

More Non-Specific Articles!

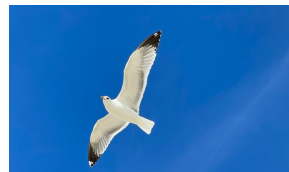
THIS ISSUE:

Women in Zoology and Conservation

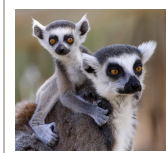
(replacing *Invertebrate of the Issue*)



**EXPLORING EARTH'S
TERRESTRIAL BIOMES
THIS PLANET WE CALL
HOME**



**ZOOLOGY
DESTINATIONS
CHANNEL ISLANDS
HARBOR, OXNARD**



**ZOOLOGY DEBUNKERS:
PRIMATE
CLASSIFICATION PART 2**

NEWS FOR THE DEDICATED ZOOLOGIST

How to Make Your Yard a Wildlife Haven

Earth Day is always an exciting day of the year for me, but it also a very important day in conservation. The purpose of the first Earth Day in 1970 was to ensure that people remained concerned about the environment as well as motivated to protect it. Today, the event celebrates the initiation of modern environmental practices and movements. So in honor of Earth Day, why not help out your local wildlife? I promise it will be fun!

Earth Day is all about conservation in action, and while the pandemic has certainly prevented any beach cleanup or protest, there are still plenty of ways to help! Many bird, reptile, mammal, and invertebrate species live in our urban environment. Each individual is always looking for a habitat with shelter and promising food and water sources. By making your yard a haven for wildlife, learning local wildlife can be pretty easy, and exciting!



Maybe you want to try attracting some birds to your yard. Bird feeders are great and come in all sorts of varieties. Hummingbird and oriole feeders are a bit more specialized, while any standard bird feeder can do just fine for finches, grosbeaks, and sparrows. Dish feeders are good for any larger bird that would normally forage on the ground, such as mourning doves, California scrub-jays, and towhees. When buying bird food, check the ingredients first! There are some companies that use artificial ingredients and we don't want birds eating any of that. Feeders are small and can attract lots of birds, especially during migration, but in general, it is better to plant native plants.

Whether you live in a house or a condo, planting native plants is always a great way to attract lots of wildlife! For those of you with yards and decent soil, planting native plants in the ground allows the plant to grow over larger areas, achieving maximum impact. In addition, planting your native plants in the ground ensures that your plant has a chance to mature and flower. Many native plants can grow to cover several feet of area. Bush sunflower, for example, can grow to be 3-7 feet wide and 1.6-5 feet tall. Meanwhile, chaparral mallow can grow some 10 feet wide and 3.3-16 feet tall! If you have the space, plant in the ground. But if you don't have a yard or the space, you can grow your native native plants in pots or other containers. A variety of succulents, including cliff maid, cacti, agave, chalk dudleya, and yellow stonecrop, do wonderfully in pots. Unlike many plants, succulents have relatively short root systems. They tend to grow in rocky soil that can constrain the roots, similar to a pot. In some cases, it's a good idea to switch to a larger pot every year or two. This helps prevent the plant's health from declining. You can also make your own pots from any recyclable bottle or other container. Simply rinse it out with water very well and drill some holes for drainage. Regardless of how you decide what you grow your plants in, it is always a good idea to do some research beforehand. Note how much sunlight the plant will need, how tall and wide it grows, how much water it needs, and what animals it will attract. Bees, butterflies, and hummingbirds pollinate and feed on native plants. Sparrows and towhees can eat any insect that may try to invade. There are lots of places to find native plants to buy, including Hahamongna Native Plant Nursery in Pasadena, which is where I got mine. Need inspiration? Mill Creek Wetlands in Chino and Arlington Gardens in Pasadena have a very impressive landscape! Native plants are generally low maintenance, require minimal water, and can help prevent soil erosion. Not to mention provide a happy place in your garden that wildlife can enjoy too!

