



## **Science Magazine Podcast**

### **Transcript, 1 April 2011**

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#### ***Music***

##### **Host – Robert Frederick**

Hello and welcome to the *Science Magazine Podcast* for April 1<sup>st</sup>, 2011. I'm Robert Frederick. This week: semiconductor nanomaterials; potential changes to animal laws and implications for animal research; and we read from your Letters to *Science* magazine. All this, plus a wrap-up of some of the latest science news—including a story about wasps that pick up ants and fling them away—from our online daily news site, *ScienceNOW*.

#### ***Promo***

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##### **Host – Robert Frederick**

There are essentially two ways to make semiconductor devices: top-down and bottom-up. In the top-down method, you start with the bulk semiconductor, typically silicon, and create extremely thin wafers. After that, you process the wafers—depositing, etching, patterning, and otherwise modifying the wafers into the computer chips, mobile phone transmitters, light-emitting diodes, and the solar panels we use today. In other words, the top-down way works and is what the semiconductor industry uses. The bottom-up method doesn't really work, at least not consistently. But the appeal of the bottom-up method means lots of scientists have been working to make it work consistently because, with the bottom-up method, you essentially build whatever semiconductor device you want out of nano-sized building blocks – spray-painting your whole house, say, with these nanocrystalline semiconductor-devices and so being able to generate electricity no matter where the sun shines. Charles Cao researches these nanocrystals at the University of Florida.

##### **Interviewee – Charles Cao**

A major challenge for using nanocrystals in electronic devices is lack of a robust methodology to dope these semiconductors.

##### **Host – Robert Frederick**

Doping semiconductors means introducing precise amounts of impurities into the semiconductor in order to improve its performance. The first of many doping techniques was patented in 1950 in the top-down method. And for decades, many research groups around the world have been working to develop similarly robust methods for doping

nanocrystals for the bottom-up method. Now, in a paper in this week's *Science*, researchers report a robust way to do so.

**Interviewee – Charles Cao**

This is a major breakthrough in the field of nanocrystal science.

**Host – Robert Frederick**

Cao writes a Perspective in this week's *Science* about the work and says the method can easily scale up to be useful to the semiconductor industry.

**Interviewee – Charles Cao**

Oh yeah, yeah, yeah, because this is made in the solution phase, you can make tons of those particles. So it's absolutely scalable.

**Interviewee – Uri Banin**

At this point, we have only demonstrated it for indium-arsenide.

**Host – Robert Frederick**

Uri Banin of The Hebrew University of Jerusalem is senior author of the paper reporting this robust method for doping semiconductor nanocrystals. The semiconductor the team used – indium-arsenide – may someday replace silicon in the semiconductor industry.

**Interviewee – Uri Banin**

I think it can be expanded to other semiconductors as well, especially the ones with a small band gap and large dielectric constants. Those kinds[s] of semiconductors are known to offer quite significant and large diffusion constants, which would also allow room-temperature diffusion to occur in those systems.

**Host – Robert Frederick**

In other words, Banin and colleagues' method for doping semiconductor nanocrystals happens at room temperature with the impurity – Banin and colleagues have used gold, silver, and copper so far – just diffusing in solution into the indium-arsenide to make doped semiconductor nanocrystals.

**Interviewee – Uri Banin**

I can imagine that we may be able to expand this into other impurities. But with chemistry and reactions, each case should be studied carefully in its own right.

**Host – Robert Frederick**

With the idea being that other semiconductors—with similar characteristics to indium-arsenide—will behave similarly in this method of making these doped semiconductor nanocrystals.

**Interviewee – Uri Banin**

What we also contribute, aside from the method, is really an understanding of what happens from the theoretical viewpoint and from a fundamental viewpoint – what

happens when you introduce such impurities into such a small nanoparticle. And then, there could be other methods that may be used for introduction of impurities. But the physical behaviors are going to be similar in those systems as well.

**Host – Robert Frederick**

And it was developing that theoretical understanding that really impressed Perspective author Charles Cao about Banin and colleagues' work. The original data, Cao says, is old.

**Interviewee – Charles Cao**

At the very beginning, they can publish the data, you know, very early, maybe last year [or] the year before. But then they hold it, and then they go deeper. I think they present a very solid case.

