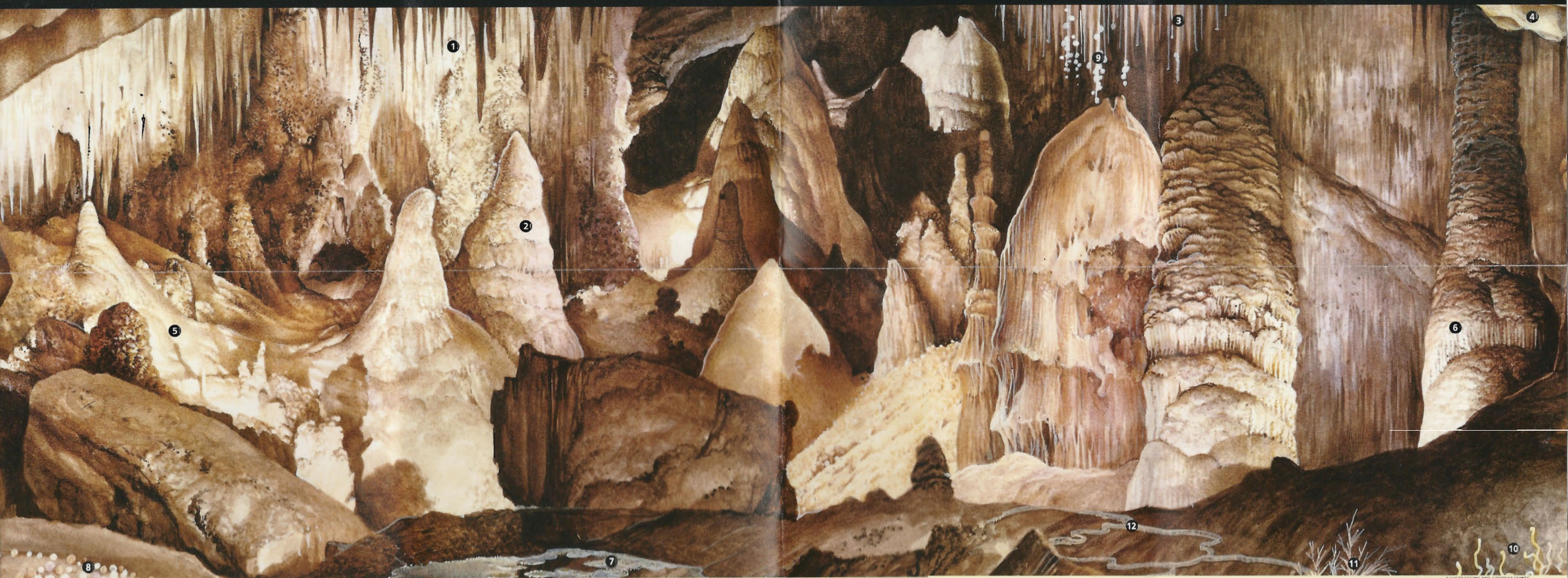


Exploring the Chambers of Wonders



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The Cave is Created and Decorated, Drop by Drop

The story of Carlsbad Cavern begins 250 million years ago with the creation of a 400-mile-long reef in an inland sea that covered this region. This horseshoe-shaped reef formed from the remains of sponges, algae, and seashells and from calcite that precipitated directly from the water. Cracks developed in the reef as it rose. Eventually the sea evaporated, and the reef was buried under deposits of salts and gypsum.

Then, a few million years ago, uplift and erosion of the area began to uncover the buried rock reef.

During the uplift that would become the Guadalupe Mountains, rainwater seeped downward through cracks and faults in the limestone. At the same time, hydrogen sulfide-rich water migrated upward from vast oil and gas fields to the south and east. These two waters mixed, forming sulfuric acid, which dissolved the limestone and opened up the fractures and faults into the large chambers we see today. As the mountains were pushed up, the level where the rooms and passages in the cave were being formed moved lower into the ancient reef rock. This

process created nearly horizontal levels connected by steep passages. In Carlsbad Cavern, the older Bat Cave level and the younger Big Room level are connected by the steeply descending trail from the natural entrance.

The decoration of Carlsbad Cavern with stalactites, stalagmites, and an incredible variety of other formations began over 500,000 years ago after much of the cavern had been carved out. It happened slowly—drop by drop—at a time when a wetter, cooler climate prevailed. Creation of each formation depended

on water that dripped or seeped down into the limestone bedrock and into the cave. As a raindrop fell to the ground and percolated downward, it absorbed carbon dioxide gas from the air and soil, and a weak acid was formed. As it continued to move down, the drop dissolved a little limestone, absorbing some of the basic ingredient needed to build most cave formations—the mineral calcite. Once the drop finally emerged in the cave, the carbon dioxide escaped into the cave air. No longer able to hold the dissolved calcite, the drop deposited its tiny mineral load as a crystal of calcite.



