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## How Species Save Our Lives

By RICHARD CONNIFF

*Specimens looks at how species discovery has transformed our lives.*

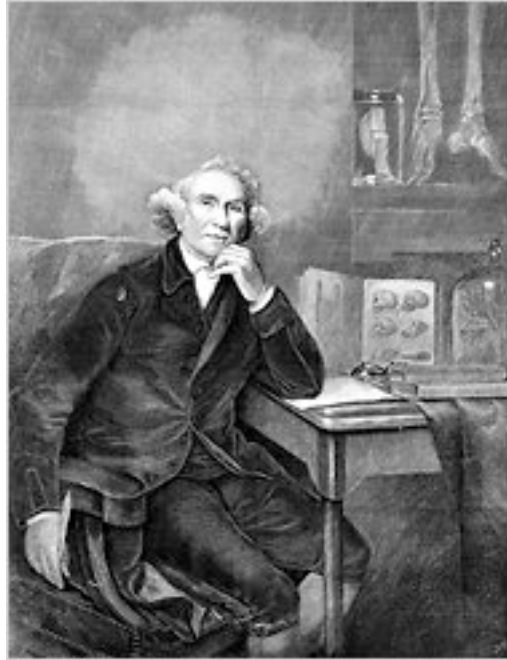
### TAGS:

CANCER, EDWARD JENNER, ENDANGERED AND EXTINCT SPECIES, FLOWERS AND PLANTS, JOHN HUNTER, MALARIA, MEDICINE AND HEALTH, SMALLPOX, TREES AND SHRUBS

When adding up the benefits from three centuries of species discoveries, I'm tempted to start, and also stop, with Sir Hans Sloane. A London physician and naturalist in the 18th century, he collected everything from insects to elephant tusks. And like a lot of naturalists, he was ridiculed for it, notably by his friend Horace Walpole, who scoffed at Sloane's fondness for "sharks with one ear, and spiders as big as geese!" Sloane's collections would in time give rise to the British Museum, the British Library, and the Natural History Museum, London. Not a bad legacy for one lifetime. But it pales beside the result of a collecting trip to Jamaica, on which Sloane also invented milk chocolate.

We still scoff at naturalists today. We also tend to forget how much we benefit from their work. Since this is the final column in this series about how the discovery of species has changed our lives, let me put it as plainly as possible: Were it not for the work of naturalists, you and I would probably be dead. Or if alive, we would

be far likelier to be crippled, in pain, or otherwise incapacitated.



Painting by Joshua Reynolds

John Hunter, a British physician, emphasized the importance of observing the natural world.

Large swaths of what we now regard as basic medical knowledge came originally from naturalists. John Hunter, for instance, was a colorful London physician, a generation or two after Sloane, and his passion for animals made him a model for Dr. Dolittle. (He may also have been the original Dr. Jekyll and Mr. Hyde for his nighttime work sneaking cadavers in by the back door.) While others were only dimly beginning to contemplate the connection between humans and other animals, he made detailed flesh-and-blood comparisons, discovering, among other things, how bones grow and what course the olfactory nerves travel.

Hunter, now regarded as the father of modern surgery, came out of a Scottish tradition that treated the study of nature as essential for developing a doctor's observational skills, and he drilled this attitude

into his students. Among them was Edward Jenner, a country doctor who spent 15 years studying cuckoos (perhaps one reason he later got labeled a quack). But this research, combined “with Hunter’s insistence on finely honed observation and cogent presentation, helped prepare Jenner’s mind for his great work,” [according to science historian Lloyd Allan Wells](#). That work was the development of the world’s first vaccine, for smallpox. Establishment physicians balked. But Jenner’s bold idea would lead in time to vaccines against countless other deadly diseases, from yellow fever to polio. He thus gets credit (with a faint nod to the cuckoo) for saving more lives than anyone in the history of medicine.



P. Goltra for the National Tropical Botanical Garden, [www.ntbg.org](http://www.ntbg.org)  
The Madagascar periwinkle is a source of cancer drugs.

You may perhaps be thinking that chocolate milk, Dr. Dolittle, and cuckoos make a very curious case for the importance of species. But our debt to the naturalists also takes more conventional form: Roughly half our medicines come directly from the natural world, or get manufactured synthetically based on discoveries from nature. The list includes aspirin (originally from the willow tree), almost all

our antibiotics (from fungi that evolved in nature, not a Petri dish), and many of our most effective cancer treatments. I can remember a pale girl in second grade going off to die of lymphoma or leukemia; children with those diseases almost always died then. Now they routinely live, because of drugs developed from the Madagascar rosy periwinkle, a flowering plant. Many patients with lung, breast, uterine, and other cancers also now recover because in 1962 a botanist named Arthur S. Barclay collected samples of the Pacific yew tree, leading to the development of the anticancer drug [Taxol](#). For those who think natural resources should stand or fall based on their current cash value, yew trees would have been basically worthless in 1961. But today, according to industry analysts IMS Health, Taxol is a \$1.7 billion-a-year product.