**Host – Robert Frederick**

With the intervening time, Banin says, needed to make sense of the data.

**Interviewee – Uri Banin**

We started off on our own. But shortly after having the first type of nanoparticles and seeing the results and scratching our heads to understand them, we approached our colleagues to join us and help us in the work to gain this better understanding. Now, I expect that in the next few years we will see more sophistication, also in the theoretical descriptions of these heavily doped nanoparticles. And after we demonstrate first devices in the lab, we will be in a much better position to speculate on its further implementation into applications.

**Host – Robert Frederick**

No results to report yet, but they've just started working on it. In this week's *Science*, find Banin and colleagues' paper, "Heavily Doped Semiconductor Nanocrystal Quantum Dots" and Cao's related Perspective, "Impurities Enhance Semiconductor Nanocrystal Performance."

*Music*

**News Writer – Greg Miller**

So, this article deals with a relatively new and rapidly growing field of the law that deals with animals.

**Host – Robert Frederick**

*Science's* Greg Miller reports in this week's issue on the rise of animal laws and whether how the legal system deals with animals will ultimately lead to changes for researchers.

**News Writer – Greg Miller**

Just in the last 10 years or so, there's been a really dramatic increase in the number of law schools in the U.S. offering courses in animal law, and it's also a really active area of legal scholarship. And I wanted to learn more about what's being taught and what are

some of the ideas that people are floating in this field, and also how it might – potentially down the road – affect researchers who use animals in their work.

**Host – Robert Frederick**

Before we get to that, how are the law school programs being funded?

**News Writer – Greg Miller**

Well, one major source of income for funding this kind of scholarly work has come from Bob Barker, the former host of the Price Is Right, the game show. He's been an animal activist for a long time and in the last 10 years or so has donated a million dollars each to a number of law schools, and he's really targeting some of the best law schools in the country, like Harvard and Stanford and Duke and Columbia and so on. So, basically endow programs in animal law, and the universities are using this for courses and to bring speakers in and have law review journals that focus on animal law and that sort of thing.

**Host – Robert Frederick**

Beyond the laws that are already on the books, is anyone advocating for or drafted particular laws beyond those that are already employed?

**News Writer – Greg Miller**

Well, there are some groups that are really active in either drafting new laws – that's sort of one aspect of it, is drafting new legislation. And another aspect is sort of using the laws that we already have, either to make sure that they're enforced or pushing the law in ways that could increase the protections for animals. But, yeah, there are a couple of groups, including the Humane Society of the United States and the Animal Legal Defense Fund, are two groups that have been really active on the legal front looking to protect animals.

**Host – Robert Frederick**

So, what would students be doing who are studying these laws? Would they be seeking to represent these groups? What is it that they see as a future career for people studying animal law in law school?

**News Writer – Greg Miller**

Yeah, I think it depends, and not every law student who takes a course is necessarily planning to be lawyer focusing on animal law. But, they review cases, and they look at some of the theoretical issues. So, one of the really big issues in this field is that the law currently treats animals as property, as things to be owned by people but without any special legal rights of their own. And so, some people think that that's not right, given our emerging understanding of animal behavior and cognition and emotion. They would say that we know now that nonhuman animals can experience pain and distress, and we know that more cognitively sophisticated animals, like chimpanzees, have rich social lives and maybe even traits like altruism and empathy that we used to think were the exclusive domain of humans. And so, they would argue that we know that these animals are not inanimate. You know, they're sentient to some degree, and the law should treat them less like things and more like people. And so, that's kind of one of the ideas that I

think is discussed in these programs, and it's one that I think has really interesting implications down the road for a wide range of, you know, uses of animals in our society from how we interact with our pets to the treatment of animals that are raised for food or even considering whether we want to use animals for food and whether we want to use them for biomedical research.

**Host – Robert Frederick**

What are scientific societies or science advocacy groups saying about this development of laws and potentially even legal rights, it sounds like, for animals?

