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dispatches from the wild, weird world of humanity and its biosphere

By Sam Matey

Scientist Spotlight: An Exclusive Interview with Dr. Stuart Pimm

Dr. Stuart Pimm (pictured) is currently the Doris Duke Professor of Conservation Ecology at Duke University, and for decades has been recognized as one of the world's leading authorities on biodiversity, extinction, and species conservation. A lightly edited transcript of this exclusive interview follows. This writer's questions and remarks are in **bold**, Dr. Pimm's responses are in regular type. ***Bold italics*** are clarifications and extra information added after the interview.

For the NGO Dr. Pimm leads, see savingnature.earth/. For Dr. Pimm's ResearchGate page, see researchgate.net/profile/Stuart_Pimm.

Hello, Dr. Pimm! It is an honor to be interviewing you today. Before I get into specific questions about recent studies and Saving Nature efforts, could you give me the background story on how you became a biologist, and why specifically a conservation biologist?

It was a huge fortune to have parents who loved being outdoors. So the earliest memories I have were of the weekends, and the summer, we went camping. My parents loved nothing more than to go out into the countryside in Great Britain. I grew up with a fascination for natural history. That became a fanatic enthusiasm for birdwatching in my teens. That led to going to Oxford University, because it was the best place to study birds. That led, by chance, going on a student-led expedition overland to Afghanistan. That got me interested in deserts, so I came to the US to study deserts for my Ph.D. Within a short time, I found myself not in the driest but in the some of the wettest places in the world, the upland cloud forests of the Hawaiian Islands. And I had essentially a conversion there. The conversion was to recognize that species were going extinct almost in front of my eyes. There were species there already on their last legs. Species that were not going to survive, and didn't. I felt two things. One of them was that as an ecologist I had a responsibility to address this awful problem of extinction. And that was a moral decision, I felt there was a requirement of scientists to act in an ethical way. We shouldn't ignore environmental problems. And the other part was that I thought I could do something

about it, I could study the process of extinction and why species are endangered, and try to do something about it. That's how I came to do conservation. I like to recount what Lord Elrond said in Lord of the Rings, "I was there at the beginning." I was at the University of Michigan when someone said we ought to found a society for conservation biology, all those in favor? I put up my hand, and I've called myself a conservation scientist ever since. It's a new field, I held the first named chair in conservation, at Duke, shortly before my friend Bill Sutherland got one at Cambridge-we Dukies beat Cambridge. So I've been a card-carrying conservationist ever since.

You co-wrote a fascinating paper in *Science* (https://science.sciencemag.org/content/369/6502/379/tab-pdf) recently about the ecology and economics of preventing pandemics, in which you identified four key cost-effective actions, addressing deforestation, farmed animal spillover, wildlife trade spillover, and earlier detection and control, that humanity should take to prevent another COVID-19. Can you tell our readers about that?

This was an effort that, as the shock of what happened in the spring began to register, I think there were several of us who recognized that whatever had been written about what we needed to do to slow the pandemic, develop vaccines, all those other measures, we needed to step back and look at why this pandemic happened. And look at it in the context of that there had been many other pandemics, approximately two spillover events of viruses into our species [from other species] every year. Some of them are really nasty, like Ebola. But there are often many obscure viruses that don't get out of the tropical countries they're from (***for example: Rift Valley fever, monkeypox, Lassa fever, Kyasanur forest disease, Nipah virus, and Hendra virus)***. And then we have HIV killing 10 million people or COVID killing 2 million people. At the core, a fundamentally environmental question. A small group of us got together and said, we need to talk about this. We need to talk about the ecology, the economics, bring in people who understand South America and the Amazon, China, and Africa. We put a team of people together to try and put all that stuff together. As we did that, we produced the paper that appeared in a *Science* policy forum. We are currently working on a much larger, more comprehensive paper to talk about those issues. The broad scheme of things is, we ought to be very careful about chopping down the world's remaining rainforests. There are a lot of wonderful species in those rainforests, but also a lot of species carrying very nasty diseases. We are being incredibly careless at moving species around the world, dead, alive, or butchered. And we are spending nowhere near enough money on stopping deforestation, stopping wildlife trade, stopping wet markets, all the things you mentioned in that question. So that was the genesis of that paper. It was an exciting two or three

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months, as we had some very energetic conversations about what needs to be done and how much it would cost to get it done.

