Life. Preserved.

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The university’s collections of plants, animals and fossils are an invaluable resource for researchers working in many different areas.

A small building tucked unassumingly behind UC Santa Barbara’s Harder Stadium is home to a refrigerated menagerie of reptiles and amphibians. Inside, rows of glass jars hold the preserved remains of a multitude of species: colorfully banded king snakes, the coiled, dappled bodies of rattlesnakes, rotund toads, rare California tiger salamanders, as well as an assortment of related specimens: rodents.
retrieved from the stomachs of snakes, frogs? eggs, tadpoles.

Much of this collection is the work of Professor Sam Sweet, (left) a herpetologist who studies reptiles and amphibians who came to UCSB in 1979. In the decades since, he?s amassed an extensive collection of creatures, most of them from southwest California, although there are a few exotic outliers lurking on the shelves: a sea snake, a cobra, a chameleon.

These specimens are part of UCSB?s 350,000-strong collection of plants, animals and fossils, initiated in 1945 and now housed at the Cheadle Center for Biodiversity and Ecological Restoration (CCBER), founded in 2005 and named for former UCSB chancellor and botanist Vernon Cheadle.

These collections, some of which reach back more than a hundred years, are a rich resource for teaching and for scientific studies, not just for researchers interested in identifying and classifying specimens, but for scientists working in a host of different areas, from climate change to restoration.

?A lot of universities have given away or discarded their collections,? says CCBER director Jennifer Thorsch, ?but we have quite a breadth and depth of collections that are used by students and researchers people from around the world.

?They?re valuable,? Thorsch explains, ?for studies on evolution, climate change, invasive species, diseases, extinctions?and for who-knows-what research that might be important in the future.

?We don?t know how these collections might be used in 10, 15, 20 or 100 years,? Thorsch says. ?One hundred years ago the scientists who were collecting had no idea what the value of these specimens might be. When a lot of these collections were made, for instance, they couldn?t do DNA analysis.?

Professor Emeritus David Chapman, showing off some of the older specimens in the extensive algae collection that he oversees, says, ?Changes due to climate and environment just weren?t thought of back when these were collected.?

The specimens in CCBER?s archives range from diatoms?microscopic, mostly single-celled algae that inhabit oceans, ponds and soils?to the hide of a bear, stretched out
atop the steel cabinets that house the bird collection, its hefty paws poking over the cabinet doors.

The vertebrate collection includes skins and skulls (more practical to store than taxidermied mammals), thousands of birds, stuffed and laid out in drawers, along with sundry feathers and wings, and various preserved fish.

The herbarium collection encompasses about 100,000 plant specimens, pressed, dried, mounted on cardboard sheets and stored in brand new cabinets, paid for out of a $270,000 National Science Foundation grant and a gift from the Cheadle family?funds that also covered ?desperately needed? cataloguing and preservation work on the plant collection, Thorsch says. Seeds and cones are stored as well, and the herbarium also includes tens of thousands of microscope slides that make up the plant anatomy collection. The university also has a living collection, which CCBER has turned into the Campus Flora Project, with interactive maps as a guide to the several hundred plant species from six of the world?s seven continents.

Although CCBER?s collections include specimens from around the world?kelp from New Zealand, birds from Peru, Southern American snakes?the herpetology, bird and mammal collections, in particular, are regionally focused, and therefore unique.

?Noone else has collected in this area like Sam has,? Thorsch says of Sweet?s specimens. Other important CCBER holdings are the 10,000 specimens of algae; the plant anatomy collection; the extensive archive of oaks built up by the late Professor of Botany Cornelius H. Muller; and the pine collection amassed by Robert Haller, an emeritus UCSB faculty member who visits the herbarium regularly to work on identifying and annotating his specimens.

Recently, UCSB Professor Emeritus James Kennett, a marine geologist, donated his collection of ocean sediment cores to CCBER. These sediments, which are filled with microscopic fossils of marine organisms, provide a record of climatic and oceanographic conditions stretching back millions of years. ?It?s more than a collection?it?s an archive
of material for future work, Kennett says. It’s going to be a useful baseline to have these collections for comparative purposes.

Carla D’Antonio, CCBER faculty director, shows off California poppy specimens from UCSB’s herbarium. A study of hundreds of poppy specimens found that 50 years ago the plants bloomed in late April or May, whereas this glorious display now begins in late March—a shift that could reflect changes in climate.

Insights into climate change can also be found in the herbarium, which includes specimens gathered over many decades and a few that date back to the 1800s.

If you look at enough specimens you can build up a story, says Carla D’Antonio, CCBER’s faculty director, who delves into the herbarium as part of her studies on plant and ecosystem ecology.

The collection of hundreds of California poppy specimens is being used by a student in the Department of Ecology, Evolution and Marine Biology to investigate whether the plants are now blooming at a different time of the year than they once did. He found a significant shift in flowering time, which could reflect changes in climate. These days, poppies burst into bloom in late March, whereas 50 years ago, this glorious display didn’t get underway until late April or May.

There’s an enormous amount of information on these sheets, D’Antonio says, from straight morphology to tracking these kinds of lifecycle changes.

The beauty of a collection like this that goes back so far, Chapman says, is that we can look at how things have changed in the last 150 years. You can then ask, Are we seeing changes in the flora because of changes in environmental conditions? These specimens preserve a history of invasion and change, she says, and not just by weeds?diseases and insect attacks are evidenced by mottled and chewed leaves.
Animal specimens, too, can be a rich source of information on diseases, pollution and other crises. Researchers have analyzed feathers from bird collections to study the historical levels of the now-banned pesticide DDT in the Southern California environment, for instance.

The CCBER collections also preserve a record of what once grew, fly, hopped and slithered around areas that are now home to shopping malls, suburbs and vineyards.

Sweet holds up a jar of legless lizards collected from parts of northern Santa Barbara County as an example. Everywhere these things live is becoming a housing development, he says. When that happens, Sweet takes the opportunity to expand the CCBER collections, lodging a record of what’s being lost. We’ll do what we can to get samples before the bulldozers go over, he says or after. We’ll be out there walking behind the bulldozers. We pick up the animals that are in two pieces rather than six.

That reflects today’s more conservative approach to collecting, which takes advantage of opportunities presented by bulldozers and busy roads. Roadkilled gopher snakes, for example, are easy to pick off Highway 166 in northern Santa Barbara County in the spring, when young snakes leave their nascent burrows and slither off in search of new territory, Sweet says. Many recent additions to the jars of rare California tiger salamanders exhibit obvious squish marks. These salamanders might someday be the only record of the species from a particular area, or even the legacy of a lost species. The collections, D’Antonio says, preserve a history.

To make the most of these rich archives, CCBER is taking advantage of 21st century technology. Exact locations where the specimens were gathered, digital photographs and other relevant information is being added to a digital database. Ultimately, it will be accessible to researchers around the world.

We try to capture the information scientists want when they’re looking at specimens, Thorsch says. Preserving these collections for possible future uses we can’t even dream of today is so important, she adds.

Links:

- CCBER [2]
- Carla D’Antonio [3]
- Sam Sweet [4]
(From left) Professor Emeritus David Chapman oversees the extensive collection of algae; Heather Fox, a curatorial assistant in the vertebrate collections, among jars of preserved reptiles and amphibians; CCBER Director Jennifer Thorsch with a plant specimen from the herbarium.