Calcite crystals

Billions and billions of drops later, thousands of cave formations had taken shape. Oh, the shapes they took!

Where water dripped slowly from the ceiling, soda straws and larger stalactites appeared. Water falling onto the floor created stalagmites. Sometimes a stalactite and stalagmite met and merged into a column. Draperies were hung where water ran down a slanted ceiling. Flowstone was created by water flowing over the surface of a wall or floor while depositing layers of calcite. Cave pearls, lily pads, and rimstone

dams appeared where pools of water occurred in the cave. Like pearls from oysters, cave pearls developed as layer upon layer of calcite built up around a grain of sand or other tiny object. Lily pads formed on the surface of pools, while dams formed where water flowed slowly on the floor.

Another type of cave formation that decorated cave walls and even other formations was popcorn, which formed when water evaporated and left behind aragonite. Aragonite is a mineral chemically identical to calcite but with a different crystal

structure. These crystals tend to be small, delicate, and shaped like needles.

Some of the more unusual formations that occur in Carlsbad Cavern are helictites. They grow seemingly without regard to gravity, their twisting shapes governed by crystal shapes, impurities, and the force of water under pressure.

The World of Bats

Carlsbad Cavern is a sanctuary for hundreds of thousands of Mexican free-tailed bats (also known as Brazilian free-tailed bats). During the day they crowd together on the ceiling of Bat

Cave, a passageway near the natural entrance of Carlsbad Cavern. In this darkened home they are seen only by scientific researchers. At nightfall the bats leave the cave in gigantic swarms. Silhouetted against the night sky like a dark, swift-

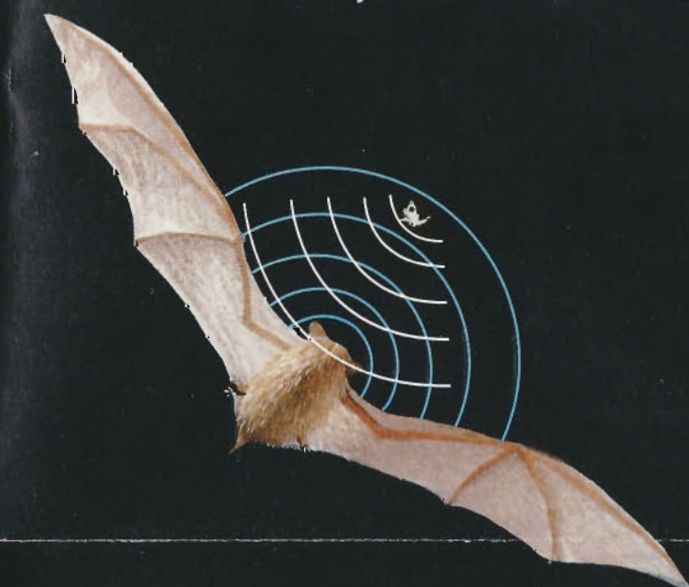
moving cloud, the bats make their most dramatic display. Other extraordinary characteristics of bats—their natural sonar system and their ability to fly—make these creatures of darkness of great interest.

Echolocation

Like most species of bats, Mexican free-tailed bats navigate and locate their prey by emitting ultra-high frequency sounds. Known as echoloca-

tion, this natural sonar system is similar to that used by dolphins and whales. When a bat's signals strike an object, they are reflected back and heard by the bat. The bat then takes whatever action is appropriate, whether it be zeroing in on a moth and other flying insects or swerving to avoid a tree limb.

All illustrations by NPS/Robert Hynes. Reference photographs for drawings of bats provided courtesy of Dr. Merlin Tuttle.



Mexican Free-tailed

As many as seven types of bats may roost in Carlsbad Cavern, but none is as prevalent as the Mexican free-tailed. This dark brown to

gray bat is distinguished by its long, narrow wings and a free-dangling, skinny tail. Only a part-time resident of Carlsbad Cavern this migratory bat stays here and

in other Southwest caves from early spring through October. It flies to tropical Mexico and further south for the winter.

Bat Families in the Cave

Bat Cave serves as a summer home, a daytime refuge, and, perhaps most importantly, as a maternity roost for Mexican free-tailed bats. The bats, which are mammals, migrate from Mexico to Carlsbad Cavern each year to give birth and raise their young. Young are born in June, under the cover of darkness and away from predators or disturbances. A female usually has just one offspring. Each birth occurs on

the ceiling as the mother hangs by her toes and thumbs. The baby (called a pup) clings to its mother or to the ceiling. For the next four to five weeks, the youngster stays on the ceiling. During the day, mothers and pups hang in clusters on the ceiling, resting and nursing. As many as 300 bats may crowd into one square foot. At night the young are left in the cave while the adults leave to feed.