**News Writer – Greg Miller**

Well, I think this is actually an issue that most researchers really don't even, is kind of under their radar. I think some societies – including AAAS, which publishes *Science* and advocates for the humane use of animals in research – are aware of it and are watching it maybe a little bit nervously. I mean, I think a lot of the things that people are proposing in this area of animal law are things that most reasonable people, most researchers would agree with. I mean, we think there should be laws against people beating their dogs or using dogs for dog fighting and things like that. But, some of the people—not all, but some of the people—in this field would like to go quite a bit further and see a world where we don't use animals for food, and we don't use animals for research. And so, I think that's not something that's going to happen tomorrow, but it's, taking the long view, a direction that some people in this area would like to push for, and that could ultimately have implications for research.

**Host – Robert Frederick**

Are there any cases pending now – or being decided soon – that we should be on the lookout for?

**News Writer – Greg Miller**

Well, there are always cases going on and, you know, I guess it's hard to predict what's going to turn out to be a really important precedent. But, one, one of the ideas here is that there's probably not going to be one legal case that establishes rights for animals once and for all, but there's going to be kind of – if that ever comes to pass it's going to be through a series of stepping-stone cases that gradually chip away at this notion that animals are things and that animals are property and establishes some kind of rights or personhood for animals. And so, one of the areas of the law that's really active in that regard – that people on both sides of the issue see as a potential stepping-stone area – involves emotional distress. So, traditionally courts have awarded damages for emotional distress only in cases where someone's child has been killed or maybe a husband or a wife has been killed. The surviving person can sue the responsible party for money to compensate them for their emotional distress and loss of companionship. And, in the case of animals, people love their pets dearly, and people in recent years have started to argue that when their pet is killed by some awful person, they deserve damages for emotional distress and loss of companionship. And that's not at all traditionally how courts have dealt with those kinds of cases, because animals are traditionally considered property – someone whose pet is killed would be entitled to the replacement cost of the

pet, essentially, so maybe a few hundred dollars. But, people have been trying to argue—and sometimes successfully—that, “Well, my dog, you know, I’ve had my dog since she was a puppy; we’ve formed this bond; I love her more than my children, and so I deserve additional money to compensate me for my emotional distress.” And sometimes courts have agreed with that, and that, again, is the kind of case that people see as a potential stepping stone because it’s moving animals away from being treated as property, like a bicycle or a book or something, and being treated a little more like we treat other people.

**Host – Robert Frederick**

And, in the research context, then, I guess in some cases a decision might be what is humane treatment? I mean, giving a dog or a mouse cancer doesn’t sound very good unless you’re working to attempt to cure cancer in people, say.

**News Writer – Greg Miller**

Right. So, the laws that govern the use of animals in research are different than the laws that govern pets and farm animals and wild animals. And, in a way, that’s kind of part of the argument that people who are interested in animal law often make is that you could have the same animal – a rat, for example, that’s in a lab, a rat that’s someone’s pet, a rat that happens to belong to an endangered species, you know, that’s out in the wild – and all three of those animals probably have pretty similar capacity for pain and distress and, you know, a similar interest in staying alive and going about their rat activities. But, the law treats them all very, very differently. And so, one of the arguments that people make is that our laws really concern how humans want to use animals – there’s really no consideration for the actual capacities of the animal itself. And so, that’s one of the challenges of how do you incorporate some of the interests of the animals into the law while still weighing them in a sensible way against the interest of humans, including the interests of humans in curing disease.

**Host – Robert Frederick**

To what extent is this a worldwide push for animal laws, or is this more just happening in the United States?

**News Writer – Greg Miller**

No, I think in some ways the U.S. is maybe five or ten years behind what’s happened in Europe. I think in Europe in the last five or ten years we’ve seen a number of laws in countries that have banned research—invasive research—on great apes, which is something that we’re considering here but is still the proposed law that’s still pending. You know, I think different countries and different cultures are kind of at different stages of this, but I think we’re probably – Europe seems to be in the forefront – and we’re maybe a little bit behind, and other parts of the world are still behind us.

**Host – Robert Frederick**

Is the idea, then, to eventually get to some sort of universal or worldwide legal system, or what?

**News Writer – Greg Miller**

I don't know. I mean, I think, you know, there are a lot of areas to the law where different countries and different cultures differ, and that's probably going to be how it goes with animals, as well. You know, different people have different ideas about where to draw the line and what's morally acceptable on all kinds of issues. And I think this is probably no different.

**Host – Robert Frederick**

Greg Miller, thank you very much.

**News Writer – Greg Miller**

Thanks, Rob.

