

A new project to take inventory of every living species may be the largest scientific effort ever

A Darwinian quest

BY MICHAEL R. LEGAULT

Scientists may finally be on track to finish work begun by Aristotle more than 2000 years ago.

Experts say there are as many as 20 million to 100 million species of plants, animals and microbes on the Earth, yet only about 1.5 million have been positively identified. The taxonomic hole is a large sore spot in the collective psyche of biologists and one of the most glaring pieces of unfinished business in the sciences.

Now, a group of researchers and philanthropists, including *Wired* magazine's co-founder Kevin Kelly, has announced a plan to identify every living species on Earth in the next 25 years at an estimated cost of US\$20-billion.

The project, called the All-Species Inventory, is in its formative stages — raising money and rallying scientists, investors and politicians around the world.

It is hardly surprising with a project this ambitious, those involved should speak in grand terms, describing it as possibly the largest scientific effort ever in terms of money and manpower.

"In scope, this is at least 10 times bigger an endeavour than the Human Genome Project," says Terry Erwin an entomologist at the Smithsonian Institution and a science advisor to the All-Species Foundation, the organization co-ordinating the inventory.

"With the [Human] Genome [Project] scientists were out to identify a limited number of genes on 23 known pairs of human chromosomes. This is way more complex and open-ended."

Kelly is even more lyrical: "The beauty of it is that it is a totally audacious, almost mythical quest."

The project, intended to promote biodiversity by quantifying it, came into being about 18 months ago. About 35 scientists gathered in San Francisco to thrash out some of the problems such an inventory might face. There were bottlenecks everywhere — in the field, at the museums, in the publication process. Plus, a controversy was raging in the hermetic world of taxonomists. The old Linnaean system that had been invented in the mid-18th century to catalogue species was thought to be hopelessly outdated in the age of genetics.

In the Linnaean system, species are classified using visual and structural differences. For example, all domestic cats are of the genus *felis*, but a tabby and a Siamese are different species. Advocates of a newer system, called phylocode, say the Linnaean system gives us little information about how closely related a tabby cat is to a Siamese.

What remains to be identified today is mostly smaller life forms such as parasites and insects, which are not only more difficult to find, but more difficult to identify using Linnaeus's visual methods. A new system was be-

ing championed by some at the meeting. How could scientists hope to identify all the species on Earth when there was not even general agreement about what to call them?

In the end, however, there was unanimous support for the endeavour. One of the scientists, Evert Schlinger, an entomologist attached to the California Academy of Sciences, came up with US\$1-million in seed money to get the project off the ground.

The scientists expect modern technology, particularly the Inter-

Species grouped by evolutionary relationship

net, to play a crucial role in the project. If all goes according to plan, much of the collection will be done by non-Ph.D. naturalists, "para-taxonomists" and citizen scientists, says Daniel Brooks, a parasite taxonomist at the University of Toronto and science advisor for the All-Species Foundation.

Under a system envisioned by the foundation, an individual on the Amazon River discovering what is thought to be a new plant would use a laptop computer and satellite phone to classify it over the Internet. This would entail answering questions about the

colour of the flowers and other details, refining the specimen's description until it is complete.

Technology will also help replace the arduous and time consuming visual identification process. "Taxonomists are identifying species in exactly the same way that Darwin did 150 years ago," says Kelly.

He expects scientists to benefit from digital imaging and pattern recognition technology that, when designed for the field, will be able to distinguish between the slight colour variation of spots on the wings of two different species of moths.

New molecular methods of identification, such as genetic fingerprinting, will also help speed identification of closely related insects and other small-scale life forms, says Robert Anderson, research scientist of entomology, at the Canadian Museum of Nature.

Many of our medicines, whether ancient or modern, are derived from plants. As the world's population grows, more land is being cultivated for agriculture or urban development and many species of plants and animals are dying out. Those involved in the inventory say it is important, not only to increase our knowledge, but also because the discovery of new species could lead to new food crops and drugs.

Some biologists have argued the launch of a project to identify all of the world's life is the ideal time to scrap the old Linnaean method of classification in favour of a

more up-to-date system, where plants and animals are strictly grouped by their evolutionary relationship to one another, rather than by their similarities in appearance.

"It's really a non-starter," says Erwin of the Smithsonian. Although he and most scientists see the benefits of a more modern system, "We're not about to go away from the Linnaeus method for this project."

Despite the project's grand ambitions, Kelly says the All-Species group is being careful to keep its feet on the ground. "We don't want to raise unrealistic expectations," he says.

For example, one of the objectives for this year is to complete a limited taxonomic survey of a few square kilometres, perhaps somewhere in North America, to raise public awareness and generate support for the project.

Erwin says scientists should have no trouble being realistic about the challenges of the project. "Since the 1992 Rio Summit [on the environment and development], countries have started to think much more nationalistically about their resources," Erwin says. "Just getting the permits to do field work in countries with different laws and political systems is going to require a lot of diplomacy, which is not usually a skill associated with mud-covered biologists."

*National Post, with files from
The San Francisco Chronicle
and USA Today*

ce
th
ta
dr
pe
I
H
M
sn
"I
th
tr
in
de
as
"

su
ho
te
f
ti
h
sl
p
tl

J
o
s
f
g
I
e

v
i
i