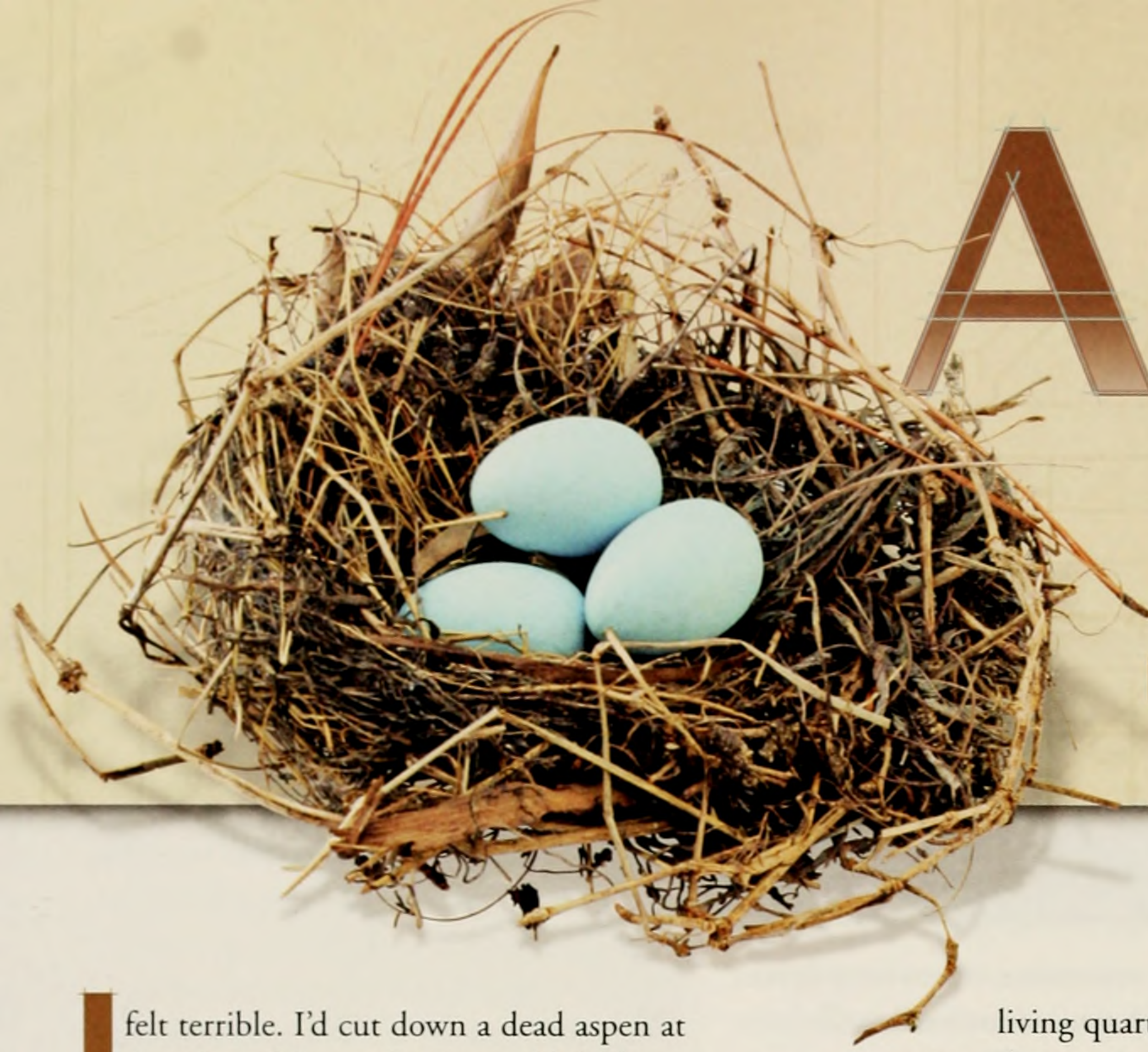


Animal

From insulated dens to insecticidal nests, wildlife build some amazing structures



I felt terrible. I'd cut down a dead aspen at the edge of the yard so it wouldn't blow over and clobber the dog or one of our kids. But in sawing it down, I'd inadvertently killed a family of four. Peering into the silver dollar-sized hole, I could see the broken shells and their scrambled contents mixed with wood chips and downy feathers. A woodpecker had gone to great lengths to chisel out the 3- by 7-inch cavity for the purpose of raising young and protecting them from predators and the weather. By not checking the tree carefully, I had put an end to all that.

