contains it anyway. But, it produces an incredibly powerful flash of light with which they hope to be able to create fusion, which is the power that fuels the Sun, where we get all our energy from.

Interviewer – Robert Frederick

How does this fusion project at the National Ignition Facility here in the U.S. differ from ITER, the fusion project in France, the one being constructed with support from many countries, including the U.S.?

Interviewee – Daniel Clery

Well, it's a different way of achieving fusion. What they're both trying to do is heat up some hydrogen nuclei hot enough so that when they collide together with such force that they actually stick together and become a helium nucleus. So, they do it in slightly different ways. ITER does it by containing a plasma – that's a sort of, you know, electrified gas – inside a donut-shaped container. But, it's so hot you can't have it touching the sides, so you have to contain it with very strong magnetic fields, and then they heat it up by various methods, such as particle beams and microwaves. And they get it hotter and hotter and hotter and hotter until the fusions start happening, and then the hope is that if they can get enough fusions happening, it'll start generating enough heat to keep the reaction going without the heating mechanisms. So then it will get a self-sustaining reaction, and it'll produce excess power. And so, you know, the idea is eventually you'd get a power station. The National Ignition Facility works in a completely different way. They have a tiny, tiny capsule of fuel, which is about the size of a peppercorn, and they hit it from all directions at once with this incredibly powerful laser beam, actually split into 192 beams, so that it's coming at this little fuel capsule from all different directions. The outer shell of the capsule, which is beryllium, then explodes, and that outward explosion makes the fuel inside implode, so crushing it towards the center. And so, it gets to a state where it's a hundred times more dense than lead and very, very hot – hotter than in the Sun – and that's what causes fusion in that one. So, there, it's a sort of like one-shot approach where they hope to get, you know, a big bang in the end. And, you know, one bang like that isn't going to make fusion reactor, but they're already working on designs where they would do this repetitively – 10 times a second or something like that – to get enough energy to fuel a power station.

Interviewer – Robert Frederick

Is there some advantage to this laser-based fusion at the National Ignition Facility over the magnetism-based project at ITER?

Interviewee – Daniel Clery

I don't know if there's any advantage. It's probably got more engineering challenges at the moment, because the facility as it is now is the very, very state-of-the-art laser – you know, one that produces that much energy in such a powerful pulse. And at the moment they can do one shot with it, and then they have to spend half-a-day, you know, checking everything, putting in a new fuel capsule, and, you know, preparing the laser again. So, it's a very, very slow process. As I said, to make a power station you have to have a laser that'll do it 10 times a second, and that's quite an engineering jump from something that does two shots a day to something that does nearly a million shots a day. So, it's got a long way to go, and there are all the other problems with making a fusion power station as well – in that they have to have, you know, shielding for the neutrons that are produced in the reaction; they have to extract the energy from the neutrons and convert it into electricity – and those are all major engineering problems. The magnetic fusion approach is slightly further ahead, you know, they're building this big reactor in France. They hope it's going to show sustained burns for a long period of time with lots of excess energy. And so, it's less of a jump for that reactor if it's successful to get to a prototype power reactor.

Interviewer – Robert Frederick

Is the U.S. the only country working on this type of laser-based fusion?

Interviewee – Daniel Clery

No, not at all. There's a very similar laser facility being built in France, which is a couple of years behind the U.S. one. And so they're hoping to do their first experiments in 2012. And like the American one, it's not only energy it's aiming for – it's also hoping to help verify the safety of nuclear weapons, a sort of defense project, as well as an energy project.

Interviewer – Robert Frederick

Is that what's keeping them from collaborating, this national security interest?

Interviewee – Daniel Clery

No, actually they have collaborated a lot, the two programs. And in fact, the laser glass that's used to amplify the laser beams up to such high powers they actually developed jointly. So, the same components are being used in both reactors. So, you know, they collaborate, but because they are defense projects they are quite separate, and that's the reason why the NIF reactor in the U.S. is not an international collaboration in the way the ITER is, because its major role is defense.

