

# Voyages of Discovery

**I**T ALMOST NEVER FAILS—use the phrase “Voyages of Discovery,” and the picture that comes to mind is one of three-masted schooners, Victorian-era expeditions, harsh field conditions, daring captains, and hardy naturalists slaving over handwritten, leather-bound journals. We think of Joseph Banks with Captain James Cook aboard the *Endeavour*, Meriwether Lewis and William Clark traveling up the Missouri River in a keelboat, Aimé Bonpland and Alexander von Humboldt on the *Pizarro*. And, of course, the five-year voyage of Charles Darwin and Captain Robert Fitzroy on the *H.M.S. Beagle* is never far from the top of the list. What marvels they found, what bizarre forms of life they collected, what awesome regions of the globe they visited.

The problem is that all such voyages are thought of in the past tense. True, there was a “golden age” of classical natural history expeditions. But have these voyages of discovery ended? Have most of the world’s species been discovered, described, named? Hardly.

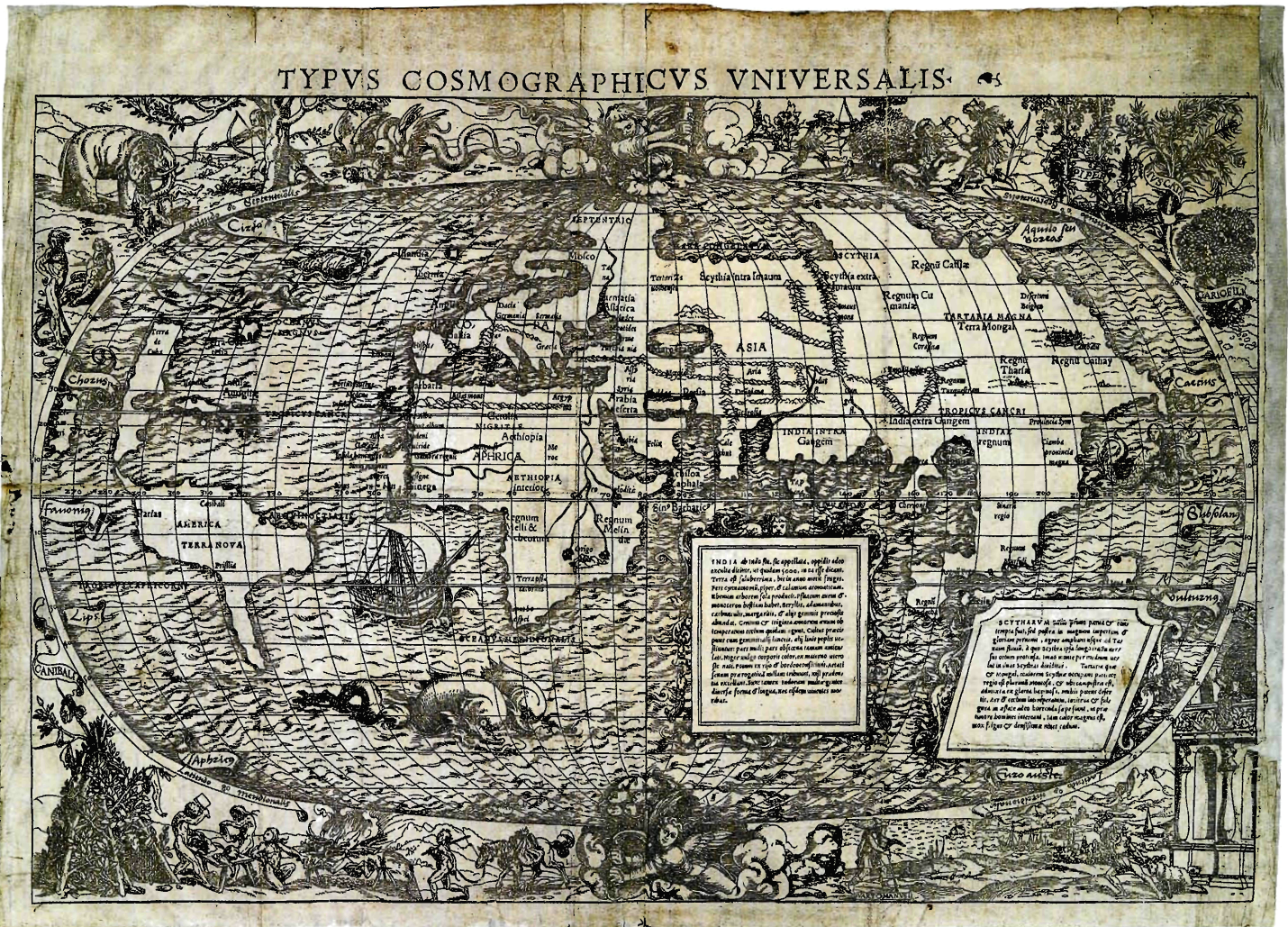
In fact, the more we learn about the natural world around us, the more apparent is our lack of knowledge, and knowledge is needed more today than at any time. We are facing rates of extinction and habitat loss on a scale that was not dreamed of in the past.

