Extremely Interesting Animal Facts
The Exciting Physiologies of Different Animals

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Ever since I was young, I have been collecting fun facts about animals. By the time I was ten, I could name more than 200 mammals off the top of my head at the dinner table. Although my parents raised their eyebrows at me, they supported my voracious curiosity. They gave me Marine Mammal Biology for Christmas and The Illustrated Veterinary Guide for my birthday. I absorbed all the animal facts I could find and quoted them back to my surprised parents, finding some particularly interesting ones. Although we like to think the human species is the pinnacle of evolutionary success, I want to share some extraordinary facts that remind us of the many animal species whose abilities far exceed our own.

Sea Dragons: Creatures You Never Imagined

I like to believe that I knew about sea dragons before anyone else. In sixth grade, I chose to write my marine biology report on these understudied creatures when my classmates were writing reports on starfish and dolphins. Relatives of sea horses and pipefish, sea dragons are members of the Syngnathidae family that live in the coastal waters of the Antarctic, where temperatures are constantly below 0 degrees Celsius. In order to keep ice crystals from forming in their blood, fish from the suborder of Notothenioidei have unique antifreeze proteins in their circulatory system.

Sea dragons have long snouts and bony rings around their bodies, with leafy or weedy appendages. Their small, transparent dorsal and pectoral fins can propel them in the water, but sea dragons spend most of their time drifting in patches of seaweed.

Sea dragons survive on a diet of Mysid shrimp and amphipods (6, 10). Like male seahorses, male sea dragons are responsible for child rearing. When a male sea dragon is ready to mate, his tail turns bright yellow, and the female deposits bright pink eggs onto the brood patch on the underside of his tail. The male carries the eggs for about four to six weeks, at which point he releases the fully-formed baby sea dragons.

The Wolverine Newt

Imagine you are a newt: you have the short stubby legs of a primitive amphibian and it is impossible to outrun a predator. Most salamanders and newts have avoided extinction by either hiding or advertising their toxicity through bright warning colors.

The Spanish ribbed newt takes an entirely different approach to survival. When confronted with a predator, it sticks its pointed ribs outward through its skin, exposing poison barbs (9). First noticed by a natural historian in 1879, this salamander was the subject of recent research that revealed that the defense comes in two parts. When the newt is threatened, it secretes a noxious substance on its skin and then contorts its body to force the sharp tips of its ribs through its skin. The ribs become fierce, poison–tipped barbs, deterring attackers. These spear–like ribs must break through the newt’s body wall every time it evokes the defense. However, as is characteristic of many amphibians, the Spanish ribbed newt possesses rapid tissue regeneration characteristics that allow it to recover from its puncture wounds (9).

Antifreeze Blood

Fish are ectotherms: the external environment determines their internal body temperature. This form of thermoregulation means that fish are the same temperature as the rivers and oceans they inhabit—even when the water is below freezing. Antarctic Notothenoids are fish that inhabit the frigid waters of the Antarctic, where temperatures are constantly below 0 degrees Celsius. In order to keep ice crystals from forming in their blood, fish from the suborder of Notothenioidei have unique antifreeze proteins in their circulatory system.

Unlike commercial antifreezes, these glycoproteins do not lower the freezing point of water. Instead, Notothenioids’ antifreeze glycoproteins (AFGPs) bind to ice crystals as soon as they form, blocking other water molecules from binding and thereby preventing the development of a larger crystal. There are several structural varieties of AFGPs that have convergently evolved in several families of cold–dwelling fish. Recent research suggests that these...
proteins evolved from mutations in pancreatic trypsinogens and adapted for survival in frigid water (5).

Eat a Bedtime Snack or You’ll Die

Hummingbirds are one of the only species of birds capable of hovering because of their complex, figure eight wing patterns. However, this agility comes at the cost of a metabolism which demands a near constant supply of nectar. The aerial performance of ‘hummingbirds’ approaches the upper bounds of oxygen consumption and muscle power input for all vertebrates (4). While nectar is popularly perceived as the food of choice for hummingbirds, insects actually provide the primary source of nutrition.

Fasting becomes a problem at night, when hummingbirds need to sleep. In order to survive the night without starving to death, hummingbirds enter a state called torpor (8). When hummingbirds enter torpor, their body temperature drops and their metabolism slows. A cold hummingbird body has lower energy needs than a warm, flying one and burns fewer calories. Because hummingbirds cannot both sleep and eat at the same time, entering torpor at night enables hummingbirds to survive until their next meal in the morning.

Mammals vs. Reptiles: Locomotion and Respiration

Reptiles and amphibians still retain the ancient form of locomotion practiced by our fishy ancestors: lateral undulation. Reptiles swing opposite pairs of their legs forward, with their legs scrunching at their side as they move. Unfortunately for these reptiles, the muscles that control their legs also control their lungs (3). As reptiles flex sideways, they compress a lung shunting air between their two lungs, rather than expelling old air and inhaling fresh air. As a result, lizards must always travel in a run-stop-run pattern.

Mammals, unlike reptiles, have diaphragms. The diaphragm is a muscle that contracts to create a vacuum inside the chest cavity thereby causing the lungs to expand. Because the diaphragm is independent of the muscles that power locomotion in mammals, we are able to breathe and run at the same time. High breathing rates enable a greater oxygen intake and stronger, more frequent muscle contractions. Perhaps the diaphragm is a strong component of mammals’ evolutionary success; if migration was quick and easy, our rodent-like, primitive ancestors could travel more easily to find new resources.

Colors We Can’t See:

In our eyes, we have two types of cells called rods and cones that send light information to our brain. Rods are the most sensitive to stimulation than cones and are found mostly at the edge of the retina, where they contribute to the motion-sensitivity of our peripheral vision. Cones give our world color. There are different types of cones, with each type containing a pigment that is sensitive to a particular wavelength of light. In humans, there are three types of cones: red, green, and blue. These are the same RGB colors of the LEDs in lampposts, stoplights, and streets signs that mix to produce the spectrum of colors we are familiar with. Humans are
thus classified as trichromads (7). When one of these cones is non-functioning, it causes vision distortions, such as red–green colorblindness.

Birds are tetrachromads: they have an extra type of cone and can see into the ultraviolet (UV) spectrum (7, 1). Most dinosaurs had four cones, but mammals lost two of these cones when they became nocturnal and had little use for color vision. When mammals diversified in their later evolution, some regained a different third cone to see into green wavelengths to complete our RGB set (7). Others did not and remained dichromads. Birds, however, being phylogenetically close to dinosaurs retained their four cones which are sensitive to UV wavelengths.

Birds have another jump on mammals: narrow the spectral sensitivity of the pigments, enabling birds to distinguish more colors than with pigments alone (7). Recent studies suggest that bird plumage is even more colorful than we can imagine (1, 2).

The more I learn about animal adaptations and evolution, the more the complexity of the world amazes me. Although I envy the naturalists of the 1800s who stepped on a new species in their backyard and went on to publish hundreds of papers about their findings, I know science is far from complete and much has yet to be discovered.

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Figure 7: An anole perches on a branch to catch its breath.

References