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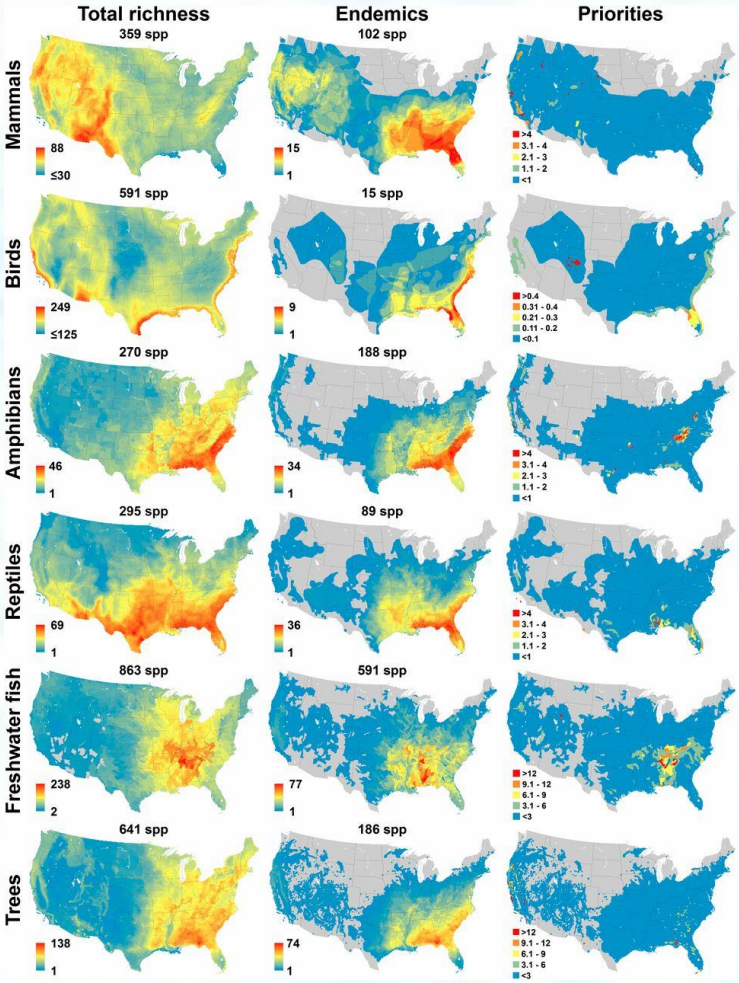
There's such an interdisciplinary aspect to this work. I suppose that's inherent to conservation, since it includes humans.

I don't like that word, interdisciplinary. It's not that we said, who are all the different people we can bring together to talk about this. What we did was say, what the hell is the problem? The problem is we have to stop viruses spilling into our species and killing us. And when you form a question like that, almost inevitably, the answer is not in one field of study. This may seem to be nitpicking, but the reality is when you have a difficult problem, you'll almost inevitably need to bring in different ideas. When you look at the major environmental questions facing society today, you realize you need lots of different pieces of the puzzle to solve them. The important thing is to go after it, answer the question.



You also cowrote a paper in 2015 (https://www.pnas.org/content/112/16/5081, maps from the paper picture) about how protected lands in the continental US don't actually match up super well with key biodiversity hotspots that need protecting. I noticed that a lot of the priority unprotected areas you identified were in the South, such as the Appalachians and Alabama watersheds. Could you discuss this project more?