Lastly, it wouldn't be Earth Day if I didn't mention a couple other things. To do your part for our environment, try to cutback on your waste by using reusable bags at grocery stores, buy sustainable and/or locally sourced goods whenever possible, educate others, and keep our planet in mind whenever you do something. Take action!

Iconic Wildlife of the 50 States and Territories



Puerto Rico: Puerto Rican Twig Anole

The Puerto Rican twig anole, also known as the dwarf anole, is an endemic lizard species inhabiting the island of Puerto Rico. *Anolis occultus* typically resides in the forest canopies of the island, foraging amongst twigs, ferns, and bromeliads. Finding Puerto Rican twig anoles in daylight can be quite difficult— they are small in size and camouflage perfectly. Thus, the species is often studied at night when they are easier to find. It has been found that the Puerto Rican tree anole has an unusual sleeping style when compared to its close relatives. They seldom reuse sleeping sites and prefer to rest on twigs instead of leaves. The Puerto Rican twig anole sleeps high in the forest canopy. Unlike other anoles, *A. occultus* has a prehensile tail, which it uses to grasp onto branches as it sleeps. Though this species is listed as least concern on the IUCN Red List, this was not the case in the past. Previously, deforestation and resource exploitation was a topic of concern. In recent decades however, reforestation initiatives in Puerto Rico's forests have helped the Puerto Rican twig anole population recover.

Interesting Reads

StarTalk: Neil deGrasse Tyson Explains the History of Earth Day

<https://www.youtube.com/watch?v=pWhheyKOgCw>

Our Collections: LA Brea Tar Pits

<https://tarpits.org/research-collections/tar-pits-collections>

Remembering Toni Morrison, the Bird Whisperer

<https://www.audubon.org/news/remembering-toni-morrison-bird-whisperer>

Bird and Moon Science and Nature Cartoons

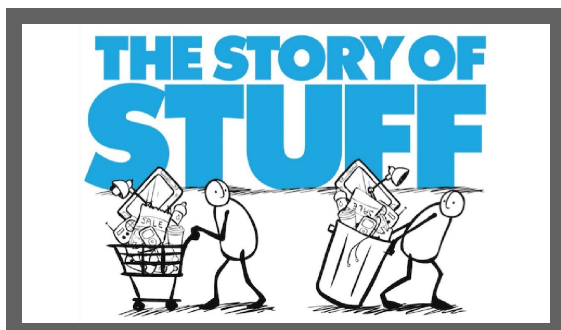
<http://www.birdandmoon.com/archive/>

Don't Miss This!

The Story of Stuff

This video will make you think about how our society works and the ways humans are hurting the environment. *The Story of Stuff* details every component of a production line—from harvesting and shipping, to processing, distribution, and disposal. It doesn't leave out a detail. Curious to know what happens before and after you buy something, what happens to it after it gets to a landfill? Our entire economy is based on buying goods. Large corporations hoard all the money and cause great damage to the health of humans and the environment. Most importantly, *The Story of Stuff* debunks what it means to be a part of a seemingly endless cycle that harms the planet and what you can do to help.

<https://www.youtube.com/watch?v=9GorqroigqM>



Major Updates to the NFDZ Website!

Remember my website, <https://dedicatedzoologist.com/>?

Well... I finally figured out how WordPress works and there is now so much more content! You can now view the PDF versions of most previous publications of *News for the Dedicated Zoologist*, see my photography (spoiler alert, it's mainly birds), read additional information, dive into NFDZ's history on the About Page, and so much more! Enjoy!

Coming this Summer: Videos for the Dedicated Zoologist!

Yes, NFDZ is expanding! VFDZ will be my little side project over the summer. I will feature various segments, such as plant-based cooking (which is great for the environment), interviews, and a segment called *Birding with Morgan!* I am so excited to be able to share this kind of content with you all! You will be able to access the videos on my website hopefully by June 12!

Stay tuned for more details on

<https://dedicatedzoologist.com/>!

Nature Photography



White-crowned sparrow

This individual is a molting juvenile. The crown is still predominantly brown, but there are some black streaks coming in.

Mourning dove

On days when the sun is out, 4-6 pm is the best times to photograph birds!