**Host – Robert Frederick**

*Science's* Greg Miller reports in this week's issue on the rise of animal laws and whether how the system deals with animals will ultimately lead to changes for researchers.

*Music*

**Host – Robert Frederick**

Now, David Grimm, *Science's* Online News Editor, is here with a wrap-up of some of the latest science news from our online daily news site, *ScienceNOW*, including a story about wasps that pick up ants and fling them away. Dave, why on earth would a wasp do that?

**Online News Editor – David Grimm**

That's a good question, Rob, considering that wasps actually have more powerful tools at their disposal. They've got a stinger they can sting with, and they've got these giant jaws that could theoretically crush the ants. So, why are they swooping in and picking up ants and just flinging them away? Well, Rob, researchers have some theories on that. But, before we get into that, let me just tell you a little bit about what's actually going on here. What's happening is, this was actually carried out in New Zealand, where wasps – specifically the yellow jacket wasp – has become a very problematic invasive species. There's actually the highest density of wasps in the world are in New Zealand. And the researchers in this study were trying to figure out, you know, we've got so many wasps – and they're competing potentially with other insects, like ants, for the same kind of food sources – have they developed any sort of unusual ways of fighting each other? And that's exactly what they saw. What they did was they went out into a forest that had a lot of wasps, and they put a plate of tuna down on the ground. And, in no short order, a group of Napoleonic ants, which are very aggressive ants, swarmed around the tuna and started eating it or taking it away. But, then, all of a sudden the wasps came too, and instead of stinging or biting these ants, they were grabbing the ants one by one and flinging them away from the tuna. And when the ants got flung away, they pretty much got scared off and wouldn't come back. And you actually can see some pretty cool videos of this happening on the site.

**Host – Robert Frederick**

So, have these two species interacted before? Is this some sort of new behavior that's never been seen before?

**Online News Editor – David Grimm**

This is a new behavior that's never been seen before. And to answer your original question about why they do it – considering that they have all of these other weapons at their disposal – these are very aggressive ants. In fact, they spit acid, and, under a lot of conditions, they'll actually attack the wasps even though the wasps are much bigger than the ant. They're also tiny chemical factories – they're producing all of these sort of noxious chemicals that you wouldn't want to get in your mouth if you were a wasp. And that's why the researchers think the wasps aren't biting them, because they would get a mouthful of poison. And so, the best strategy for the wasps is really just to grab these ants and fling them away.

**Host – Robert Frederick**

Does the strategy work? Are the wasps victorious? I mean, I imagine there are lots of these ants.

**Online News Editor – David Grimm**

Well, it's a good question, Rob. And, in the experiments the researchers set up, there wasn't a clear winner. But, they think what might happen under more naturalistic situations is – oftentimes you'll have this original scout ant that will come in, find the food, and then alert all the other ants that will then swarm around the food. And they think that maybe under those circumstances, the wasp may just grab that scout ant and throw him away, and he'd be so scared that he wouldn't go grab all of his buddies and go swarm the food source, and then the wasp would have it all to itself.

**Host – Robert Frederick**

You're okay, then, with “ant-throw-pomorphizing” the ants, as it were.

**Online News Editor – David Grimm**

Of course.

**Host – Robert Frederick**

Okay, so what other stories have you brought with you this week?

**Online News Editor – David Grimm**

Well, speaking of fear, Rob, this next story is about people's fear of heights and how it may be overcome, ironically, by giving them a hormone associated with stress.

**Host – Robert Frederick**

Seems a little counterintuitive.

**Online News Editor – David Grimm**

It does, Rob. And the reason this finding came about is that usually when people have a fear of something – whether it's heights or spiders – one of the common therapies is a