There's two parts of this. One part is very familiar, and the other part is unfamiliar and inexcusable. The familiar part is that like many other countries, we've set aside protected areas in the places where people don't live, in the Rockies, in Alaska. We have very few protected areas in the Eastern United States, the big ones are the Everglades, which is a swamp, and the southern

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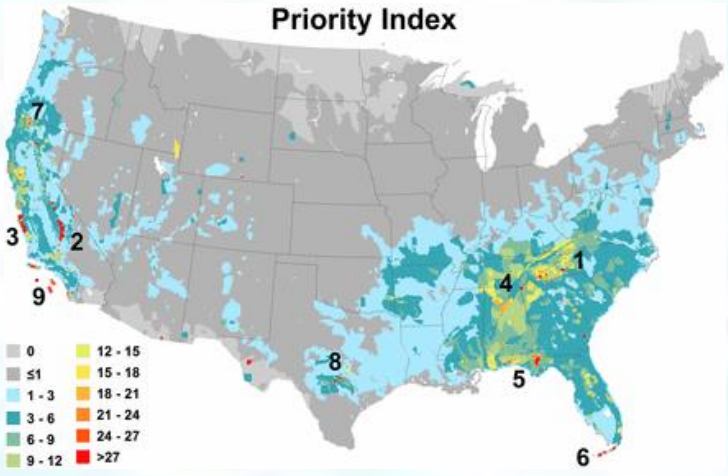
Appalachians, the Great Smoky Mountains. Not a lot of people live there. But our criticism was really leveled at what we're doing in the private sector to protect biodiversity in the eastern United States. For that, there are conservation easements that purport to be looking after biodiversity. And they're not. They're doing a poor job. Take the Nature Conservancy, they have some really good local chapters, they're wonderful in North Carolina. But if you look at the national organization, it is going where the money is. So the national-level Nature Conservancy puts its money into Connecticut, Massachusetts, Northern Virginia, that's where the money is, where the rich people are, and they're protecting green space next to where they live. Don't get me wrong, I live next to some beautiful woods, and they're protected, and I want to keep them that way. I understand that. But we fail as a nation and as a conservation community if we don't understand that there are parts of the eastern US that are much more special than others. ***(Pictured: a figure from the paper).*** The streams that flow down the Appalachians into Western Virginia, North Carolina, Alabama, West Virginia, Tennessee, the species that live there are unique, endemic to those places. They also include some of the poorest places in our nation. Much of Appalachia is very poor. So while I understand that you can become a billion-dollar organization like the Nature Conservancy, putting all your money into Connecticut is not doing a good job for conservation. You need to be putting money into Northern Alabama or Eastern Tennessee. That's a critical thing to say, and somebody has to say it, that we are not allocating our conservation resources in an appropriate way in the eastern United States, where most of the land is privately owned. In the West, there's a lot of publicly owned land, you can set aside national parks, but in the eastern US it comes down to private individuals. And those private individuals need to know that northern Virginia might be where they live and want to see green spaces, but you know, rural Georgia is more important.



We are Americans, and we should be proud of our ecological heritage. And that is under great threat in parts of the eastern United States, and we need to be energetic about protecting those areas.

I saw that you've also written a wide array of papers on protected areas in China, their effectiveness, spread, umbrella species. Could you tell me more about those collaborations?

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I thought probably about 15 years ago that I was going to start working closer to home, probably in South America. Just about that time I got another invitation to go to China, where I had been ten years earlier. And I'm now, in a typical year-last year was not a typical year-spending a month or two a year in China. I have a very energetic group of Chinese colleagues and collaborators and students. China is interesting in that like the United States, it has an exceptional amount of biodiversity. The big national parks in China are in the west, in the mountains. China's about the same size as the continental US, broadly similar in that most people are in the east and most biodiversity is in the west. So the question is, is China doing a good job of protecting its biodiversity? And what can we say that will engage the Chinese authorities to do a better job? As it happened, over the last few years it's been easier to persuade the Chinese to do things about the environment. President Xi Jinping talks about "eco-civilization," by which he means a commitment to development, but to respect nature. And in part, that comes from the fact that there was a period during the 1960s where China abused its environment far more than probably any other country has done. There was massive deforestation, major land use changes. And those changes cost a lot of lives. They led to massive flooding, the landslides, soil degradation. So China learned the hard way that people suffer if you don't look after nature-that's the message behind our paper on COVID. If you mess with Mother Nature, she'll turn around and bite you on the arse. That's not a good idea. And it cost China dearly, in terms of things that took place. ***(For more on the massive environmental destruction under Mao, see jstor.org/stable/3182245 and wikipedia.org/wiki/Great_Chinese_Famine).*** And I think China has learned the hard way they need to stop growing agriculture on steep mountain slopes where the soils wash away. That they need to undertake a massive program of reforestation. They need to look after their watersheds and their environment, or their people will suffer. I think President Xi Jinping gets that in the way our soon-to-be-ex-President singularly fails to do so.

