

Alimentary, My Dear Hoatzin

Ruminations on a gutsy bird

By RON COWEN

Never mind the Gryphon. Forget the Jabberwock. Picture a creature that hangs out on jungle tree limbs, has red eyes framed by electric-blue skin, sports a 4-inch crest of spiky feathers that stick out like a punk haircut, and calls to its mates with a hissing screech. Lewis Carroll, eat your heart out.

When ornithologist Stuart D. Strahl ventured into the forests of central Venezuela eight years ago to study an avian oddity known as the hoatzin (pronounced WAT-sin or wat-SEEN), he followed in the footsteps of only a handful of naturalists from the 1910s and '20s. Intrigued since childhood by accounts of the bird, Strahl figured researchers had probably discovered most of its stranger characteristics. After all, how much weirder can you get than a bird that feasts on a diet of 95 percent leaves, nests in groups of as many as seven adults, has claws on its wings during infancy and can dive underwater before it can fly? But Strahl suspected there were still some surprises left when he caught his first whiff of hoatzin.

"The bird smelled like the inside of a cow," he says. Further study corroborated his gut feeling about the creature's telltale odor of fresh manure. Strahl discovered that the hoatzin (*Opisthocomus hoazin*) is the only bird known to digest food in the same way as cows, sheep and other ruminants—using bacteria to break down fibrous plant material in a special foregut chamber above its stomach.

Foregut-fermenting mammals use a prestomach compartment called a rumen to digest plants. Strahl finds hoatzins rely on the lower esophagus and the crop—an enlarged pocket of the upper esophagus in which birds hold and soften food—to extract smelly but life-sustaining volatile fatty acids from the cellulose of tender young plants before



Opisthocomus hoazin

they reach the small intestine. Some other birds, including emus, chickens, cassowaries and grouse, have a "hindgut" structure beyond their regular stomach to digest occasional fibrous meals.

Details of the hoatzin's unusual digestive system—the fruits of a four-year survey that Strahl and his collaborators report in the Sept. 15 *SCIENCE*—may force researchers to rethink how and why the foregut evolved in the animal kingdom. "Hoatzins don't seem to follow the rules of evolution," Strahl says. The existence of foreguts in animals other than mammals, he adds, is a notion some scientists find hard to swallow.

"It's fun to look at people's faces when I talk about [the hoatzin] at a research meeting," says Strahl, who coordinates South American studies for the New York

Zoological Society's Wildlife Conservation International in New York City. "Everyone's shaking their heads. They just don't believe it."

Small wonder, considering that even the tiniest known mammal with a foregut—the muntjac, or toy deer, of Southeast Asia—weighs more than five times as much as the roughly 1.5-pound hoatzin. Conventional foregut theories hold that the energy extracted from this unique digestive organ could not sustain smaller animals, especially rapid fuel-burners such as birds.

But Strahl and his collaborators suggest that the hoatzin's foregut, a prerequisite for digesting its leafy diet, may reflect an evolutionary tradeoff that accounts for many of its other peculiarities, including a sedentary lifestyle.

"Leaves are plentiful in the hoatzin's limited territory, but this food is also a poor energy source," notes Strahl. The hoatzin's sluggish growth rate—it takes 2.5 months to mature—as well as its inability to fly when young may stem from its energy-poor diet, suggests co-worker Alejandro Grajal, a graduate student at the University of Florida in Gainesville. With flying not an option, Grajal says, a baby hoatzin pursued by predators must use other traits to escape, such as its agility underwater and its clawed wing-tips, which enable the chick to clamber up trees like a monkey. Even so, only about 20 percent of hoatzin hatchlings survive past their first birthday.

The volume occupied by the bird's large crop, which ferments leaves like a miniature compost heap, may account for the adult hoatzin's concave breastbone and its tiny flight muscles, Grajal adds. Like an overstuffed hen, the adult hoatzin can flutter clumsily for several hundred yards, but that short range is all it needs to find the seven plant species that make up more than half its leafy diet.

Why did the hoatzin develop a foregut

in the first place? "Most evolution is common sense, but this bird is bizarre," Strahl says. "It's some kind of abnormal creature that has developed a lot of life history traits that are extremely different from any other bird. . . . Alejandro and I are both pretty creative, but we never came up with a good explanation [for the foregut]."

