

Realizing the tremendous potential of biological collections will require strategy, action and investment

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A new report on biological collections from The National Academies of Sciences, Engineering, and Medicine points to the need for

sustainability, digitization, recruitment of a diverse workforce, and infrastructure upgrades to meet the challenges now facing science and society. The report, "[Biological Collections: Ensuring Critical Research and Education for the 21st Century](#)," says these collections are a critical part of the nation's science and innovation infrastructure and a fundamental resource for understanding the natural world.

"This report, two years in the making, demonstrates the diverse benefits for science and society of building robust biodiversity infrastructure," said Joseph Cook, member of the report committee and Regents Professor of Biology and Curator of Mammals of the Museum of Southwestern Biology at The University of New Mexico.

"Many biological collections are at a critical juncture," said James Collins, co-chair of the committee that wrote the report and Ullman Professor of Natural History and the Environment at Arizona State University. "They are a cornerstone of research and education related to past and present life on Earth. Our study found that biological collections need increased investment to serve us in the way we expect, while at the same time expanding their potential for new uses related to science and society."

Collections are important resources for research into changing conditions on our planet, by providing critical samples for fields from biology, to chemistry and engineering that are using emerging technologies such as genomics, stable isotope chemistry, and 3-D scanning. Biological collections underpin numerous basic science discoveries and innovations. Research using biological collections, for example, has advanced our understanding of biodiversity loss, [environmental change](#), emerging human diseases—including hantavirus, Zika and COVID-19—and has led to important biotechnology laboratory techniques, including CRISPR and polymerase chain reaction (PCR) tests.

These collections and their associated data also provide authentic and tangible educational resources, both in formal training for the science and technology workforce, and in informal learning through schools, citizen science programs, and adult learning. UNM was recently awarded a \$3 million grant from the National Science Foundation to initiate the Museum Research Traineeship (MRT) program. The MRT develops new ways to connect museum resources to graduate education, research, and training of a diverse STEM workforce.

The University of New Mexico's Museum of Southwestern Biology plays a pivotal role in conducting research of national and international significance on the evolution, ecology and conservation of plants and animals, serving as an international resource with an extensive informatics resource on biodiversity. The museum has grown significantly to more than four million plant and animal specimens spread out over eight divisions including Amphibians & Reptiles, Arthropods (insects, spiders, etc.), Birds, Fishes, Genomic Resources (frozen tissues), Mammals, Parasites, and Plants.

UNM holds world-class biological collections, with parasites, mammals, and frozen tissues among the largest worldwide and the other divisions are among the largest in the region. These have become critical infrastructure for applied and theoretical studies ranging from identifying and characterizing zoonotic pathogens (e.g., hantaviruses in New Mexico and globally), to understanding how changing climate has impacted species, to physiological responses of organisms to stress, endangered species management, and investigations aimed at understanding how species have solved fundamental engineering problems, including flight.

"The amazing span of topics that these specimens are used to address never ceases to amaze me. It is quite phenomenal that UNM is an international leader on several fronts in the specimen-based sciences,"

said Dr. Cook. "Every week we see new applications for these materials and the future will surely unveil many exciting new discoveries."

The report says that sustained support will be paramount to support [collection](#) growth and ensure availability for research. New investments in personnel, infrastructure, digitization, and other upgrades go beyond what annual budgets have historically covered. Also, noted in the report was that the workforce pipeline necessary for biological collections is fundamentally different from the broader science workforce pipeline. Collections, host institutions, professional societies, and funders should collaborate to develop and strengthen the pipeline. Making specimens and their data digitally accessible is one crucial component of achieving better access to collections.

"This report validates what we have been working to build at UNM over the last 80 years," said Christopher Witt, Professor of Biology, Curator of Birds, and Director of the Museum of Southwestern Biology, "and we're very lucky to have outstanding curators, collection managers, and students who can pursue this vision. Dr. Cook's leadership on this report speaks for itself, and it provides some insight into why UNM's natural history collections are exemplary."

As the nation's largest supporter of biological collections infrastructure and management, NSF has a particularly pivotal role to play, the report says. NSF should lead efforts to develop a national vision and strategy, such as a National Action Center for Collections and a Decadal Survey, for the growth of biological collections, their infrastructure, and their ability to serve a range of scientific and educational needs. Collection leaders should also develop strategic plans outlining their individual infrastructure needs.

More information: Biological Collections: Ensuring Critical Research and Education for the 21st Century: [www.nap.edu/catalog/25592/biol ...](http://www.nap.edu/catalog/25592/biol...)

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