Daniel Loebmann, 2005

An enzyme in the venom of the South American pit viper *Bothrops jacara* revealed a new mechanism for controlling human blood pressure.

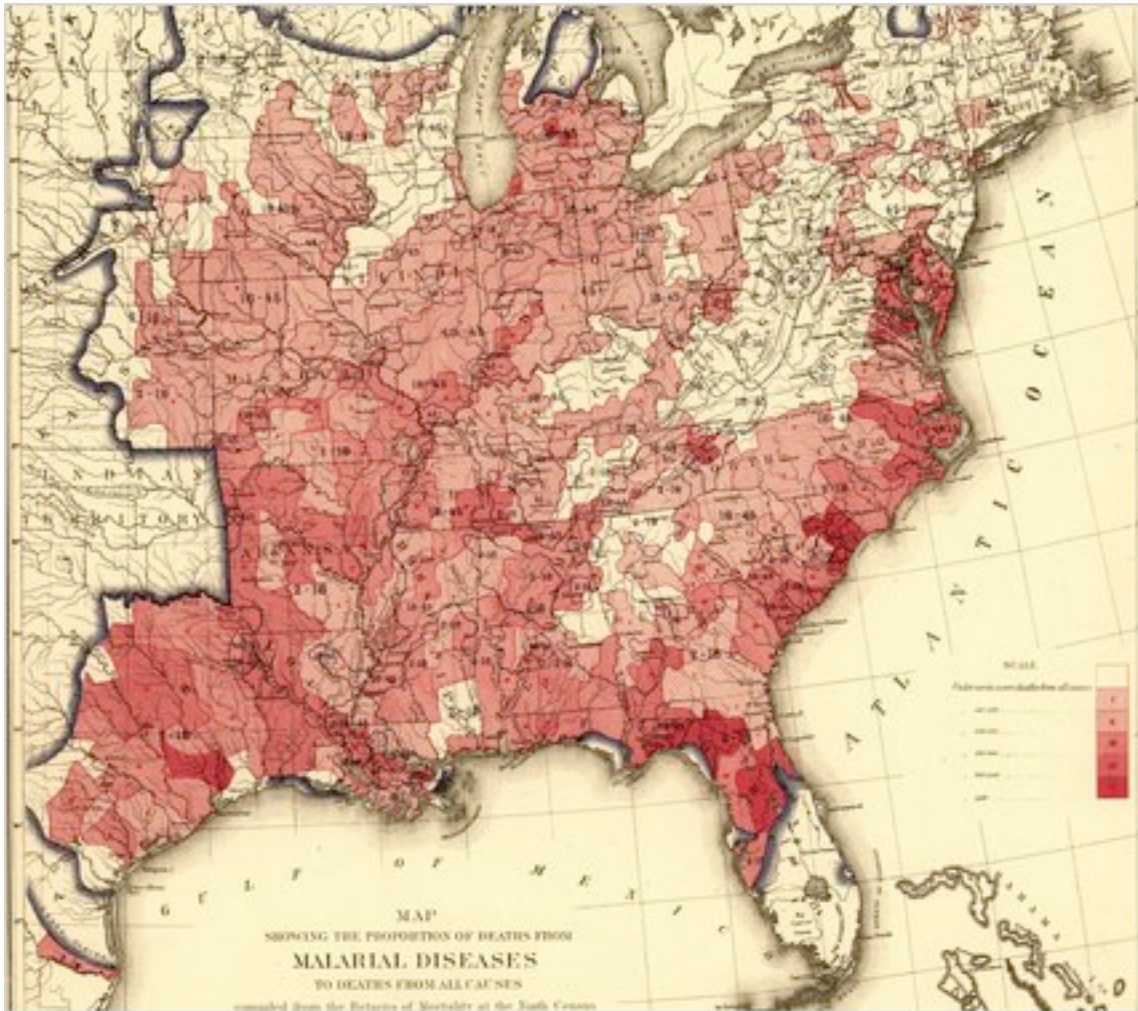
Beyond giving us powerful new drugs, discoveries from the natural world also frequently open our eyes to the unsuspected workings of our own bodies. One of the more obvious effects of being bitten by the

South American pit viper, *Bothrops jacara*, says the Harvard pediatrician Aaron Bernstein, is that “your blood pressure drops to the floor, and then *you* drop to the floor.” So kill all the vipers, right? On the contrary, says Bernstein, a co-author of the 2008 book [“Sustaining Life: How Human Health Depends on Biodiversity.”](#) The study of a key enzyme from this snake’s venom revealed a new mechanism for controlling human blood pressure. ACE inhibitors, the direct result, are now our most effective remedy for hypertension and congestive heart failure, and certainly save more lives than these snakes ever killed.

Likewise, rapamycin, [also known as Sirolimus](#), developed from a soil fungus on Easter Island, suppresses immune response through a pathway previously unknown to medicine. It’s now widely used for organ transplants and as a coating on heart stents. By itself, that might not make anyone run around with an “I ♥ Fungi” bumper sticker. But consider this: A [2009 paper in Nature](#) reported that mice dosed with rapamycin experienced a 28 to 38 percent increase in subsequent lifespan—and these mice were 60 years old (or the mouse equivalent) to start with. So Baby Boomers, are we starting to feel the fungal love?