Endangered Species Spotlight

California Condor



There are many empowering success stories in conservation—bald eagles being saved from DDT poisoning, gray wolves in Yellowstone National Park being saved from overhunting, the Monito gecko being saved from invasive species. In California, the most famous conservation success story is likely that of the California condor (*Gymnogyps californianus*). Though there has been some serious progress, the California condor is still listed as critically endangered on the IUCN Red List with 488 individuals in 2018. 488 seems like a minuscule number, but what if I told you that there was a point in time (that was fairly recently) in which there were exactly 27 individuals. Allow me to tell you the incredible story of this astonishing vulture!

The California condor has a wingspan of 9.5 feet long. This incredible length allows the condor to soar on air currents (called thermals) for hours at a time, rarely needing to beat their wings. Once the condor reaches an appropriate height thousands of feet in the air, they can fly at speeds over 55 miles per hour! Despite having such a large wingspan, condors only weigh 17-23 pounds. Any bird capable of flight has hollow, porous bones which keeps the bird lightweight and able to fly. California condors are scavengers, meaning instead of hunting their own food, they find already dead animals and consume that! While this sounds gross, scavengers fulfill a critical niche in their ecosystem, playing the role of nature's clean up crew! No food goes to waste with scavengers around! California condors may travel 150-200 miles a day in search of food, which is where those wings come in! Food sources include deer, cattle, pigs, rabbits, sea lions, and whales. Ever wonder why a California condor (or any vulture for that matter) has a bald head? Sticking your head into carcasses can get messy. Having feathers on their heads prevents bacteria from collecting there and causing disease. In addition, the head's skin can change to a deep red-pink color during courtship or when the individual is alarmed or excited. California condors mate for life (*monogamy*) unless the partner dies. This is definitely useful for the species as these long-lasting bonds make raising chicks easier. 4.5 x 3 inch eggs are laid every other year, which gives the parents time to care of the previous chick. Chicks are raised one at a time and take 8 months to go from egg to fledgling. Fledglings are young birds that have just left the nest and developed some feathers, but is still mildly dependent on the parent and isn't completely ready to fly yet. Parents will take 1-7 day shifts sitting on the nest to incubate the eggs, while the other forages for food. Young are fed regurgitated carrion—yum!

California condors used to be prevalent in much of North America, with a range spanning from the Pacific Northwest, Texas, Florida, and New York, to Canada and Baja California. Condors faced illegal hunting up until 100 years ago, but this was not proven to be the main issue. The main threat was poisoning—intentional and indirect. Once people began settling the West, hunting also settled in. People would shoot condor prey with lead bullets. When the condor came to scavenge on the carrion, they would get poisoned by the lead. The highly toxic synthetic insecticide DDT affected many raptor species as well, including the California condor. DDT thinned out condor egg shells, which caused a decrease in the number of chicks hatched each year. By the 1970's, condor populations were critically low, with only a few dozen left. Biologist and conservationists had to act quick and decided to try captive breeding in the mid-1980s after tagging some condors and taking wild eggs wasn't enough. All remaining 27 individuals were captured and brought to zoos, including the Los Angeles and San Diego Zoos, which continue their condor conservation work today. Lead poisoning is still an ongoing issue. From 1992 to 2019, 93 condor deaths have been linked to lead poisoning alone, making up around 50% of the total deaths. To combat this threat, "non-lead zones" were created to prevent people from hunting in condor range in 2007. In 2013, Assembly Bill 711 was signed, which banned lead ammunition for all wildlife. Since the breeding programs started, the condor population is at 337 wild, free flying condors and 181 in captive populations. Bringing the total world population to 517 in 2019. Each California condor has been tagged so biologists and conservationist can track them in the long term. This will be critical in determining future plans of action for condors and other critically endangered species.

Zoology Destinations

Quarantine Escape: Come for the birds, stay for the beaches!