Interviewer – Robert Frederick

Any skeptics of the NIF project, this National Ignition Facility project?

Interviewee – Daniel Clery

Yes, there are. There's quite a few that say that they're being over-optimistic on how easy it's going to be to reach ignition, which is a self-sustaining fusion burn. They think it's going to take a bit longer. The NIF people say they'll be able to do it by the end of 2010, but others think it's going to take a few years, because it's a very, very complicated process, and no one has ever tried to control a plasma at these temperatures and pressures before. So, they think that new complications will crop up, and they'll have to figure out ways to overcome them. So, most of their researchers I spoke to thought they'll get there, but it'll just take longer than the NIF researchers think. There are a few people that say these complications will be insurmountable, and the laser just won't have the power or the precision to get to a fusion burn. But I would say they're probably in the minority.

Interviewer – Robert Frederick

New complications, a longer timeline – presumably meaning all more money – how much has been spent so far, and how long has it been going on?

Interviewee – Daniel Clery

Well, I think the project was started in 1994, but construction began in 1997. The original completion date was 2002, but there were all sorts of complications in developing this laser, which, as I said, is bigger and more powerful than anything built before. And it was more tricky than they expected. And they came up with all sorts of clever ways around these problems, which my colleague, Robert Service, encountered when he visited the facility last month. But, all of that cost money. So the bill at the end was \$3.5 billion to build NIF, which was more than the \$1 billion that it was originally budgeted at. It is quite an incredible feat of engineering, you know, it does boggle the mind, you know, let's just hope they get what they're looking for, because otherwise people are going to be angry about spending that amount of money on something that doesn't work.

Interviewer – Robert Frederick

So, with that much money being poured into it, what are some of the basic science questions that they're going to try and tease out using this project?

Interviewee – Daniel Clery

Well, apart from the challenge of creating fusion, which is a potential energy source, these very, very dense plasmas that they're going to create are of interest to all sorts of researchers – you know, those that are just interested in plasmas, but also planetary scientists, astrophysicists, who want to use it to recreate the sort of material at the center of giant planets. You know, the center of Jupiter has a sort of chemistry and physics that we know nothing about, because we're not able to produce materials that dense at the moment. But, with NIF we can do it. And similarly – the sort of stuff that a supernova is made of – you can simulate that in the center of NIF. So, basic scientists are quite excited about it too, and they're going to get some value out of this machine as well.

Interviewer – Robert Frederick

Dan Clery, thank you very much.

Interviewee – Daniel Clery

Thank you.

Host – Robert Frederick

Science news writer Dan Clery on efforts to create laser-based fusion.

Music

Host – Robert Frederick

Also in this week's *Science*: Antarctica's Blood Falls. Jill Mikucki and colleagues report that the rivers of red, iron-rich minerals that spill out from the snout of an Antarctic glacier and look like waterfalls of blood are fed by subglacial pools of microbes that have lived there for millions of years. The water in these pools has little or no oxygen, is very salty, and is loaded with iron. And so the microbes are an example of how a microbial system can survive for a long period without photosynthesis or nutrients from an external source. Instead, these microbes get their energy from cycling sulfate present in the water via a coupled iron-sulfur metabolism. The researchers propose that such microbial systems may have persisted during the Neoproterozoic "snowball Earth" episode, when the planet may have been covered in ice.

Music

Host – Robert Frederick

Finally today, David Grimm, editor of *Science's* online daily news site, *ScienceNOW*, is here with a wrap-up of some of the latest science news. Hi, David, what's new?

Interviewee – David Grimm

Hey, Rob. I've got three cool stories for you. We're going to talk about why tree leaves change color in the fall; how an optical illusion is shedding light on the crosstalk between our sense of vision and our sense of touch; and finally, how our early ancestors may not have been the swingers we thought they were.