But what can we find today to equal the excitement generated in those heady days of the Victorian era? I contend that we are living now in an age of discovery that is as exciting as any time in our past, full of the weird, the wonderful, and the unexpected, and that the curatorial staff at the Natural History Museum is very much involved in this adventure.

## Recent and Current Voyages of Discovery

Today our equipment has changed dramatically, but our goals have not. We still strive to reach remote areas, document the fauna and flora of unique regions, and discover and describe spe-

The world as it was known in 1532, attributed to Hans Holbein, only ten years after Magellan’s circumnavigation. From the Shearman Collections in the Seaver Center for Western History Research



cies unknown to science. The leather-bound journal has largely been replaced by laptop computers (although some of us still keep a handwritten journal, perhaps because there is a tangible joy associated with writing results by hand at the end of a hard day of field work). The expedition illustrator has been replaced with cameras, often digital, although there still is no substitute for an accurate illustration rendered by a skilled artist. We have the ability to take a digital photograph in the field, load the image onto a laptop computer, send the image via satellite to another specialist anywhere in the world, and ask relevant questions about the specimen before we even collect it.

But what are the results of these modern voyages of discovery? It may come as a surprise to learn that today we are describing new species at rates easily equal to those of the expeditions of the 1800s, even though a modern description entails considerably more work and detail. One might expect that the large number of newly discovered organisms is because they are mostly small species that were overlooked, or because powerful new molecular tools allow us to distinguish populations that in the past seemed identical. Both are true in some cases, but in fact, descriptions of new species of some very large animals, including mammals, also are on the rise. In the mountainous region between Laos and Vietnam, a new species of bovid, the family to which cattle belong, was described in 1993. In that same region, there have been three new species of muntjac deer found since 1996. Later this year, a new species of whale will be described, representing the first new species of cetacean described in almost 20 years.

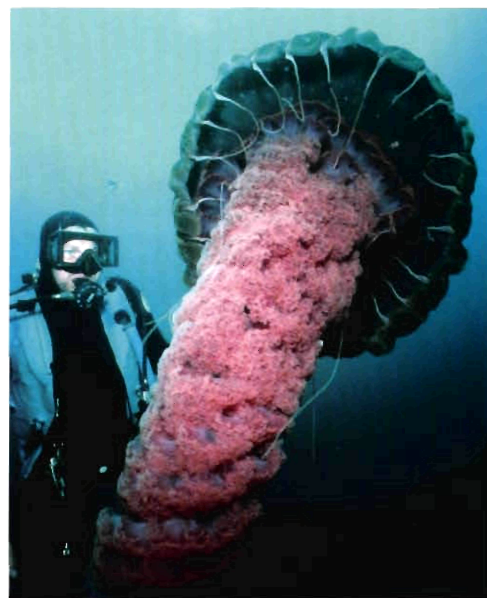
Although we think of mammals as large organisms, there are, of course, larger ones. New species of trees are also being discovered, again at surprising rates and from well known areas. In 1989, a new species of tree named *Ticodendron incognitum* was described from Costa Rica; it is now known from montane rainforests ranging from Mexico to Panama. In 1994, the seed-bearing tree *Wollemia nobilis* was discovered and described from Wollemi National Park, north of Sydney, Australia, a large tree with a very distinctive morphology, resembling fossil trees from the Cretaceous period. Yet it was discovered near Australia's largest city, in a national park, only seven years ago. Also from Australia comes *Eidothea zoexylocarya*, a newly discovered tree reaching over 120 feet in height, whose closest relatives are 60-million-year-old fossils. A second "living fossil," the Nightcap oak, over 120 feet in height and over 30 inches around, was discovered in December 2000 in New South Wales, Australia. In 1998, *Erisma japura* was collected, the dominant tree species in the non-flooded forests of Venezuela, reaching over 100 feet in height. Its unusual winged fruit is used by local people as a source of starch, but the species

had never been recorded from Venezuela despite the fact that this region was rather extensively explored by Alexander von Humboldt, Aimé Bonpland, Richard Spruce, Alfred Wallace, Llewelyn Williams, and other notable explorers. Closer to home is the discovery of *Neviusia cliffoni*, a small shrub from the region around Mount Shasta. It is abundant and conspicuous when flowering, but even with the large number of visitors to this part of northern California, it had never been collected before 1992.