Given the untapped potential of the natural world, you might think governments and drug companies would be racing to save species and screen them for other such extraordinary powers. In fact, says James S. Miller, vice president for science at the New York Botanical Garden, “only a tiny percentage of the world’s plants have been screened,” and even those “have only been screened against a small fraction of the diseases for which they could be effective.” Instead, pharmacologically-active compounds developed over millions of years and found effective in the world’s harshest laboratory—nature—

routinely vanish, as the species in which they evolved go extinct.



Library of Congress

Map of malarial deaths in the United States, 1870. [CLICK TO ENLARGE](#)

There's one final way we owe our lives to naturalists. The absence of epidemic disease is now so completely taken for granted that it's hard to imagine we ever lived otherwise. But malaria once routinely killed people from the Gulf of Mexico to the Great Lakes. Yellow fever epidemics swept down like the wrath of God on cities as far north as Boston. In the nation's worst outbreak, in 1878, one in eight residents of New Orleans died, and everything south of Louisville,

Ky., was “desolation and woe.” All that changed in the miraculous 1890s, when researchers suddenly identified the causes of yellow fever, typhus, plague, dysentery and, above all, malaria. In each case, the solution depended on having precise knowledge—both taxonomic and behavioral — of the species involved, from microbial organisms to mosquitoes. As Patrick Manson, the father of tropical medicine (and a great Scottish naturalist), once put it, the study of the origins and causes of disease “is but a branch of natural history.”

It’s worth remembering all this now because some scientists say we are on the brink of a new era of epidemic diseases, with H.I.V., SARS, H1N1, and Ebola merely the ominous harbingers. New diseases are emerging because logging roads are reaching into the remotest habitats. Some scientists also think that deforestation is stripping away our biological buffer — [the natural community of animals and plants](#) that would normally dilute the effect of a disease organism and prevent it from spilling over to humans.

It’s hard to accept that you and I may be vulnerable. Our brief century of freedom from disease has given us the delusion that we are separate from nature, somehow hovering above the world in which we live. So we no longer think it worthwhile to spend our money studying the species around us (better to search for life in outer space). And we accept the loss of forests and wetlands, not thinking that it may translate in time to the loss of our own families and friends. When the new wave of emerging diseases comes washing up on our doorsteps, we may find ourselves asking two questions: Where are the naturalists to help us sort out the causes and cures? And where are the species that might once have saved us?

But why wait? Why not ask those questions now?

*POSTSCRIPT: The natural world ought to be a source of pleasure and consolation. So I've avoided pushing the conservation message too hard in this series. But I also hope readers are wondering what they can do in their own lives to slow the loss of species. Fortunately, a lot of the changes we can make to help the environment also help with our own economic struggles. Here's a baker's dozen of ideas. I invite readers to add their suggestions:*

- 1. Reduce meat in your diet and stick to sustainable fisheries. (Find [a pocket guide](#) for your region.)*
- 2. Buy less stuff, or buy it used.*
- 3. Favor companies and countries that value the environment. (But beware of greenwashing. BP used to tout itself as environmentally aware.) Check the [green rankings](#) of top companies.*
- 4. Add up your annual energy consumption (including air travel, gasoline, electricity, and heating fuel) and set a program to cut back by five percent a year. Be clever and you may hardly notice. Start by making a one degree change in the thermostat, and replacing incandescent light bulbs with compact fluorescent lights. (Some energy audit programs will do it for you and you will spend less for the service than you will save in utility costs in the first year alone.)*
- 5. Walk, bike, or take public transportation. The exercise will do you good (and you might see an interesting bird or bug on route).*
- 6. Get acquainted with some of our weird, delightful fellow species. Any book by Gerald Durrell, for instance, "My Family and Other Animals," is a fine place to start,*
- 7. Learn to identify 10 species of plants and animals in your own neighborhood, then 20, and onward.*



8. Stop using lawn pesticides and fertilizers. They contaminate nearby waterways. For the same reason, don't dump old prescriptions down the toilet.

9. Reduce water use, particularly for lawns; it depletes a limited resource, sometimes directly damaging habitat.

10. Plant trees, and since maintaining them is the hard part, stick around to be a tree steward.

11. Lobby public officials to do smart things like installing more sidewalks, limiting carbon emissions, and investing in conservation of threatened species.

12. Adopt a species that needs help and actively support its conservation. Groups exist focused on tigers, rhinos, chimpanzees, gorillas, orangutans, frogs, and so on.

13. Encourage your local zoo to focus on species conservation.

Many thanks to the readers of *Specimens*. The entire eight-part series can be read [here](#).

*Richard Conniff's work has appeared in Smithsonian, National Geographic, Time, The Atlantic, The New York Times Magazine, and on National Public Radio. He is the author of several books, most recently, "[The Species Seekers: Heroes, Fools, and the Mad Pursuit of Life on Earth](#)." He blogs at [strangebehaviors.com](#). Twitter: [@RichardConniff](#).*