process called exposure therapy. It's essentially forcing people to confront their fears. So, if you've got a fear of spiders, then a researcher might actually put a spider in your hand and have you get really used to that experience, so that you realize it's not so bad after all, and those positive memories replace the negative associations you had with spiders before. Same thing with the fear of heights – people can go through virtual reality simulations where they're walking on a steep ledge or something like that, and the more they do it the more they overcome their fear. These treatments work, but it takes a lot of repetitions to make them effective. And, as you can imagine, if you've got a fear of heights or a fear of spiders, having to confront these fears over and over and over again, even though you're becoming more accustomed to them, is a pretty unpleasant experience. So, in this new study researchers said, you know, "Is there a way to increase the efficacy of these therapies so that patients don't have to go through them as much?" And one thing they noticed is that when people have these unpleasant experiences, they release stress hormones. And previous studies have shown that these hormones seem to help us create these new safe memories that give us those more sort of positive memories to replace the bad ones, and they also inhibit these fearful memories. So, the researchers said, "You know, if we're producing these hormones anyway when we're having a stressful experience, and these hormones seem to be helping us get over that stressful experience, what if we gave people even more of these hormones when they were having that stressful experience to see if it would help them overcome their fear faster?" And it worked. In this study, researchers focused on the fear of height, and they had 40 people with what's called "acrophobia," which is a fear of heights, and they did this exposure therapy with them. And they had these people walk in this virtual environment where they had to ascend tall elevators, walk over bridges, and things like that, even the researcher said it was pretty scary, even for him, to take a walk through this environment.

**Host – Robert Frederick**

All the while knowing that they're actually on the ground and not really moving at all.

**Online News Editor – David Grimm**

Exactly. But people with a fear of heights still get very scared in these situations. And what the researchers did was, they took a few of these people and gave them a placebo, but the other ones they gave cortisol pills – and cortisol is one of these stress hormones. And what they found, according to surveys that the volunteers filled out, was that those who had taken the cortisol pills had about a 60% drop in their fear during these experiments versus a 40% drop in fear for the people that just took the placebo.

**Host – Robert Frederick**

So, the exposure therapy worked in both cases, but those who got the cortisol – the stress hormone – it did seem to work faster.

**Online News Editor – David Grimm**

It worked even better. That combination of the cortisol and the exposure therapy really bumped these people up to a new level where they were shedding a lot more of their fear. And, what's more, when these people ascended a virtual elevator about a month after their treatment, the participants who had received cortisol showed just a one-fifth

increase in skin conductance – and this is sort of a measure of stress – compared with subjects who had just received the placebo. So, not only did the volunteers who took cortisol overcome their fear quicker, their fears were abated for a much longer period of time.

**Host – Robert Frederick**

And not just according to their own perception, but actual skin conductance.

**Online News Editor – David Grimm**

Exactly.

**Host – Robert Frederick**

Hmm. Where else might this combination therapy be used?

**Online News Editor – David Grimm**

Well, as we talked about before, there's a fear of spiders – this could be helpful with that. But, there's other types of fears that are more complicated, such as obsessive-compulsive disorder, posttraumatic stress disorder, and other fears that researchers call more general fears. And they think that, you know, the therapies that are available for those could also be improved by treating patients with cortisol or another stress hormone – might make these therapies a lot more effective than they are now, but they haven't done those studies yet.

**Host – Robert Frederick**

Okay. So, last story. What's this last one about?

**Online News Editor – David Grimm**

Well, Rob, now for something completely different. This last story is about how to fold a shopping bag made of steel.

**Host – Robert Frederick**

Steel isn't something I typically associate with folding, Dave – more like crushing or crumpling.

**Online News Editor – David Grimm**

Well, that's a really good point, Rob, and why would you want to fold a steel bag in the first place? But, it turns out that there are a lot of applications for folding very rigid materials. Think about when you move to a new house. You buy all of those boxes that are totally flat, and you've got to reassemble them, and you've got to construct the bottom and reconstruct the top. Well, what if you could just get a box that was flat, and you just had to push something on the box, and it would automatically unfold itself into a regular box – top intact, bottom intact – all you have to do is start throwing stuff in there. Not only would that be a great thing for moving, but this also could be a big boom for the packaging industry, which you could imagine deals with millions or billions of cardboard boxes every year. So, there's a lot of applications to this technology, but the problem is how do you fold something as rigid as steel? And the answer is origami.

**Host – Robert Frederick**

The art of Japanese paper-folding.