In an effort to understand how the hoatzin's digestive system influences its lifestyle, Strahl and his co-workers are now comparing the tropical bird with a relative, the guira cuckoo, which munches leaves only part-time and lacks a foregut. "Leaf-eating did not happen overnight," Strahl told SCIENCE NEWS, adding that some fossil evidence indicates the hoatzin may have originated in the Eocene epoch, predating mammal foregut fermenters.

Strahl's own history with hoatzins began in the 1960s. Living near the Bronx Zoo and next door to the zoo's director, he had plenty of opportunities to ponder strange animals. As a boy, Strahl read the works of bathysphere inventor William Beebe, who served as the zoo's first curator of birds and who studied the hoatzin in South America during the early years of the century.

By the time Strahl entered graduate school in the late 1970s, he was hooked on birds. He turned to Beebe's 1918 book, *Jungle Peace*, for help in finding a thesis topic. "The flight of the hoatzin resembles that of an overfed hen," Beebe wrote. "The hoatzin's voice is no more melodious than the cry of a peacock and less sonorous than an alligator's roar. . . . Still, zoologically considered, the hoatzin is probably the most remarkable and interesting bird living on the Earth today."

Inspired by these words, Strahl set out for the hoatzin's South American habitats in 1981 to conduct his thesis research. A study site in Peru would require an arduous canoe trip, he discovered, and though areas of Ecuador and Guyana looked promising, their political climates did not. So Strahl began work at a small research station 150 miles south of Caracas, Venezuela, a region crisscrossed by 2,500 acres of lush forest and twisting rivers — prime nesting areas for hoatzins. Considering the bird's bovine smell, it seems fitting that Strahl's study site lies in the heart of a cattle ranch.

To study the creature further and to educate the public about a bird the Guyanese call "the stinking pheasant," Strahl and Grajal plan to transport 11 hoatzins to the Bronx Zoo this winter for captive breeding. More than 60 years ago, Beebe failed in a similar attempt, but Strahl believes researchers of that era were less familiar with the bird's highly restricted diet. Bringing this storybook-like bird to Beebe's own zoo, Strahl says, "is a dream I've had since 1981." □

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Perhaps the longevity study should be based on positions with even distribution of handedness.

The baseball statistics indicate the player's throwing and batting handedness, or his natural handedness. Some young players adopt their older siblings' handedness along with their fielding gloves. A youngster who aspires to play shortstop, third base or catcher will learn to field right-handed.

Batting handedness has an even weaker correlation to natural handedness. Switch hitters are made, not born! Some players choose to bat left-handed because they are two steps closer to first. Now, if we were to study the beer ads to see which hand . . .

*Philip J. Levinson
Left-hander
St. Clair, Mo.*

Headaches and zigzags

I hope researchers have noted the striking left-right asymmetry in the artistic renderings displayed in "Images of Pain" (SN: 8/26/89, p.136). All the imagery for pain and disintegration travels down one side of the head but not the other. Even Sandra Turner's work, the most apparently symmetric, shows striking asymmetry in the neckline of the sufferer's garment as well as in the size of the two skull hemispheres in the



Sandra A. Turner

pain ideation above her head.

*R. Blu
San Francisco, Calif*

I very rarely have headaches, but I have had the "apparition of sparkling zigzag bits of light," which you describe as common among migraine sufferers. Perhaps my observations will be of interest to researchers.

The phenomenon occurs maybe six times a year at irregular intervals, with no concurrent discomfort. I have never had one together with a headache. It seems to occur mostly after I have looked into a bright light or a brightly illuminated surface. The first occurred when I was a little over 50 years old.

The apparition begins with a bright zigzag figure of small size in the central area of the visual field. The zigzag then gradually increases in size in all directions, eventually coming close to the outer edge of the field of vision. Finally, it seems to disappear beyond that edge. The total duration is about 15 minutes. During that time, I can continue to read, but I must at times move my head or eyes to see better into spots where the bright zigzag interferes with vision. The apparition persists if I close one or both eyes.

I mentioned it once to my optometrist (I wear glasses for moderate nearsightedness, with slight astigmatism), and he felt, as I do, that it has to do with the brain rather than the eyes.

*Walter H. Oettinger
South Royalton, Vt.*

Your Aug. 26 cover gave me a headache!

*Mrs. C. Sneller
Carlsbad, Calif.*

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