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'One Of A Kind' Collection Of Animal Eyeballs Aids Research On Vision Problems

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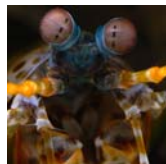
Eyes come in all sizes. These belong to a domestic cat (from left), an owl and an octopus. The Comparative Ocular Pathology Laboratory of Wisconsin has 56,000 specimens in its collection — including 6,000 from more exotic species.

From left: Andyworks, Ralf Hettler, vicmicallefi/StockPhoto

There is a little room at the University of Wisconsin-Madison that is filled with the eyeballs of animals — everything from the duck-billed platypus to the two-toed sloth

to the boa constrictor.

"We think we're the largest collection of animal eyeballs," says Dick Dubielzig, who founded the Comparative Ocular Pathology Laboratory of Wisconsin in 1983, but he admits that this is hard to prove. "Maybe we should go to the Guinness people and see if they have an answer to that."



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If there's a bigger collection out there, though, he has never heard of it. And every day, the mail brings about 20 more specimens to the lab. "About two-thirds of what we get are globes," Dubielzig says. "That means the whole eyeball."

The collection now has more than 56,000 eye specimens. Most are from dogs, cats and horses — sent in by vets who wanted help diagnosing eye disease. But the lab also has about 6,000 specimens from more exotic species.

A few days ago, for example, a couple of okapi eyes showed up, courtesy of the Bronx Zoo in New York. Dubielzig says it was the first time the lab had gotten eyes from this strange-looking relative of the giraffe.

"We pretty much have any kind of an animal you can think of — any kind of a mammal you could think of," he says.





Pathologist Gillian Shaw retrieves glass slides that hold carefully cataloged sections of eye tissue from the Wisconsin lab archive.

Courtesy of University of Wisconsin-Madison

Pathologist Gillian Shaw put on gloves and picked up one of the okapi eyeballs, which looked like a wet, gray hunk of ragged flesh about the size of a golf ball.

"I think this animal had sudden blindness or something, yeah?" she asked a colleague, who consulted the submission form that came with the eyes. Shaw then used a razor blade to slice the top off the eyeball, so she could peer down at the vitreous, a gel-like substance that helps the eye maintain a round shape, and the lens.

"I don't see anything grossly wrong, or obviously wrong," Shaw mused, "though I admit this is the first okapi eye I have seen myself."

When eyeballs like these arrive, she and her colleagues take photos and embed the eye in paraffin wax to preserve it.

Preserved samples fill blue boxes that are stacked up against the walls of this lab, and thin sections of eyeballs are put on the microscope slides that fill cabinet drawers. It's all carefully organized. So if you're a scientist who wants to study the architecture of the eye — or eye disease or anything eye-related — this is the place for you.

"This is a resource that's unlike anything else in the world. It's a one of a kind," says Ivan Schwab, an ophthalmologist at the University of California, Davis, and the author of a book called *Evolution's Witness: How Eyes Evolved*.





Shaw inspects one half of a dog's diseased eye that was submitted to the lab for analysis. She found evidence of extensive bleeding inside the eyeball and a detached retina — likely caused by chronic high blood pressure.

Courtesy of University of Wisconsin-Madison

"It's the Taj Mahal of ocular specimens," Schwab says.

And the collection even has a very special human eye. One of the reasons Dubielzig got so interested in eyes is that one of his own gave him very poor vision, starting in childhood. It turned out he had an exceedingly rare eye disease, and his eye was later surgically removed — he added it to Wisconsin collection.

"What I say is that you're not really an eye pathologist unless you have your own eye in your eye collection," Dubielzig jokes.

Sometimes researchers ask the lab to help them figure out whether a species even has an eye and, if so, where it is.

"We tried to find the blue glaucus eye," recalls Shaw, with a laugh. "We were not successful finding the blue glaucus eye. It's a strange little rubbery thing, from the

ocean."

Leandro Teixeira, the lab's current director, says he has been collaborating with colleagues who have been studying the effect of the Zika virus on the developing eyes of laboratory animals.



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He opens up a small black case to show off teeny tiny eyes from dragonflies, spiders and a squid. Then he pulls out some plastic bags filled with fluid and the big gray eyes of elephant seals. "So these are very large eyes," he notes.

But he would like to get specimens that are even bigger. Teixeira says that a colleague recently told him that he had somehow gotten ahold of a well-preserved eye from a blue whale. "I'm excited about that eye," says Teixeira.

The one Dubielzig really wants is an eye from a giant squid, which has the biggest eye of any living animal — it's the size of a dinner plate.

"But there are no intact specimens of giant squid eyes, only rotten specimens that have been beached," he says.

He also needs eyes from the echidna, or spiny anteater, and some of the bigger whales. So if you've got any, you know where to send them.

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