**Online News Editor – David Grimm**

Exactly. What the researchers did in this new study was, they created a pattern of creases that they could overlay on a material like steel. And what these creases do is, they allow the steel – in this case, it was a steel shopping bag, and you can actually see a picture of that on the site and a picture of it folding – they were able to turn this very rigid shopping bag flat just by folding it along these creases that they had designed. Now, researchers have done this before; in fact, the solar sails that researchers are now putting on spacecraft in space to help catch the Sun's light and help provide energy for a lot of these craft – they are essentially "origami-ed" flat, so that they can be easily transported into space and then unfolded there. But, there you're dealing with a very simple structure. You know, a sail is just basically like a giant rectangle. Here we're talking about something like a shopping bag, which is not a very simple structure. And, again, you can't simplify things by taking out the bottom or the top—in case it was a box. You're really trying to keep this very complicated structure in its original conformation, so that when you unfold it, there's no extra work to be done.

**Host – Robert Frederick**

So, the ultimate in reusable shopping bags, I guess. When do I get to see one?

**Online News Editor – David Grimm**

Well, Rob, it may not be too far down the line. These researchers are already starting to talk to manufacturers about implementing this design. But, what's really cool is, down the line, if this really catches on, experts are envisioning even wackier ideas like a television that could fold up or even an entire building that could be folded up, transported somewhere, and then unfolded. So, a lot of really cool applications for this technology – some a little closer to reality than others.

**Host – Robert Frederick**

Okay, well thanks, Dave.

**Online News Editor – David Grimm**

Thanks, Rob.

**Host – Robert Frederick**

So, what other stories are you looking into for the site?

**Online News Editor – David Grimm**

Well, Rob, for *ScienceNOW* we've got a story about bacteria that act like dental floss and also a story about an artificial leaf that could provide a potentially limitless source of energy. And on *Science's* policy blog, *ScienceInsider*, we've got a new survey to come out of India about the number of endangered tigers that are there and whether that number is going up or down. And also we're continuing our coverage of the Japanese

quake. This week we're really focusing on the impact it's having on the U.S. – the way we prepare for earthquakes, the way we design our nuclear power plants, and other responses that U.S. experts are having to the crisis in Japan. So, be sure to check out all of these stories on the site.

**Host – Robert Frederick**

David Grimm is the online news editor of *Science*. You can check out the latest science news, plus all the stories on the *Science* policy blog, *ScienceInsider*, at [news.sciencemag.org](http://news.sciencemag.org).

*Music*

**Host – Robert Frederick**

Finally today, we read from your Letters to *Science* magazine. Joining me is our Letters editor, Jennifer Sills.

**Letters Editor – Jennifer Sills**

This month, we start with a Letter from our March 4th issue in which eight scientific societies offer their expertise to the U.S. Environmental Protection Agency and the Food and Drug Administration in assessing chemical risk. The societies' subjects of expertise range from genetics to reproductive medicine to developmental biology.

**Host – Robert Frederick**

As corresponding author for the eight scientific societies, Patricia Hunt from Washington State University writes, "The effect of environmental exposures on human health is a growing area of concern. The number of new chemicals is increasing exponentially, with approximately 12,000 new substances added daily to the American Chemical Society's CAS registry.... Currently, the EPA and FDA are charged with safeguarding the health of Americans. This is a daunting task that is hampered by the growing recognition that currently accepted testing paradigms and government review practices are inadequate for chemicals with hormone-like actions."

**Letters Editor – Jennifer Sills**

Hunt continues, "The need for swifter and sounder testing and review procedures cannot be overstated. Recent scientific evidence has established direct links between exposures that occur during fetal development and adult disease. Data from the U.S. Centers for Disease Control and Prevention have established clearly that most—if not virtually all—Americans, are exposed to contaminants in the environment that cause serious health effects in animal models. Direct links to humans remain uncertain, but there is sufficient experimental evidence to raise concern. Furthermore, there is growing evidence that some chemicals once thought to be safe and allowed into common and, in some cases, abundant commercial use may not be as benign as previously assumed."

**Host – Robert Frederick**

Hunt concludes "As concerned scientists and clinicians, we are writing to offer the expertise of our collective societies.... We recognize that the FDA and EPA face

challenges on many fronts, and we believe that the vast expertise available through the members of our societies can aid both agencies in achieving their goals."