The incident made me think of the many other nests, burrows, and dens our land has housed during the 30-plus years we've lived in South Cottonwood Canyon, near Bozeman. Several years ago, a hummingbird stitched together a diminutive nest of lichen and seedpod on a decorative metal sculpture hanging from our porch. She hatched and raised two babies there. Water ouzels have maintained the same mossy nest for two decades under the footbridge crossing the creek near our house. When I replaced the bridge several years ago, I moved the nest to a perch under the new bridge. The ouzels have renovated their old home into a basketball-sized dome with a side entrance leading into a soft chamber for laying eggs and raising young.

Elsewhere on our property, ants have mounded huge hills, voles have tunneled

living quarters underground, paper wasps have fashioned intricate hanging homes in trees, foxes have dug dens, and beavers have engineered dams and constructed lodges in the creek. Observing various creatures' diverse architectural ingenuity has taught me much about their lifestyles.

Animals build homes for the same reasons people do: protection from predators, shelter from weather, and sanctuary for raising offspring. And, as is the case for us, building a home isn't cheap. For wildlife, the cost comes in expending time and energy. For example, a bird may make 1,000 or more trips to transport twigs, grasses, and other nest-building materials.

Some animals, like moose and elk, are so big they don't need a home to protect them



SILK CIRCLE A spider spins grass heads into a circular home and insect trap.

MICHAEL AND PATSY FRIBLEY

from predators. Others, like robins and wolves, build nests or dens only as a place to raise their initially helpless young. Still others, such as bears, construct rudimentary homes in which they spend only the winter sleeping and giving birth.

Other animals may spend their entire lives in their constructions. Moles excavate nest chambers and intricate tunnels where they hunt, sleep, and raise their families.

Just as humans build homes out of everything from brick to straw, animal architects use all sorts of different building materials. The strings, leaves, twigs, and pebbles that birds use to fashion nests act both as structural support and camouflage. Animals may also use fur and feathers, from their own bodies or shed from others, to add insulation to their homes. Bird nests have been found with snakeskins woven into their fabric. Researchers theorize the skins may help frighten predators.

Other materials used in nests help repel pests. Zoologist Dr. Michael H. Hansell writes in *Animal Behavior* that some birds, including Harris's hawks and bald eagles, "bring fresh plant material with insecticidal properties to the nest. One herb used by the starling is *Erigeron*, known as fleabane (the flea killer)."

Other birds are less discerning about building materials and gather anything that's easily obtainable around their building site. According to David Hancocks, who wrote *Master Builders of the Animal World*, a Californian "recorded the contents of an osprey nest built in his garden, which

Architecture

By Sam Curtis

included three shirts, a bath towel, one arrow, and his own garden rake.”

Though big, osprey nests are nothing compared to those of bald eagles, which can be as large as a Volkswagen Beetle and weigh a ton or more.

Robins and many other birds use mud as a mortar to cement grasses and mold the nest cups. Birds also gather silk produced by insects and spiders and use it to fasten nesting materials. Paper wasps collect dried wood fibers from dead trees and old boards, and use their mandibles to ball up the fibers. The wasps then carry the sawdust spheres back to the nest site in their mouths. They drink water that they then regurgitate, along with other stomach contents, to paste the wood fibers together into a semi-waterproof nest.

Caddis fly larvae living in mountain streams build tubular living structures, like hard-sided mummy bags, that protect them against predatory fish. A caddis larva starts by weaving a silky tube around its own body with material from its salivary glands. The insect reinforces this with pieces of vegetation, twigs, or sand applied with more silk. “Each [caddis] species has a characteristic way of arranging its building materials,” writes Karl von Frisch in *Animal Architecture*. “Some align little bits of broken twigs in parallel with the axis of the tube; others put them crossways; others still arrange them in spiral, or just jam them together in a haphazard way.”

What tools do animal builders use to construct their homes? Usually, it’s their

HIDDEN HOUSING The female rufous hummingbird uses spider silk to construct her tiny walnut-sized nest (shown here twice actual size) from soft plant fibers and attach it to a twig. She then sticks bits of moss and lichen to the outside to camouflage the nest from predators. Photo by Alan G. Nelson.