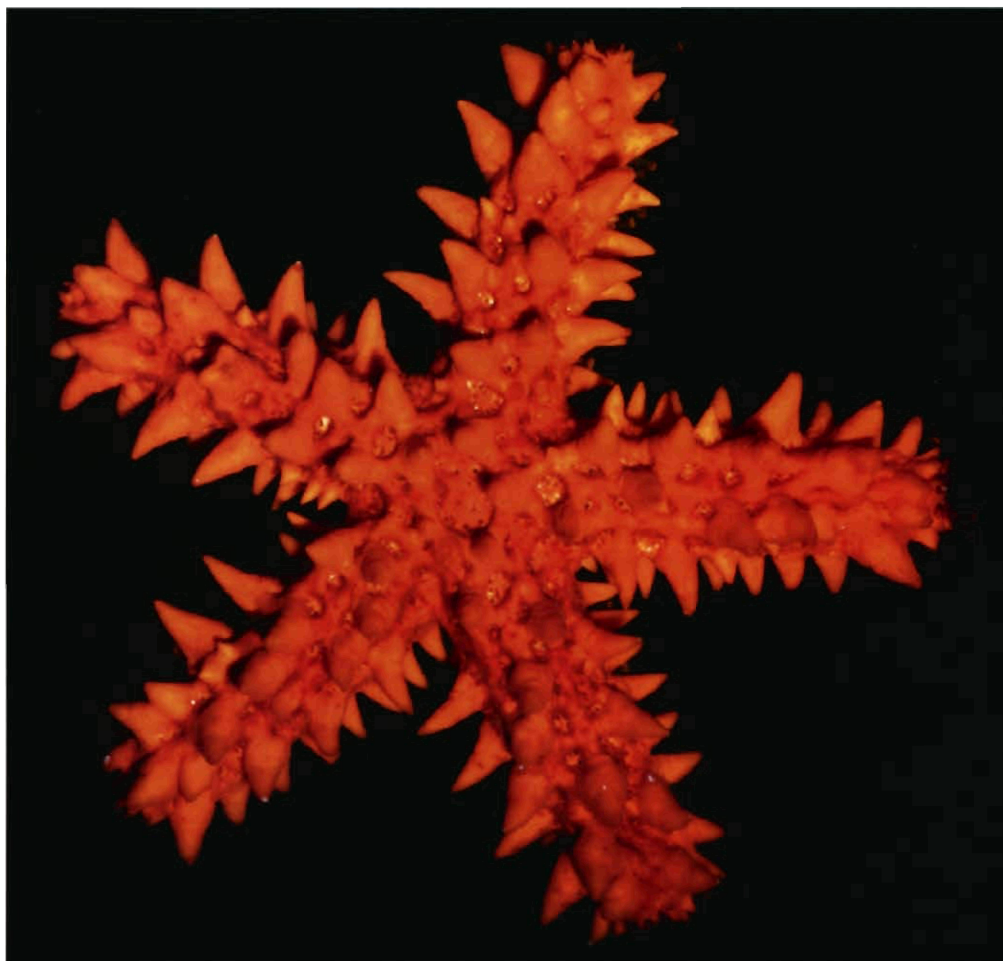
Discoveries of new species of amphibians are also on the rise. In the last 40 years, more new species of amphibians have been described than in all the years from 1750 through 1900 combined. Some are the result of "splitting" former species based on new genetic information, but most are simply the result of venturing into unexplored regions with old fashioned, keen-eyed naturalists collecting specimens using time-honored techniques.

### Jellyfish

This enormous new species of jellyfish was found in southern California waters and described by Dr. Martin and colleagues in 1997. Of those creatures lacking a backbone (collectively termed "invertebrates," although they are not all closely related), this was the largest species described in the 20th century.



In 1989, I had the pleasure of collecting an unknown and very large species of scyphozoan jellyfish that had washed ashore by the thousands during June and July. Because there are so few marine taxonomists working on jellyfish, it was not until 1997 that we were able to describe it as *Chrysaora achlyos*. A veritable sea monster, it reaches over three feet in diameter across the bell, with 18-to 20-foot tentacles and oral arms, making it the largest invertebrate animal described in the 20th century. Where did I encounter this bizarre beast? Venice Beach, California, hardly a remote or unpopulated region, although some would say it is a rich source of unusual life forms.



#### Starfish

This small starfish is one of the relatively few species of asteroids found on Guana Island. This specimen was collected by T. Zimmerman and J. Martin while snorkeling in shallow water in the grass beds on the Atlantic side of the island.