Oxnard, a city of coastlines, harbors, small shops, and lots of seagulls! Well, not just seagulls, but an array of bird species— pelicans and cormorants, starlings and crows! Oxnard is a wonderful place to get outside and observe urban nature. I visited Channel Islands Harbor in February and loved photographing and hearing the local birds. Along the beach, I saw western gulls and ring-billed gulls, met my first willet and marbled godwit. In the harbor, a lifer female bufflehead, pied-billed grebe, and eared grebe, as well as three mallards. I could be looking at the bufflehead, turn around, and not see her for a couple minutes. She must have dove down for a snack! The mallards meandered through the docked boats, dipping their head in the water every so often. I couldn't stop looking at the eyes of the eared grebe, with their red irises. Walking along the sidewalks, I noticed my first European starling and Say's phoebe, three American crows, and more western gulls. I passed by a parking lot and found a juvenile Cooper's hawk sitting on a pole! Not to mention the couple of feral/rock pigeons that eyed my every move as I passed by them. Out of the 16 species I saw that day, 10 of them were lifers, birds I hadn't positively identified/observed before. I find it both funny and interesting how birds are able to adapt to city life. In many cases, bird populations are in decline due to human development. But, it seems the birds of Oxnard sure know how to adapt, and they do it well. How exciting!



Channel Islands Harbor, Oxnard

Location

3850 Harbor Blvd
Oxnard, CA 93035
United States

Facility

Walk along the beach or harbor. There is a farmers market open from 10 am to 2 pm on Sundays. Parking is plentiful

COVID-19 Safety

Most people are masked and socially distanced. Make sure you follow the guidelines and stay at least 6 feet apart with masks on.

Oxnard has a wonderful assortment of habitat for the local species. In the mornings, you can spot the stellar sea lions, piled on top of each other in creative ways, communicating loudly with one another. In the harbor, you can spot tide animals— ochre stars, moon jellies, and even a nudibranch if you're lucky. Birds surround you, all kinds. Rock pigeons, who are descended from pigeons that were once kept as pets, are also known as feral pigeons, not wild, but not domesticated either. They fly about in large flocks, rest on sailboat masts, and huddle together on street lamps. As you walk along the harbor, gazing up at the puffy clouds, a great blue heron flies through. You follow it as it crosses the sky, before seeing it land on a nearby building. Heading towards the beach, wind blowing your hair, you spot seagulls, western and ring-billed, riding on the air. Running down the sand covered hills, you reach the waves, uncovering the rocks that come with the recession of water. You are met by a willet, a medium sized shorebird with a long, rounded bill,



feathers speckled with wavy lines and spots. The willet walks into the waves, and you do too, each running towards the shore as the waves come back again. You watch the willet with great curiosity, repeating each other's movements, wet and happy. The first willet is joined by two others, and they gather for a few moments. The first willet leaves the group and heads back to the shore, repeating the cycle of moving in and out of the waves. A marbled godwit, a larger bird with an even longer bill, pink this time and ended with black. The marbled godwit, with its streaked face, looks into the waves, into the day that lies ahead. Western gulls soar overhead, fighting the wind currents, staying still in the sky.

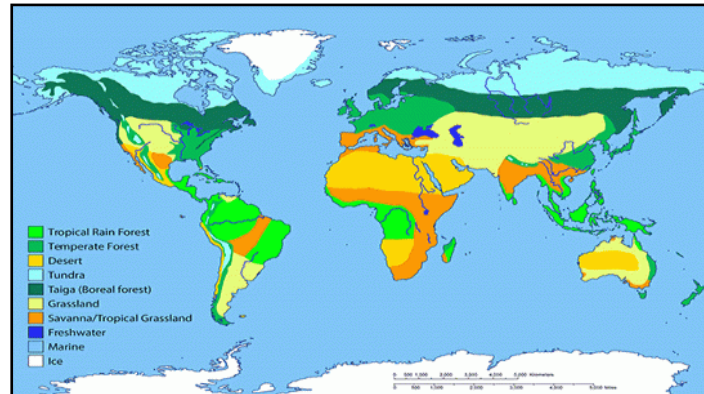


*Sorry if that sounded a bit poetic!

