Florida’s Archbold Biological Station gives online access to unusual natural history collection

The Archbold Biological Station, a world-renowned ecological field station based in Florida, USA, is uploading its natural history collection onto the Internet for the first time. The diverse collection, containing 270,000 specimens of more than 10,000 species will provide researchers and students around the world, with access to this rich source of ecological data. This highly collaborative project, which involves making data and images of thousands of biological specimens available online, is funded by NSF and is being led by Dr Hilary Swain and Dr Mark Deyrup.

Founded in 1941 by Richard Archbold, a biological explorer, the Archbold Biological Station (Archbold) is an internationally renowned, not-for-profit biological field station located in central Florida. Archbold manages nearly 20,000 acres of land, is dedicated to research and conservation programs, and conducts scientific studies at more than 50 locations throughout the headwaters of the Everglades – a 2.6-million-acre watershed in south-central Florida encompassing those lands and waters that drain south to the Everglades and onto the coasts. The region is one of the most important biodiversity “hot spots” in North America. The endangered Florida scrub is of special interest, being a harsh and stressful habitat that is home to many plants and animals found nowhere else on Earth. Through its research, education and outreach programs, Archbold aims to conserve this biodiversity, and maintain vital ecosystem processes that support Florida’s natural environment and its people. The research addresses many of the most important issues facing our world today, such as: climate change, species and land conservation, water quality, and sustainable food production. The Station is also home to the Archbold Natural History collection – a diverse record of life taken largely from the habitats of the ancient Lake Wales Ridge, a 100-mile-long north-south sand ridge running up the interior of the Florida Peninsula. The 75-year-old collection has grown through the years, and currently contains more than 270,000 specimens and over 10,000 different species. Although smaller than the vast collections at some universities and at large museums, the Archbold collection is valuable in that it is representative of in-depth and very rich regional collections, with a nearly complete local diversity rarely captured elsewhere. “We all believe that natural areas teem with biodiversity,” says Archbold entomologist Dr Mark Deyrup. “Here is proof. For example, more than 1,500 species of beetles live on this single site.” Overall, it is one of the largest collections for any North American site and includes a wide variety of arthropods, plants, mammals, birds, fish, reptiles and amphibians. It also houses specimens of threatened and endangered plants and animals, giving scientists a unique opportunity to study these rare species. And it includes specimens of many newly arriving species, some of which are invasive, thus tracking changes in Florida’s diversity over time. Now, with National Science Foundation (NSF) Collections in Support of Biological Research (CSBR) funding, Dr Hilary Swain and colleagues, aim to share the Natural History collection with a much wider audience, putting Archbold on the global stage.

DIGITAL COLLECTION
During the last couple of years, a team of scientists led by Dr Swain at the Station have been diligently photographing specimens, and adding label information of the flora.
The online arthropod collection in particular is absolutely outstanding, as the Archbold Natural History collection is best known for its pinned collection of 250,000 insects, including 137,450 preserved specimens of ants; this encompasses the largest collection of Florida ants in the world. Currently a total of 9,718 ant specimen records – representing 236 species of ants – have been uploaded online to SCAN, including detailed drawings completed by Dr Deyrup (see example opposite). Over the years, the arthropod collection has served as the basis for many scientific papers, contributing to numerous studies requiring insect identification, and was the main source for the Dr Deyrup’s 2016 book Ants of Florida. The book is a natural history and identification guide for all 239 species of Florida ants.

The collection also includes specimens of insects that were captured feeding on nectar and pollen of local flowers. This record of ‘flower-insect visitor interactions’ was begun in 1983. It includes more than 5,000 specimens of bees and wasps, 1,500 flies, 200 Lepidoptera (butterflies and moths) and 500 beetles, with labels that record the species of flower being visited by the insect, the location, and the date of capture. So far, a total of 10,868 flower-insect visitor specimens have been uploaded to the online database SCAN, representing a total of 952 insect species. This ecological dataset is an important resource for biologists, as it can answer questions like: Which bees visit which flowers and when? At the community level, this information is now available to allow researchers to model the stunningly complex network of relationships among flowers and insects at a single site.

