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All Species **Great** and Small --- Taxonomists Unite to Catalog **The Planet's Biodiversity; Possible Cost? $3 Billion**

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Corrections & Amplifications

THE ALL SPECIES FOUNDATION received a grant of $56,000 from the Gordon and Betty Moore Foundation to hold a conference at Harvard University last October. A Tuesday Marketplace article incorrectly stated that Mr. Moore gave $1 million. Also, accompanying pictures included those of the ocellated antbird and of mating termite symbionts, or parasites. Those species were misidentified as the bright-rumped Attila and termites. Also, there are 23 pairs of human chromosomes. The article incorrectly referred to the number of pairs as 24.

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SANTO DOMINGO DE HEREDIA, Costa Rica -- We know very little about life on Earth. Scientists have identified fewer than two million species, out of at least 10 million and perhaps as many as 100 million.

True, most of the unknown species are bacteria, fungi, nematodes and insects. But as Rodrigo Gamez, head of the National Institute of Biodiversity, a research facility engaged in cataloging and preserving Costa Rica's plant and animal life, says, "It's the little things that run the world."

Mr. Gamez is one of the leading lights in taxonomy -- the science of identifying, naming and organizing species -- who have come together to form the All Species Foundation. Its aim is to combine results of the world's scattered taxonomic projects into a single catalog of every living species, big and small. Taking a page from the playbook of the human-genome project, the All Species Foundation has set an audacious goal of completing the global biodiversity map within 25 years, coordinating efforts that together may cost $3 billion or more. The organizers envision a common, publicly accessible database -- in effect, a Web page for each and every species.

Like the genome project, which set out to compile a complete DNA sequence of the 24 human chromosomes, the All Species Foundation is attempting to elevate a pedestrian task to the level of a moon shot or Manhattan Project. "We think an inventory is a first step toward putting biodiversity to work for society," says Mr. Gamez. "We use the metaphor of the forest as a library, and a library is useful when you have an idea of the content of each of the books."

Leading the all-species effort are Edward O. Wilson, a Harvard University naturalist; Terry Erwin, a research entomologist at the Smithsonian Institution; Kevin Kelly, an author and former executive editor of Wired magazine, and Stewart Brand, a consultant and founder of the Whole Earth Catalog. Ryan Phelan, a software entrepreneur who is Mr. Brand's wife, has been named chief executive of the foundation, based in San Francisco.

As envisioned, the foundation will award contracts for training local "parataxonomists" around the world to collect the specimens, and for hiring professionals to lead expeditions and work on the backlog of specimens already collected. By 2007, it hopes to quadruple the pace of species description to 60,000 a year from 15,000 currently. The foundation says it won't compete for funding with ongoing collection and cataloging projects, instead providing technology and other services and acting as a cheerleader and record keeper.

Potential returns from such a global inventory include a complete understanding of ecological relationships. Without knowledge of all species, biologists say they have been working in the dark, like chemists with an incomplete periodic table of elements. Other possible benefits include an early-warning system for the

emergence of new viruses and the discovery of natural compounds useful in the pharmaceutical and other industries. Making the task even more urgent is what scientists say is an accelerating pace of extinction.

"We are not going to be able to save the diversity of life from severe deterioration in the next century unless we know what the species are," says Prof. Wilson. In October, he convened representatives of the world's major taxonomy projects at Harvard University, where they and leading philanthropists resolved to unite behind the foundation. Gordon Moore, the billionaire co-founder of Intel Corp., provided $1 million to stage the Harvard meeting and attended all three days.

The foundation's first challenge is an overhaul of taxonomy, long viewed as a boring backwater. Researchers rely on techniques little changed since the time of Charles Darwin and budgets that are just as inadequate. Around the world, there are only about 10,000 active taxonomists. Meanwhile, millions of unidentified specimens lie in backrooms of museums and botanical gardens.

A model for the global effort is already under way at Costa Rica's biodiversity institute, familiarly called InBio, which occupies a sprawling campus on a former coffee plantation. InBio researchers discover, on average, one new species each day. Local residents are trained and sent into the field to collect insects and worms. Each new species is tagged with its own bar code and entered into a database. Bioprospectors comb the findings for new drugs and natural insect- and plant-control techniques.

One dogged taxonomist is Charles Staines, a Smithsonian researcher who not too long ago was at work in an InBio lab, poring over a collection of Hispinae beetles pinned in a white tray, some of them leaf-miners that keep the growth of certain Central American plants in check. Each of the 15 specimens, labeled with its own bar code, is a species previously unknown to science and occupies a unique niche in its particular ecosystem.

During his career, Mr. Staines expects to add 1,500 or so species to the list of approximately 3,000 already described. It is unlikely competing researchers will beat him to the punch. "I'm the only person in the world who works on this group of beetles, so I don't have to worry about that," he says. "I keep looking for nice graduate students, but nobody's really gotten excited about this group other than myself."

The tools for modernizing taxonomy are at hand, Mr. Kelly says. Pattern-recognition software would let collectors quickly separate known and unknown species. Digital and 3-D imaging techniques and common data protocols could eliminate the need to physically ship "type" or reference specimens around the world. Electronic keys could speed identification and reduce errors. Such methods could increase the rate of new-species identification by a factor of 100 or more. And they could reduce costs, bringing down the bill for identifying a new species to a few hundred dollars from about $2,000 currently. In that way, the global project's total cost could come in at about $3 billion, less than the cost of the human-genome project.

It is still a lot of money for a project that, by itself, won't save any species from extinction. In December, Intel's Mr. Moore, a major funder of environmental causes, made a $261 million grant to Conservation International to protect key tracts of land and establish field stations around the world to monitor environmental change. But beyond the $1 million for the Harvard meeting, he has pledged no funds for the global species inventory.

"It's something that would be nice to have, certainly, but it's not necessary to complete it in order to take major steps toward conserving what's around," Mr. Moore says.

Prof. Wilson, who has been advising Mr. Moore, is heading the committee overseeing the conservation group's field stations and hopes to use them in the foundation's species-collection efforts. He presses the notion that conservation and taxonomy must proceed simultaneously, "The conservation biologists need this information for the kind of science and planning they want to do," he says. "They need to know about the millipedes and what is particular about the fungi in these areas they are trying to protect."

At InBio, Mr. Gamez hopes the discovery of a new species will one day merit as much attention as the discovery of a new star. "The difference," he says, "is that in the case of living organisms you can derive very direct benefits from the discovery."

Counting Critters

Scientists have identified most of the higher-order animals and plants, but the vast majority of bacteria, fungi and `creepy crawlers' have yet to be discovered. A sample of those life forms:

Group	Identified	Estimated
Viruses	4,000	400,000
Bacteria	4,000	1 million+
Fungi	72,000	1.5

million		
Protozoans	40,000	200,000
Algae	40,000	400,000
Plants	270,000	320,000
Nematodes	25,000	400,000
Crustaceans	40,000	150,000
Arachnids	75,000	750,000
Insects	950,000	8 million
Mollusks	70,000	200,000
Vertebrates & close relatives	45,000	50,000
Others	115,000	250,000

Source: Global Biodiversity Assessment, United Nations Environment Program

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