MASLOWSKI PHOTO



TIM CADY



GARY LEPPART

DOWN HOME Many animals build their homes below ground (or water) for safety. From left: A mink and her kits den in a tree stump hollow; beavers stay secure in their underwater lodge; a burrowing owl waits for prairie dogs to vacate their burrow so it can move in.

beaks, jaws, feet, claws, wings, and other body parts. A warbler uses its whole body to mold the symmetrical cup of its nest. Gathering sprigs of grass and stems in its beak, the bird clumps the materials into the fork of a tree branch and then rotates its entire body, using its legs and chest to push against the developing sides of the nest and uniformly compact them into a cup. Sitting in the nest, the warbler then uses its beak to twine pieces of grass together for more structural integrity.

“To make the rim of the nest strong and smooth, the bird often collects the fine threads of spiders’ silk,” writes von Frisch. “When it returns with the spiders’ webs, it first brushes them off its beak onto twigs

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where they attach themselves. They can then be drawn out to fine threads that are shuttled back and forth across the rim, firming the structure.”

Animals that gather mud for building their homes face the problem of the material drying out between applications, causing cracks and improper molding. “Some mud-daubing wasps overcome this by making a buzzing noise (with their wings) as they spread a fresh load of mud,” writes Hansell. “This temporarily liquifies the mud, allowing tiny air bubbles to escape and the new load to weld firmly onto the existing structure.”

Design, of course, is the essence of architecture. Animal architects, demonstrating Frank Lloyd Wright’s

dictum that form follows function, create extremely efficient designs that reflect how effectively the structure fulfills their purpose.

The nest of the red wood ant, for example, begins as worker ants hollow out cavities in the dead wood of an old stump and connect them with tunnels. Other workers then bring bits of grass, twigs, moss, and needles to the site and mold them up and over the stump while more workers dig passageways underground to a depth that may equal the mound’s height.

“Smaller particles are used to ensure a dense surface and to line the inside of the various chambers and connecting passages,” writes von Frisch. “The surface has a great number of holes that serve as entrances. Their numbers and position is often changed. At night and on cold days the

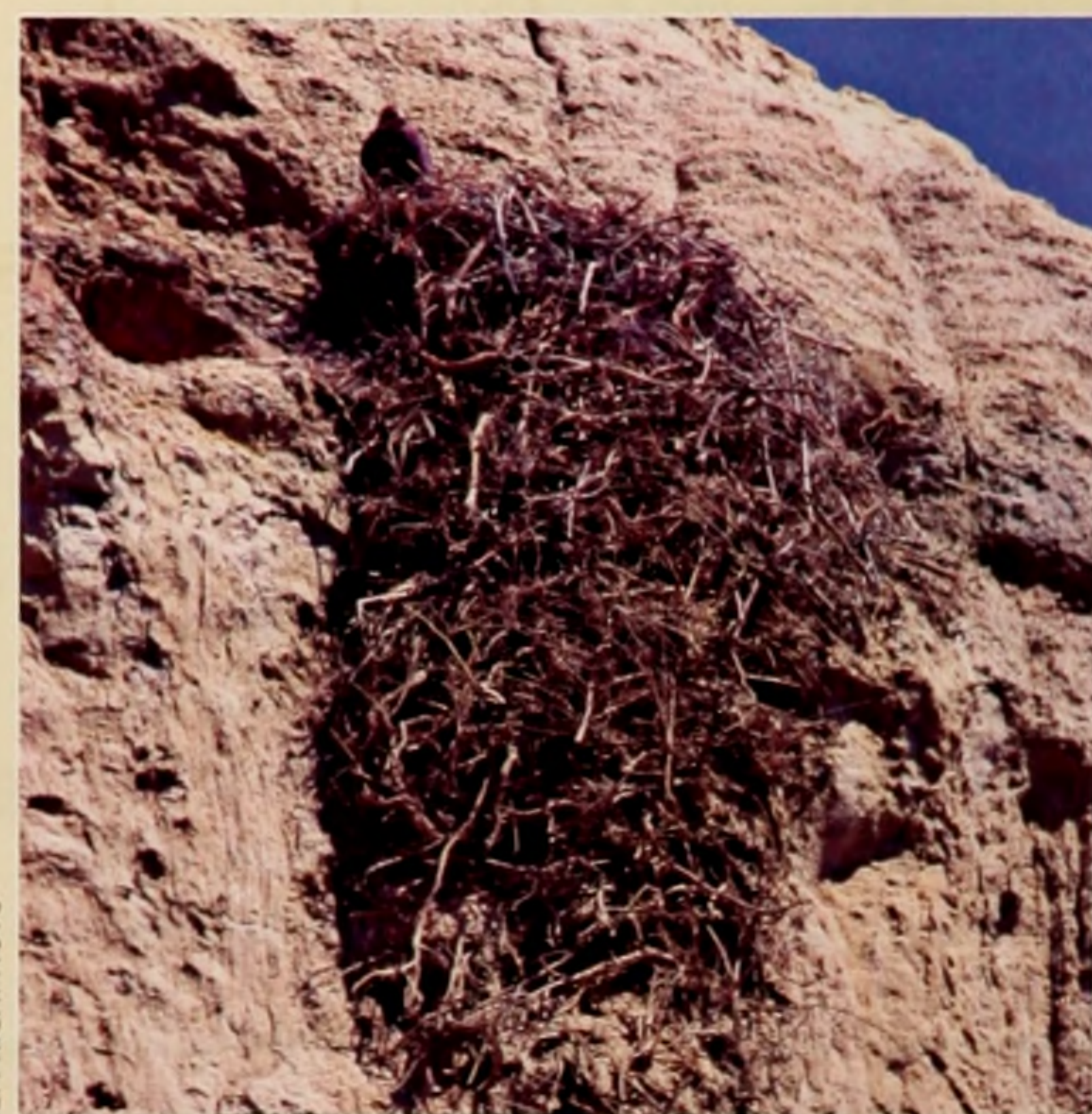
LET’S LIVE...HERE Birds will build almost anywhere. From left: A red-necked grebe constructs a nest of mud and aquatic plant material on the water’s surface; a blackbird nests in the red light district; amazingly secured to a cliff, a golden eagle nest stretches 20 feet from top to bottom.