Interviewer – Robert Frederick

Well, let's start with how leaves turn red in the fall.

Interviewee – David Grimm

Well, actually Rob, this story is not about the "how," it's about the "why." Scientists already know how leaves change color, but they really don't know why tree leaves change color. And, there's been a lot of theories about this. One theory says that tree leaves change color to resist sun damage – maybe the Sun is stronger in the fall. But, there's been another interesting theory that tree leaves change color to dissuade insects from attacking them the same way you might see a very colorful butterfly or colorful frog in the Amazon – a lot of times creatures adopt these very colorful patterns to show that maybe they're toxic, or they're poisonous, and, you know, "Hey, don't eat me or don't attack me because you're going to get sick." And some scientists have wondered are trees doing the same thing. And the cool thing about this study is they tried to solve this

riddle by using a natural experiment. And it turns out that a lot of the apple trees we see in the U.S. and also in Europe aren't very representative of the way apple trees used to be – of their wild cousins. And apple trees actually first originated in central Asia and countries that are now like Kyrgyzstan and Kazakhstan.

Interviewer – Robert Frederick

And they're redder there, or their colors are more vibrant?

Interviewee – David Grimm

In this new study scientists looked at some of these relatives of our sort of more quote-unquote domesticated apple trees. And what they found is that if they looked at these trees in central Asia, 62% of them sported these bright red leaves in the fall versus only about 2.8% of them in Britain, and only about maybe 5% of them in the U.S.. So, these wild trees have much brighter colors. And now, so they said, "Well, what's different about these wild trees versus the cultivated trees?"

Interviewer – Robert Frederick

So, there was something that the domestication did to dampen the colors?

Interviewee – David Grimm

Well, the idea was maybe, yeah, when the trees were domesticated in the U.S. and in Europe maybe the selection for maybe bigger fruit or more fruit or whatever somehow selected against more bright leaf color.

Interviewer – Robert Frederick

How do insects respond?

Interviewee – David Grimm

Well, that's the big question. So, to sort of show whether this theory about whether this coloration was some sort of warning to insects, the scientists actually put aphids on these two different types of trees. They put aphids, which are sort of a pest of apple trees, on trees with leaves that really didn't change colors, so leaves were mostly green, and they put the aphids on trees which have a lot of these really bright red leaves. And what they found was that – come Spring – 60% of the aphids in the green trees survived versus only 29% of those in the red trees. So, even though the scientists didn't show it specifically, it seems to argue that maybe there is something poisonous about these red leaves or just something undesirable about these leaves that's harmful to the insects, so when the trees get, you know, bright red, when the leaves get bright red in the Autumn, they're saying to insects, "Hey, you'd better stay away."

Interviewer – Robert Frederick

Or, potentially the domestication did something else.

Interviewee – David Grimm

Right. And, you know, that's a real confounding factor here. It may be completely unrelated; maybe just the fact of selecting for trees that produced bigger fruits cause

different colors or cause the lack of colors, and it has absolutely nothing to do with insects at all. So, there's potentially one intriguing theory about why leaves change color in the Fall, but definitely not the last word on the subject.

Interviewer – Robert Frederick

Well, let's turn next to the story about crosstalk between visual and sensory experience. What you see is what you feel?

Interviewee – David Grimm

Well, that seems to be what researchers are showing in this study. And, Rob, this study has to do with all the senses we have – you know, we talk about our five senses like sight and touch and smell and things like that. And until recently, scientists thought that the brain processed all these senses separately. So, you look at something and only the visual part of your brain lights up, or you touch something and only the part of your brain responsible for, you know, interpreting tactile stimuli lights up. And, sort of “never the twain shall meet.” But, in the past few years there's been some sort of interesting research that suggests that maybe the picture is not that simple. In fact, one interesting study had to do with blind people reading Braille, and researchers, you know, would look at their brain while they read Braille. And you would just expect, you know, people running their finger over a series of raised dots, it's just going to activate the tactile regions of the brain. But, in fact, it also activates the visual regions of the brain. So, it suggests that, you know, there may be some sort of crosstalk happening, you know, within our brain. Our brain is not just processing these senses separately – it's actually maybe combining them early on at some level.