Photo: L. Zimmerman

There are more examples. In the life sciences, we divide known life forms into phyla, the most basic of the taxonomic units, and there have been several new phyla described in the last two decades as compared to none in the entire 19th century. In 1983, the phylum Loricifera was established for minute animals that are found among sand grains on the ocean floor. In 1995, the phylum Cycliophora was established to accommodate a small creature found on the mouthparts of the Norwegian lobster, *Nephrops norvegicus*. In both cases, the new discoveries resulted from closer examination of things already known.

Modern manned and unmanned deep sea submersibles have made dramatic discoveries of new life forms at hydrothermal vents, but it is not only the large-scale expeditions that increase our knowledge of the world around us. The new jellyfish species mentioned above, found near one of the world's most densely populated regions, is one example. Another is the discovery in 1996 of a new species of

lungless salamander in the San Gabriel Mountains, less than 30 miles from Los Angeles.

#### The Museum's Modern Explorers

Are Natural History Museum curators involved in these modern voyages of discovery? Absolutely. We are carrying on a time-honored tradition. Listed below are some of the expeditions involving museum curators who are exploring and finding new, undescribed species.

■ **Gordon Hendler**, Curator of Echinoderms, has dived in the manned submersibles *Johnson-Sea-Link*, *Delta*, *Turtle*, and *Sea Cliff*, as deep as 10,000 feet, and used the remotely operated vehicles *ROPOS* and *ATV* to study the invertebrates that thrive in Caribbean and Pacific deep waters.

■ **Brian Brown**, Associate Curator of Entomology, along with Mike Sharkey, from the University of Kentucky, and others are conducting an in-depth survey of the insects of Colombia, a country so rich in species that it has been termed "mega-diverse."

TOP LEFT

### Hermit crab

Hermit crabs are among the most challenging crustaceans to identify. This spectacular species, another example of the marine diversity surrounding Guana Island, is shown removed from the borrowed gastropod shell in which it lives.

TOP RIGHT

### Marine worm

One of a huge number of unusual species of marine worms, the subject of study of curator Kirk Fitzhugh and collections manager Leslie Harris. This specimen was collected by museum staff in shallow waters off Guana Island.

RIGHT

### White shrimp

This undescribed species of lobster-like shrimp was found off Guana Island in the Caribbean by the Zimmerman and Martin team. They estimate that 30% of everything they are finding there is new to science. This specimen, one of only two that exist, was collected from an artificial coral reef assembly invented by the team for attracting coral reef species.

FAIR RIGHT

### Treefrog

A new species of treefrog of the *Hyla larinopygion* group was recently discovered in a cloud forest in southern Ecuador by Dr. David Kizirian, Curator of Herpetology. This species possesses a unique repertoire of anti-predator mechanisms, including a sticky, noxious skin secretion and a posture that prominently displays otherwise concealed white patches.



TODD L. ZIMMERMAN



LESLIE HARRIS



TODD L. ZIMMERMAN



DAVID KIZIRIAN

■ **Todd L. Zimmerman**, a graduate-student-in-residence and a Research Assistant in Crustacea, and I are leading a team of six to eight marine biologists (including three museum staff members) to the coral reefs of Guana Island in the British Virgin Islands each summer to document small, cryptic invertebrates. Thirty percent of what we're finding is new to science.

■ **Christine Thacker**, Assistant Curator of Fishes, is heading a multi-year project to study the evolution and distribution of several goby species (a small, bottom-dwelling reef fish) throughout the Society Islands and other archipelagos in the South Pacific.

■ **David Kizirian**, Assistant Curator of Herpetology, is conducting a general survey at remote localities in poorly known regions of Ecuador, with colleagues at the Pontificia Universidad Católica del Ecuador.

■ **Luis Chiappe**, Associate Curator of Vertebrate Paleontology, is continuing to discover extinct species as he breaks new ground (literally and figuratively) in his fascinating search for dinosaur embryos in Patagonia as well as expanding his search for Early Cretaceous vertebrates in the northwestern corner of China. He is also part of a team that is resuming exploration of the vast dinosaur deposits west of the Rocky Mountains.

### Tomorrow's Voyages of Discovery

Discoveries we are making today compare favorably with some of the most famous exploits in the annals of natural history. In fact, the museum as a whole is embarking on an unprecedented "Voyage of Discovery" as we enter a new millennium and create a new museum, both metaphorically and physically, with unlimited opportunities for advancing knowledge of the natural world. What we find will depend on our determination, vision, attitude, and perseverance.

*Dr. Joel W. Martin, the museum's curator of Crustacea and Chief of the Division of Invertebrate Studies, is a leading authority on biodiversity, particularly as it pertains to marine invertebrates. With funding from the National Science Foundation, he organized the first conference of government-sponsored biodiversity scholars in 2000, and he is currently funded by the National Science Foundation to survey the marine biodiversity of Guana Island in the Caribbean.*