How does a mother ever find her own baby in the teeming mass of pups? She remembers her pup's location, its scent, and the sound of its cry. In July or August each young bat takes its first flight, joining the adults on nightly forays. In Bat Cave, bats share their quarters with only a few insects and spiders. In late October or early November the adults and young leave for Mexico—and return again next year.



Mexican free-tailed bats are born naked. Their fur grows in by the time they can fly.

Night Flight

The spectacular flight of the Mexican free-tailed bat begins with a few bats fluttering out of the natural entrance of Carlsbad Cavern. Then in a matter of minutes a thick bat whirlwind spirals out of the cave up into the darkening night sky. The exodus can last from 20 minutes to 2½ hours. Once out of the cave the mass of thousands of bats undulates, serpentine fashion, toward the southeast

to feed in the Pecos and Black river valleys. Once there, they gorge on moths and other night-flying insects. Using echolocation, its sonar system, each bat may catch and eat more than half their body weight in insects in a single night. With the coming of dawn, the bats begin flying back to the cave individually or in small groups. They reenter the cave in a fashion almost as remarkable as their departure.

Each bat positions itself high above the cave entrance. It then folds its wings close to its body and plummets like a hailstone into the blackness of Carlsbad Cavern, making strange buzzing sounds as it does. One by one, the bats return to the safety of Bat Cave, where they sleep until dusk the next evening.

Lure of the Unknown

Over 1,000 years ago American Indians ventured into the entrance of Carlsbad Cavern. They left no record of entering the dark zone of the cave, but they did leave mysterious drawings on cave walls near the natural entrance. In the 1800s settlers discovered the cavern, drawn to it by the spectacle of hundreds of thousands of bats rising up out of the natural entrance in the evening. Some stayed on to mine the huge deposits of bat guano in the cave and sell it as a natural fertilizer. A cowboy named Jim White became fascinated by the cave and spent hours exploring it. White was eager to show the natural wonders of this extraordinary place to others, but few believed his improbable tales of a huge underground wilderness full of unusual formations. It took photographs to convince skeptics that Carlsbad Cavern was everything it was said to be.

In 1915 black-and-white pictures taken by Ray V. Davis, who accompanied White on a cave trip, were displayed in the town of Carlsbad, N.M. They created a sensation. People clamored to see the marvelous cave. White took them on tours that began with a 170-foot descent in a bucket once used to haul bat guano from the cave.

Word of the cave spread, finally reaching Washington, D.C. Again, there were nonbelievers. In 1923 the U.S. Department of the Interior sent Inspector Robert Holley to see whether Carlsbad Cavern was truly an outstanding natural scenic wonder. Originally a skeptic, Holley wrote in his final report: "I am wholly conscious of the feebleness of my efforts to convey in words the deep conflicting emotions, the feeling of fear and awe, and the desire for an inspired understanding of the



Cave explorer Jim White.



Early cave visitors.



National Geographic Society expedition, 1924, climbs a stairway made of guano bags.



Chandelier Ballroom in Lechuguilla Cave has spectacular gypsum formations.

Divine Creator's work which presents to the human eye such a complex aggregate of natural wonders."

Later that year Carlsbad Cavern was proclaimed a national monument. White, who continued cave explorations for most of his life, became its first chief ranger. In 1930 Congress created Carlsbad Caverns National Park. Through illustrated articles in magazines like *National Geographic* and by word of mouth, Carlsbad Caverns became one of the world's most celebrated cave systems and was designated a World Heritage Site in 1995. The park has expanded and now includes 46,766 acres and over 100 other caves.

Experienced underground explorers, or cavers, and cave scientists are the Christopher Columbus of today—journeying beyond what is known into the unknown. For many years

cavers felt a strong breeze blowing from the floor of a small cave known as Misery Hole. In 1986 they received permission to explore and break through this level. Their discoveries opened Lechuguilla Cave.

Lechuguilla Cave extends over 112 miles and holds a spectacular but fragile ecosystem. To protect this system, entry into Lechuguilla is restricted to exploration and scientific groups. Lechuguilla Cave will probably not be opened to the public. Within, cave scientists have discovered microbes that produce enzymes capable of destroying cancer cells. Scientific discoveries continue to give us clues about the complex creation of the area's caves, about bats and other members of the cave community, and how human activities affect these fragile underground worlds.