Interviewer – Robert Frederick

And this would be for more than just blind people, who may be experiencing this as a way of the brain compensating for the lack of sight.

Interviewee – David Grimm

Right. And that was the question, “Is this something that just happens in blind people or does it happen in all people?” And what they did with this study was they looked at a really interesting optical illusion called the “motion after effect.” One example is if you stare at a waterfall for, say, 20 seconds, and then you look at an object next to the waterfall, say, like a tree or rock, those objects will actually appear to be moving upwards for a brief period of time, and this is an optical illusion. And actually, if you check out this story on the site there's a test you can take, which has other types of optical illusions, and you stare at patterns, and you stare at other patterns, and they look totally funky – it's kind of cool. But, this is just obviously a visual illusion, and what the researchers wanted to see in this study is – 'Can we combine this visual illusion with a tactile stimulus and see if the two influence each other?'

Interviewer – Robert Frederick

So, how would they go about doing that?

Interviewee – David Grimm

Well, they have this device called the DaVinci, and it is a kind of cool device. It's a centimeter square array of pins, and they can tap, you put your finger basically on the pins, and it taps, you know, patterns onto your hand. You can actually see a video of this on the story as well. And they had subjects stare at these illusions on the computer while DaVinci tapped patterns on their hand. And so, for example, they would have a subject look at a series of lines that looked like they were falling down the screen while the DaVinci tapped a pattern on their finger that was just sort of a stationary pattern – it was just sort of a tap, tap, tap, tap, tap all on the same place on their finger. And they also did the opposite experiment where subjects would stare at something that was static on the screen that didn't really seem to be moving, but DaVinci would sort of sweep an up or down pattern on their finger. And what they found was when people were staring, say, at the static pattern on the screen but DaVinci was sweeping their finger up or down, all of a sudden that pattern on the screen seemed to move in the opposite direction that DaVinci was sort of tapping their fingers.

Interviewer – Robert Frederick

Like the optical illusion.

Interviewee – David Grimm

Just like the optical illusion.

Interviewer – Robert Frederick

Huh.

Interviewee – David Grimm

And vice versa – if DaVinci was tapping a static pattern, but the object on the screen was moving up or down, people would say that they felt like DaVinci was brushing their finger up or down. So, it's really some of this first concrete evidence to show that there really is this crosstalk between how our brains interpret and what we see, but also what we feel – and these senses can really get intermingled in our brains as we're trying to, you know, interpret them.

Interviewer – Robert Frederick

I imagine there'll be lots of scientists now trying to figure out if there's other types of crosstalk, but for this particular crosstalk are there any applications?

Interviewee – David Grimm

Well, you know, when we talk about the brain we often worry about injuries, like you know, stroke or other types of brain injuries, and these injuries can sometimes impair the senses. So, you know, it's a long way off, but, you know, researchers, you know, hope with a study like this if they learn more about how the senses are working in the brain then they can learn more about how to treat disorders where these senses are impaired.

Interviewer – Robert Frederick

Okay. Finally, our ancestors were no swingers. “Swingers” usually refers to sort of a particular type of sexual appetite. Here, I’m guessing you’re talking about trees swinging, however.

Interviewee – David Grimm

Right. That was a bit of a tease there. We are talking about tree swinging, and here’s how the story goes. You know, five to seven million years ago, the ancestors of chimpanzees and humans split off. Humans, sort of, took to the ground and chimps stayed in the trees. And the question has been, you know, “As soon as our ancestors, you know, took to the ground, did we stay on the ground, were we still sort of spending half our time on the ground, half the time in the trees? Were we still, you know, swinging around like the chimps?” And, you know, “What were we doing when we first split off?” And that’s what this study is trying to answer.