From top: Willet, juvenile Cooper's hawk, Say's Phoebe, juvenile western gulls

Exploring Earth's Terrestrial Biomes

Earth, isn't it a wonderful place. I mean really, how perfect is our planet (humans and their threats aside). Third planet from the sun, fifth largest in the Milky Way, a moon and an atmosphere, about 71% water and 29% land, around 4.54 billion years old. Life evolved here some 3.8 billion years ago, when Earth was a hostile environment home to ancient microorganisms that practically formed by chance (but that's a story of its own). The atmosphere predominantly contained methane, ammonia, neon, and water vapor. Then, oxygen comes into the picture. 2.4 billion years ago, cyanobacteria evolved and began photosynthesizing, releasing oxygen in the process. Multicellular life evolved, giving rise to plants, animals, and fungi. It has taken a lot of chance and a lot of time to get to where we are today in Earth's history, and we still don't entirely understand how it all happened. Today, Earth is a planet thriving with diverse species and ecosystems, a place where everything is interacting with everything else in a beautiful way.



Just as we have an atmosphere or a lithosphere, we have a biosphere. The biosphere is made up of every living thing: biomes, ecosystems, populations of species, the flow of energy from one individual to another throughout food webs. Biomes are the combination of climate (temperature, precipitation, sunlight), environment, and inhabitants. Generally, we classify biomes into 9 different groups. We'll cover the 8 terrestrial biomes here.

Let's first take a look at forests. Forests have great variation, from the Amazon Rainforest to a forest of pines and cedar in the Pacific Northwest. The forests of Great Smoky Mountain National Park are famous for its beautiful tree leaves in the fall months. Wildlife includes black bears, elk, turtles, white-tailed deer, coyotes, salamanders, squirrels, and owls, to name a few. Deciduous trees such as maples, hickory, oak, and chestnut dot the landscape. The leaves of these trees change color with the seasons and fall off in the winter. Evergreen trees, trees that stay green all year long and do not lose all their leaves at once, can be found throughout the landscape and include spruces and pines. Great Smoky Mountains is an example of a temperate forest. Tree leaves change color with the seasons and fall off in the winter. Temperate forests can be found in the eastern parts of the United States, Asia, and Australia, the southern parts of South America, Europe, and New Zealand. Boreal forests, more commonly referred to as the taiga, make up the largest terrestrial biome. Evergreen trees, mainly conifers (cone-producing trees such as pines and cedars) grow in these areas. Species living here have to be pretty hardy, needing to withstand cold temperatures combined with snow in the winter months. Animals that live here tend to wait out the colder months with hibernation. Others, such as weasels and rabbits, grow thick fur that matches the color of the snow. Boreal forests make up much of Alaska, Canada, and Russia. Tropical rainforests stay warm and humid all year long, with lots of precipitation of course! Lots of water, some 50-260 inches of it, brings lots of wildlife. Monkeys, insects, macaws, and snakes species all call rainforests home. The Amazon rainforest, for example, is so diverse that around half of Earth's species call it home even when the forest only covers 6% of Earth's surface! Tropical rainforests are mainly located at the equator, where the planet receives the most sunlight. More sunlight means more photosynthesizing plants, which means millions of tons of water being released into the atmosphere via transpiration. Evaporation takes place quickly and warm, moist air rises and cools to form clouds and eventually rain. Parts of Mexico, northern South America and Australia, central Africa, and Indonesia are all tropical rainforests.