> "China learned the hard way that people suffer if you don't look after nature... If you mess with Mother Nature, she'll turn around and bite you on the arse."

I also looked at your literature review of emerging technologies to conserve biodiversity, also from 2015 (cell.com/trends/ecology-evolution/fulltext/S0169-5347(15)00212-8). You discussed everything from remote sensing to genetic barcoding to citizen science smartphone apps like iNaturalist, which is one of my personal favorites.

I was actually the godfather of iNaturalist. Well, Scott Loarie (***co-director of iNaturalist***) was my Ph.D. student. We talked a lot about how we needed to have a better knowledge of where species go. I was not there at the beginning, I was there before the

beginning. We needed something that will fit in with us, and this smartphone has the potential to be the best tool for studying biodiversity. Perhaps sort of like a Pinterest, just putting pictures up on the web. Scott and I talked about how that could be made into a powerful scientific tool. Within a year, Scott and his partner had gotten one million observations. It took ten months to get the second million, and now they're getting a million a month. It's become a very powerful tool for doing science. My fingerprints were on that, and also something else you might not realize. 20 years ago, if you wanted to understand what was happening in the world, you could go and buy a satellite image, and that would cost you two thousand dollars. To see it change, you'd have to buy two of them, now four thousand. So to be able to study any land use changes on a wide scale, you needed ten or twenty thousand dollars just to get started. So I used all my influence, charismas, bribes, threats, and bottles of wine to get one hour of the NASA Administrator's time [***The NASA Administrator was then Daniel Goldin, known for his controversial management style***]. He was famous for not coming into the room until your presentation was on the screen, and then if he didn't like it leaving without a word. I said, Mr. Goldin, please sir, we would like a complete global coverage of Earth for 1990 and another one for 2000. We wanted thousands of satellite images, and we wanted them for free. He stayed through my talk, and at the end he said we don't do that at NASA, we develop new technologies, we don't give stuff away. I said, look, you're in the business of developing new ideas, and people can't develop new ideas if every time you've had a new idea it costs twenty thousand dollars to develop it. You need to put this out there into the public domain. And that was the origin of the two data buys that led to Google Earth and everything we see now. So I think technology can make a huge difference. Freely available global coverage is 20 years old, iNaturalist is ten years old, technology can change things not overnight but in a very short time. But what we tried to outline in that paper was that once you'd got all this information, the hard part was doing clever things with it. It's not immediately obvious what to do with all the data you have. And getting data that's appropriate-the wonderful thing about iNaturalist is it's simple to use. But there are other technologies that could be even simpler. We need appropriate technologies, and ways of handling the tsunami of information when it comes into us. The main theme of that paper on technology how to collect appropriate data and handle the information once you've got it. So how can you be smart with the information? And how can you get information in the right hands? And how can you develop appropriate technology? I often hear people come up with extraordinary ideas, but they cost millions of dollars to implement and you want to use them in poor countries. The great thing about a smartphone is that most people in the world have something like a smartphone. For example, one of my former students, Dr. Krithi Karanth ***(pictured)***,

worked in India. Her father was a well-known tiger biologist. Krithi worked with people who lived next to tigers and elephants. If tigers eat their livestock or elephants trample their crops, the Indian government will pay compensation. But that compensation requires the poor Indian to go to the nearest town and fill out paperwork, and they may not be literature. And that means they're not able to do that, and so they get very angry if the tiger kills their livestock. Krithi got them an 800 number service. They've got basic cellphones, they call the number, and Krithi's team will photograph the dead cow, fill in the paperwork, collect the money from the Indian government, and pay the poor farmer. ***(For more on this epic conservation story, see tinyurl.com/KaranthTigerHotline or tinyurl.com/KarnatakaTigerHotline. For more on Dr. Karanth's research, see researchgate.net/profile/Krithi_Karanth.).***

I also really admire your classic paper from 2006 (https://www.nature.com/articles/nature04927) on ecological networks and their fragility. You were looking at connectedness and complexity of food webs, distance between species in terms of predator/prey linkages, and lots of other fascinating modeling. Could you tell me more about this work?