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This collection grants an amazing project to be involved with! What are the major benefits this grant will bring? Swain: First and foremost, the major benefit of the grant is to enable and enhance more scientific research. As anticipated by our funders, the National Science Foundation, we already see that having Archbold’s collection online is shining a light on these data for scientists around the world, not just those involved with Archbold. Whether scientific interests lie in identifying new species, cataloguing biodiversity, highlighting the arrival of new species, noting changes in the timing of flowering, or building complex networked analyses for insect flower visitors, this collection is a treasure trove of ecological information just waiting for scientific discovery and synthesis. Archbold is one of many biocultural field stations around the world that are important to scientists because although their collections are relatively small, they are extremely important representatives of regional biodiversity.

Leon: One major benefit of this grant is demonstrating the importance of natural history collections, and how they can be used outside of a museum setting. More importantly, the flowers in the collection can demonstrate how a well-curated, regional, on-site collection can provide useful information not only for taxonomy and systematics, but also for ecology and conservation.

Deyrup: Natural history collections are currently cascading onto the Internet, escaping from their traditional wooden cabinets, moulder mortuaries to present their true aspect as enormous and dynamic sources of original information.

Why is it important that a record of life in the Florida Scrub habitat is made and preserved? Swain: Since scientists first visited the Florida scrub and started collecting specimens of its plants and animals, it has always been recognized as one of the most threatened ecosystems in the USA. Like nowhere else on Earth, there has always been a scientific race to ensure we capture and catalogue all its precious life and unique adaptations.

Deyrup: As we consider our own survival in a world of increasing environmental stress, we could benefit from examining the information and morphology associated with our fires and invasions, and swept with fires, floods and droughts. Leon: The Florida scrub is a unique habitat with diverse flora and fauna and an important resource for research and conservation.

How will school children benefit from accessing the database? Swain: Children are natural observers. Their curiosity especially draws them into the spectacular photography of our plants, birds, and the bugs in the online databases. Their faces watch with awe as a small bug looms large on the screen: they see the spectacular colours and intriguing shapes. Here lies inspiration for a future structural engineer, computer modeller, fashion designer, or budding ecologist. Hopefully it will also draw them into the natural world where they can use their sharp and laser-focused eyes to be further intrigued by nature.

Leon: Children will learn about the diversity found in the Florida scrub. It might encourage exploration, not only of the scrub, but of different natural habitats. It might also supplement their learning, research projects, and general interest of biodiversity. Many children that visit Archbold are given tours of the Archbold collection; they learn about the vast diversity of insect species cataloged at Archbold. This might entice some to start their own personal collections.

Q&A with Dr Hilary Swain, Dr Mark Deyrup and Stephanie Leon

RESEARCH OBJECTIVES
Dr Swain, Dr Deyrup and their collaborators’ aim is to increase digital access to the Archbold Collection, enabling studies of biodiversity in ways that would be difficult to replicate elsewhere, and enhancing its conservation value as a critical repository for species of the globally threatened Florida scrub. In addition, this project aims to offer students and research interns more opportunities for use of the collection as a source for research ideas and study materials, as well as provide new marketing for this next generation of field station users in the importance of collections.

FUNDING
National Science Foundation (NSF)

COLLABORATORS
Co-Project Investigators: Dr Mark Deyrup, Dr Reid Bowman, Dr Eric S Menges, Dr Betsie B Roethermel, Stephanie Leon and Stephanie Koontz.
Research Interns: Gabrielle Lafolla, Carly Tolles, Ryan Huulman, Dylan Rick, Katherine Beigel and Trevor Young.
Graduate Students: Tram Nguyen and Young Ha Suh from the Cornell Lab of Ornithology who aided in the digitisation of bird specimens.
Nancy Deyrup is a volunteer in the entomology program who singlehandedly digitised the majority of the insect-flower database. Dr Butch Norden, volunteer, organised the amphibian and reptile collection for digitisation.

BIO
Hilary M. Swain has been the Executive Director of Archbold since 1995, directing activities at Archbold Biological Station and the MacArthur Agro-ecology Research Center (MAERC). She works with a staff of 50 involved in long-term research, environmental monitoring, science education for students and the public.

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