Interviewer – Robert Frederick

So, they’re looking at fossils to try to make this distinction?

Interviewee – David Grimm

Well, they looked at fossils in this study, they actually also took videos. And one of the first steps they did was they actually took videos of a bunch of wild chimpanzees just to see how they scale trees. And one of the interesting observations they made is that when a chimp climbs up a tree it flexes its ankle about 45 degrees from the normal position. And that’s actually a pretty big degree of flex. And what’s interesting about that is humans only can flex our ankles about 15 to 20 degrees – if they flex it any more than that they get injured. So, right away that suggests that because of our anatomy we’re not able to climb trees as well as chimps, which we sort of knew already, but this is sort of, you know, providing some physiological evidence. But, you know, they went beyond that. As you said, they started looking at fossils, and they looked at these fossils of hominids, which are, you know, this sort of group that includes these ancient human-like creatures that, you know, first branched off from chimps. And they looked at their ankle bones. And what they found was the ankle joints of these ancient hominids much more resembled our ankle joints or, you know, the ankle joints of modern humans than they did of chimps, which suggests that even back millions of years ago we don’t seem to have had this sort of ankle flexibility that chimps have – which suggests that our early ancestors probably weren’t very good at climbing trees. And because of that, they probably weren’t spending a lot of their time up in trees. You know, once they hit the ground they almost literally “hit the ground running”, you know – once they were on the ground they really adapted very quickly to this ground-based lifestyle, and, you know, just weren’t jumping back in the trees at any opportunity.

Interviewer – Robert Frederick

So, it’s really the bones that are the limiters not the ligaments. I mean, babies are extremely flexible with their joints, but the bones is the limitation here.

Interviewee – David Grimm

That seems to be what they focused on in this study that, you know – what is sort of the limiting factor to being a good tree climber? – and it seems to be really this ankle joint and how flexible it is.

Interviewer – Robert Frederick

People still climb trees all the time – maybe not as good as chimps – but still, we can certainly go up them.

Interviewee – David Grimm

Right. And that's one criticism that's been leveled at this study. You know, just because we're not built for climbing trees, we do climb trees, and we can climb trees. So, some researchers have suggested, "Well, maybe, you know, a long time ago – millions of years ago – maybe we weren't very good at climbing trees, but maybe we still did, especially, you know, it was a good way to escape predators, and so even though maybe we weren't spending a lot of time in trees, we were still probably spending some time in them, especially as a form of self-defense – or to get apples."

Interviewer – Robert Frederick

Yeah. So, what other stories are you looking into for *ScienceNOW* or on the policy blog, *ScienceInsider*?

Interviewee – David Grimm

Well, Rob, for *ScienceNOW* we're looking into stories about an ancient ecosystem found under the Antarctic ice, and also more insights into those mysterious hobbit-like creatures that were found in Indonesia a few years back. And on the policy blog we're delving into the fate of GM crops, that's genetically modified crops, in Europe. There have been some new restrictions placed on them this week that can have a real impact on how and where these crops are grown in Europe. And also, we're really tracking this big economic stimulus that has been set up by President Obama and the U.S. Congress, and the effect that's having on scientists. And apparently, scientists are just flooding these grants databases with applications because they're trying to get a piece of this money, and we're tracking that and what the impact of all this influx of cash is going to have on U.S. science. So, be sure to check out all of those stories on the site.

Interviewer – Robert Frederick

David Grimm is the editor of *ScienceNOW*, the online daily news site of *Science*. You can check out the latest science news, plus find a link to the science policy blog, *ScienceInsider*, at sciencenow.sciencemag.org.

Music

Host – Robert Frederick

And that wraps up the April 17th, 2009, *Science Magazine* Podcast. If you have comments or suggestions for the show, please write us at sciencepodcast@aaas.org. The show is a production of *Science Magazine* with the support of AAAS, the Science Society. Jeffrey Cook composed the music and 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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