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MICHAEL J. WOLF

MATERIAL WORLD Wildlife use all types of natural matter to build their homes. From left: Cliff swallows use mud to construct their nests; an ant excavates wood from a rotting stump; a golden-mantled ground squirrel gathers grasses to line its nest.

ants plug them with nesting material just as we close our windows to keep heat in.”

The anthill is an ever-changing architectural structure. Over a period of three or four weeks, workers constantly bring bits of building material from the depths of the nest to the surface, causing the original surface layer to gravitate to the center. Once all these particles reach the center of the nest, they are then carried back to the surface.

“This constant turnover,” writes von Frisch, “causes the material from the humid interior to be regularly dried on the surface, and this helps to prevent mold formation.”

Big pieces of material that are difficult to transport remain in the center to form the sturdy core of the nest. Fine material is packed down on the surface as insulation and waterproofing, and the entire hill is

molded to an angle that will efficiently catch the low rays of the sun to warm the nest in the morning and evening.

Montana’s greatest architectural master may be the beaver. Using their large, sharp incisors, these rodents cut down trees and trim branches to produce timbers they drag to a creek bottom. The logs, along with cross pieces, create a support structure against the water current. From there, beavers continue to build up, until they have blocked the stream to create a deep pond. Beavers design their lodges with complex heating, ventilation, and air-conditioning systems based on the position of air openings. Some beaver dams stretch 1,000 feet or more across. The dams can create ponds larger than a football field

and are strong enough to support a person riding across on horseback.

Humans have long studied animal architects and marveled at both the simplicity and complexity of natural design. For inspiration, modern architects are looking to the homes and other structures created by wildlife. Their goal, in the words of renowned California architect Eugene Tsui, is to look at humanity and nature “as design partners,” based upon the fact “that nature is the supreme architect and designer of all living things.”

That’s quite a compliment for an ordinary beaver lodge, ant mound, or bird’s nest. But as Tsui notes, nature “has had five billion years time to practice, to evolve and perfect its designs.” By comparison human architecture, even that of the ancient Egyptians, is just getting off the ground. 🐿

CRAWLING HOME The architecture of spiders and insects is some of the most ingenious in the animal world. From left: A spider web is unmatched for melding strength and lightness; paper wasps build a honeycomb structure; only tent caterpillars could find this silken glob comfy.



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