That's sort of how-I told you how I became a birdwatcher and a conservation biologist. At the time I became a conservation biologist, I was doing a lot of work on food webs. And that surprised me, because I never thought I would be an ecological theoretician. I think the important message is that it's very, very hard to predict what nature is going to do. Even the simplest actions, supposing you take away a predator, you might think its prey will be happy, prey numbers will go up. But half the time, prey numbers go down, because the predator was also feeding on another species that was the first species' competitor. So one of the broad lessons that comes up is that it's very hard to predict what happens when we start losing species, destroying ecosystems. So the best thing we can do is not lose the species in the first place.

So before we get to specific examples of their work, could you speak more about the structure and genesis of the NGO you lead, Saving Nature? Correct me if I'm wrong, but you folks focus on partnering with local NGOs in five biodiversity hotspots: Brazil, Colombia, Ecuador, India, and Sumatra.

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As I traveled around, looking at endangered species, it became clear that there are certain places in the world where extinctions are concentrated. The Hawaiian Islands is a case in point. Coastal Brazil, the Andes, Colombia, Ecuador, key places around the world. When I looked at what was happening there, I was critical. Because I felt that there was a lot of money being raised for conservation there, but it wasn't really accomplishing enough. And the feelings were twofold, the first was it wasn't really scientifically driven. There were a lot of people saying, we have to save something. But what it was we were saving was detached from what the solutions were. So there is a large international conservation organization that has the tiger as one of the key species that they're trying to save. There are more tigers in India than anywhere else. Do they have a resident Indian tiger biologist running their program? No. There's a disconnect between what people are trying to do and their scientific knowledge on the ground. The second point is related, and that is, conservation is local. You've got to engage people where they live, you've got to find local solutions. What I like about Krithi Karanth's work in India on tigers is that she is intimately connected with the people who live in these communities. What I wanted to do was to found a conservation group that was scientifically driven. So my board has me, Ed Wilson, Tom Lovejoy, Peter Raven, Patricia Wright, Trevor Price, we have more scientists on our board than all these big conservation groups combined. We are very scientifically heavy, we want the best science to be employed. The other part of what we do is how many staff we have, and the answer is one. We have one executive director. What we wanted to do was to empower local conservation groups, to give the local people the resources they need. I don't think you can do conservation effectively in expensive office buildings inside the DC Beltway. You've got to be out there in the communities where people are facing the challenge. So I founded what is now Saving Nature-then called Saving Species-to empower local people. What we do is empower the people in the communities. And that's an important difference, we want to be science drive, because science makes you more effective. And we want to enhance the capability of good local people, help them raise money, buy land, give them the support they need. So it's a fundamentally different way of running a conservation group.

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Fascinating. That is really very interesting. There's this whole movement for more effective altruism, without as much overhead. More and more studies have found that one of the most effective things you can do to reduce poverty is to give money to poor people, not to rich people who think they can design a program to help poor people.

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Jeffrey Sachs' book on governance and poverty has something on that. A lot of what happens is completely detached from where it needs to be. What we do is, we have people who are there. We do not support lots of people sitting in offices, we want the money to go the people who are working in the places that matter. And we essentially charge almost no overhead on the money people give us. Somebody gives us a hundred or a thousand or ten thousand dollars, we can say all of that is going to a piece of land right there, we can show it with satellite imagery. We can say this is what it looked like when we bought it, in a year you can say look at it now it's got small trees, five years from now it'll have a forest. Transparency, science, letting people know where the money is. That's why we're getting people to support us. They can see, if somebody wants to plant trees, there are your trees.