**Letters Editor – Jennifer Sills**

You can read the full Letter in the March 4<sup>th</sup> issue of *Science*. Our next Letter is also from that issue and highlights two responses to threats to biodiversity: "positive steps taken by Thailand and insufficient action by Indonesia" according to Luke Gibson and Navjot Sodhi of National University of Singapore. The authors write, "Tropical forests and coral reefs are well known as bastions of biodiversity, and Southeast Asia contains large areas of both. However, these habitats are threatened not only by human activity, but also by climate-induced increases in sea temperatures and drought severity. The steps we take to mitigate further degradation may be essential to saving these imperiled habitats."

**Host – Robert Frederick**

The authors continue, "Sharp increases in sea temperature recently triggered widespread coral bleaching in reefs along the entire western length of the Malay Peninsula, from the tip of Sumatra to Myanmar. In response, the Thailand government closed several popular dive sites spread across seven Marine National Parks in an attempt to prevent damage by tourists, despite the risk of immediate losses to the tourism industry. Coral reefs may be particularly vulnerable to human disturbance during bleaching events, and Thailand's decision to take action may ultimately save this valuable natural resource. Bleaching events in the region are expected to become more common in the future, and preventative measures like the one implemented by Thailand will be crucial to ensure the survival of this endangered habitat."

**Letters Editor – Jennifer Sills**

But, the authors suggest, Indonesia's response to a different environmental crisis wasn't nearly as strong. Gibson and Sodhi continue, "In the extreme 1997 El Niño year, fires from Indonesia produced the equivalent of 13 to 40% of mean annual global carbon emissions from fossil fuels; these enormous carbon discharges make Indonesia the world's third largest producer of greenhouse gases. Despite these threats, the Indonesian government's attempts to prevent these fires and the resulting smoke have been largely ineffective. As recently as October 2010, smoke blanketed the region, producing the worst haze in the region in 4 years."

**Host – Robert Frederick**

The authors conclude, "Thailand's protective response to the latest coral bleaching event should serve as a model for other countries in the region and beyond. In contrast, Indonesia should work more actively to alleviate the increasing fire hazards in its forests and peat swamps.... Climate change mitigation efforts have been far from satisfactory across the tropics, and Thailand's efforts should inspire others."

**Letters Editor – Jennifer Sills**

You can read the full Letter in the March 4<sup>th</sup> issue of *Science*. Our final Letter comes from the March 18<sup>th</sup> issue and announces the launch of an initiative to sequence the

genomes of 5000 species of insects and other arthropods during the next five years. Gene Robinson from the University of Illinois at Urbana-Champaign and colleagues from several institutions in the United States and the Wellcome Trust Genome Campus in the United Kingdom write, "In the past decade, biomedical research has increasingly relied on information obtained from sequencing the human genome, and early genome-enabled successes have inspired a new vision of genomic medicine. We believe that genomics also can improve our lives by contributing to a better understanding of insect biology and transforming our ability to manage arthropods that threaten our health, food supply, and economic security. Because of the overwhelming diversity and abundance of insects, achieving these goals will require a project of grand scale."

**Host – Robert Frederick**

The authors continue, "This project is aimed at sequencing and analyzing the genomes of all [insect and arthropod] species known to be important to worldwide agriculture and food safety, medicine, and energy production; all species used as models in biology; the most abundant insects in world ecosystems; and, to achieve a deep understanding of arthropod evolution, representatives of insect relatives in every major branch of arthropod phylogeny."

**Letters Editor – Jennifer Sills**

The authors conclude, "Th[is]... initiative will be broad and inclusive, seeking to involve scientists from around the world and obtain funding from academia, governments, industry, and private sources. We also aim to encourage new collaborative research by computer scientists, bioinformaticians, and biologists to overcome the challenges of handling this unprecedented volume of data and derive meaning from these genomes."

**Host – Robert Frederick**

You can find the Letter by Robinson and colleagues in the March 18<sup>th</sup> issue of *Science*. Thanks, Jennifer.

**Letters Editor – Jennifer Sills**

Thanks, Rob.

**Host – Robert Frederick**

Jennifer Sills is the Letters editor of *Science* magazine. If you would like to submit a Letter to *Science*, you can do so online, at [submit2science.org](http://submit2science.org).

***Music***

**Host – Robert Frederick**

And that wraps up the April 1<sup>st</sup>, 2011, *Science* Magazine Podcast. If you have any comments or suggestions for the show, please write us at [sciencepodcast@aaas.org](mailto: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.

*Music ends*