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Libraries of Life

By NATHAN K. LUJAN and LARRY M. PAGE FEB. 27, 2015

HIDDEN behind the popular displays at many of your favorite natural history museums — in their basements, back rooms and, increasingly, off-site facilities — sit humanity's most important libraries of life, holding not books but preserved animal and plant specimens, carefully collected over centuries by thousands of scientist explorers.

These specimen collections serve as the bedrock of our system of taxonomy — the rules by which we classify life — and are integral to our understanding of the threats, origins and interrelationships of biodiversity. And yet, thanks to budget cutbacks, misplaced ethical critiques, public misconceptions and government regulations that restrict scientists while failing to restrict environmental exploitation, the continued maintenance and growth of these libraries is in danger.

Though most visitors never know they are there, natural history collections are as critical to modern biologists as libraries are to journalists and historians. Indeed, like good literature, each museum specimen allows reinterpretation by every person who examines it.

A taxonomist looking for minute differences between species, and a biogeographer investigating species distributions across a landscape, will find the same specimen valuable for different reasons, as will an evolutionary biologist resolving the interconnectedness and history of life, and an ecologist piecing together the intricate functions of whole ecosystems. These collections are particularly critical in today's era of rapid ecological and climate change, providing a unique and vitally important glimpse into ecological conditions of the past.

In the same way that students of the humanities use new critical approaches to pull novel ideas out of old books, scientists regularly use new technologies — like

stable isotope analysis, high-throughput DNA sequencing and X-ray computed tomography — to draw new discoveries from sometimes centuries-old specimens. The never-ending story of every specimen continues to unfold for as long as it is cared for, but threats to this care have recently accelerated.

In October 2014, a Smithsonian botanist and curator named Vicki Funk cataloged recent budgetary and curatorial cutbacks at several of our nation's premier natural history museums, including the Field Museum in Chicago, the California Academy of Sciences and the New York State Museum. The curatorial staff at the Field Museum dropped by almost half, to 21 from 39, between 2001 and 2014, and that's at a relatively well-funded American institution.

According to an editorial last November in the journal Nature, most natural history collections in Italy are virtually derelict, with up to a third of all specimens lost to neglect. And many tropical countries, which have disproportionately rich biodiversity and booming economies linked to resource extraction, allocate few if any funds for cataloging their natural heritage — shifting greater responsibility to those few European and North American institutions that maintain robust global collections.

Funding cuts aren't the only threat. In the journal Science last April, the Arizona State University ethicist Ben A. Minteer and his co-authors made the dubious claim that scientific specimen collection had significantly contributed to many species' decline and extinction. They recommended that such collections be minimized in favor of nonlethal tissue samples, photographs or other recordings, particularly for species thought to be under threat of extinction.

They aren't alone. In October 2014, the Harvard entomologist and wildlife photographer Piotr Naskrecki received withering public criticism, including at least one death threat, for mentioning in a blog that he had euthanized and preserved a single specimen of the relatively common and widespread Goliath bird-eating spider, which he later deposited in Guyana's natural history museum.

We heartily agree that the impact of scientific collections on species should be minimized. But to deny the value of specimens is to accept ignorance of many of the requirements for understanding the evolution, ecology and conservation of biodiversity.

To the extent that they can still capture a rich and verifiable record of biodiversity at a single point and time, many biologists already strive to maximize nonlethal sampling techniques, including camera traps, audio recordings and tissue collection. But these tools are often effective only for organisms that can be identified with certainty in the field. What about the estimated 86 percent of all species that remain unknown? And while photographs can record an organism's external appearance, they reveal nothing about its internal anatomy, reproductive state, diseases and genetics.

And specimen collection need never threaten extinction. It is hard to imagine any modern scientist collecting more individuals from a wild population than are regularly lost to predation and disease.

As we enter an age of human-dominated landscapes, it would be a crime to restrict the cataloging and study of biodiversity and consign natural history museums, our most diverse archives of nonhuman life, to selling themselves only as educators and entertainers. The research, growth and maintenance of scientific collections must be strongly and publicly supported.

There is no substitute for collecting and curating specimens for long-term study — not just for scientists studying biodiversity today, but also for future generations, whose need for clues to the spectacular breadth and complexity of unaltered ecosystems will be even greater than our own.

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