I saw in your recent newsletter that Saving Nature recently helped expand the El Silencio Nature Reserve in the Magdalena Valley of Colombia, and you're also attempting to raise funds to buy a parcel that would increase connectivity in the cloud forests of the Colombian Andes. Can you tell me more about these two recent projects?

The Silencio project is an area that was almost totally destroyed by cattle ranching. There's an area where natural habitats remain, there's been quite a bit of deforestation. We moved in a year and a half ago, we said to a local group we have great confidence in what you're doing. We gave them 100,000 dollars essentially as a down payment, we're going to say we trust you. In the subsequent eighteen months, they raised all the other money, which enabled them to buy a huge tract of forest and pasture, and now they're going to be planting trees there. The project in the Western Andes is the second project we started, we've been working there for about a dozen years. And there's this area of about 100 square kilometers, 50 square miles. It's sort of isolated from the rest of the Andes, isolated by agriculture and cattle pastures. Bit by bit by bit, we've been helping our local partner buy that land and reforest it. We know we'll be able to reforest a good piece of that this year-that's the nature of my 4:15 phone call. We hope to get the rest of it, so we can forest in these cattle pastures. ***(For more, see savingnature.com/colombia-magdalena-valley-wetlands-rainforests/ and savingnature.com/cloud-forests-colombia-la-mesenia/).***

In the US, we're moving from a historically anti-environmental and anti-conservation president to President Biden, who's campaigned on a strong environmental platform. You have considerable experience with American politics, you've testified before the House and Senate on reauthorizing the Endangered Species Act. What biodiversity-related actions are you hoping to see, in terms of both regulation change and possible new laws passing Congress, from the Biden Administration?

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I am thrilled that one of his first appointments was John Kerry. I got to meet John Kerry a few times, he's exactly the right person to get us back on track with climate. He's enormously respected. Trump did a huge number of legislative actions that harmed endangered species, protected areas, the natural environment, and I'm fairly optimistic that President Biden will be able to stop and reverse those actions very quickly. The next two things are related. Trump and his fellow Republicans always want to say that environmental actions harm the public, that we can't make money because of this. That's always missing the point. North Carolina is still very much a Republican state, where I am around Raleigh is Democratic, but on the whole, it's conservative. Yet I believe we have more visitors to national or state parks than any other state. We have the Great Smokies, Blue Ridge Parkway, the Outer Banks, a whole variety of state parks. Millions come to North Carolina to enjoy our natural environment, and they drop a lot of money. Destroying the natural environment doesn't make any sense-and it's harmful to the economy. In the first government shutdown, they shut down the national parks. People screamed bloody murder. 300 million people visit our national parks a year, they go to stores, buy food, stay in hotels, it generates an enormous amount of activity. ***(Over 327 million visits in 2019-see nps.gov/subjects/socialscience/annual-visitation-highlights.htm).*** To the people who say environmental legislation is bad for the economy, I say, I'm ready for you, let's battle. To the extent I get the chance to make that point, I will be making it. We need to start putting some money into the various things we talked about earlier. We need to encourage countries to stop deforestation. There were programs being pushed during the Obama Administration that make it clear that investing in stopping deforestation around the world's tropics is smart. It's smart in terms of stopping the emissions of greenhouse gases, but it'll also have the potentially even bigger economic benefit of stopping the next pandemic. We need to stop wildlife trade, encourage China to stop its wet markets. I hope those international commitments can be made, and made in a way that's good for us and go to the country. If I got my five minutes with John Kerry,

"To the people who say environmental legislation is bad for the economy, I say, I'm ready for you, let's battle."

Can you tell me what you wish the public knew about biodiversity and conservation issues? The greatest misconceptions, or knowledge gaps, that you'd like to address?

I think the last point I made is the overarching one, that we Americans benefit spectacularly from the natural environments around us. This nonsense that it's okay to destroy our environment for some notion of economic growth is just pure rubbish. And globally, we've got to invest to stop environmentally damaging things that have cost us in this last year trillions in economic activity. **Well, Dr. Pimm, thank you so much for sharing your wisdom. Thank you so much for joining this interview. It's been a pleasure talking with you.**