Great Smoky Mountains NP



Alaska



Amazon Rainforest



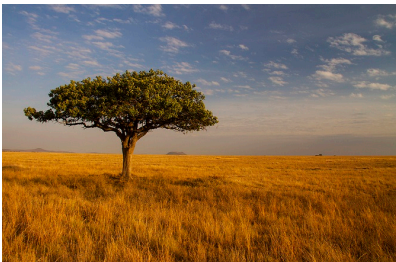
Chihuahuan Desert



Greenland



Little Missouri National Grassland



African savanna

Deserts are generally thought of as unbearably hot environments, but they are actually classified based on annual precipitation, not temperature. Death Valley holds the record for hottest recorded temperature on Earth, a sweltering value of 134°F on July 10, 1913. Antarctica is a cold desert, with temperatures as low as -112°F. On average, deserts receive less than 20 inches of rain each year, while some receive almost none, such as the Atacama Desert in South America. Deserts make up 20% of Earth's surface and can be found on every continent, especially in areas halfway between the equator and a pole. This is no coincidence. Warm, moist air rises from the equator and will eventually result in cloud formation and precipitation as it cools. As for the warm air, it will keep going, gradually rising above the equator as the cooler air moves throughout the north and south. As a result, two circulating air currents form around the equator, known as Hadley cells. As our cool air sinks, it warms. This warmed air is very dry now and will try to take in any surrounding water. At around 30-50 degrees north and south of the equator, the warm air makes the climate dry— a desert. These points take you to places such as the western parts of South America, Mexico, northern and southern parts of Africa, the Middle East, and central Australia. Wildlife includes kangaroos, rabbits, cougars, bobcats, burrowing owls, scorpions, and snakes. Plant life includes cactus such as the saguaro and cholla cacti, acacia trees, desert pea, palm trees, and creosote bush. On Antarctica, we see penguins such as emperor, chinstrap, and Adélie, narwhals, beluga whales, krill, snow petrels, and Antarctic fur seals. Plant life is extremely limited in the Antarctic, with there being only two native vascular plant species: the Antarctic hair grass and Antarctic pearlwort.

Tundras are one of the most difficult biomes to live in. Covering around 20% of Earth's surface, tundras are located in the northern and southern hemispheres, mainly Greenland, northern Canada and Russia, parts of Alaska, and the outer edges of Antarctica. Tundras are not only cold, but also very dry. The poles are furthest away from the sun and are therefore some of the coldest places on Earth. In addition, weeks or months can go by with no sunlight at all in the northern hemisphere at winter time. Low temperatures, little precipitation, poor soil nutrients, and short growing months all define a tundra. Layers of permafrost blanket the soil and prevent trees from taking root. Tundras are relatively new in Earth's history, only existing for the recent 10,000 years. Within that time frame, life has managed to support itself in this bitter biome. Snowshoe hares, lemmings, musk oxen, caribou, wolves, and ptarmigan all live here. Plant life is even more limited, with small shrubs, flowering plants, and grasses taking root here. No trees can be found in the tundra, as hinted by the word itself, which means "treeless plain" in Finnish. Lichen and liverworts are able to

survive here and provide a major food source. Many migratory bird species spend their summers in the tundra, including the Arctic tern, snow buntings, gulls, and sandpipers.

Grasslands are found in the western parts of the United States, southern half of South America and Russia, Mongolia, and Australia. Grasslands are vast areas of wild grasses and are separated into many categories, such as by annual rainfall. Some grasslands are dry and are therefore called desert grasslands. Others flood for all or part of the year. Most grasslands are flat, while others occur on mountain sides. North America's grasslands are known as prairies or plains. South African grasslands are called velds, while those in Europe and Asia are known as steppes. Grasses of varying heights grow in this biome, ranging from around 20 feet tall in some of Nepal's grasslands, to less than a foot in the United States. Black-foot ferrets, prairie dogs, pronghorn, and bison inhabit United States grasslands. Herbivores such as rhinoceroses and elephants inhabit Africa's grasslands.

Savannas are quite similar to grasslands. The main difference is that savannas are found in tropical regions, such as northern Mexico, northern parts of South America, the southern parts of Africa, India, Bangladesh, Myanmar, and Europe, and small parts of Madagascar and Australia. Savannas are defined by how much rain falls in a season, separated into a wet and a dry season. Temperatures rarely fall below 60°F and generally stay in the range of 80-100°F. 4 inches of rain falls during the wet season, while hardly any will fall in the dry season. Droughts and fires are common and wildlife such as zebras, lions, and antelopes must adapt.

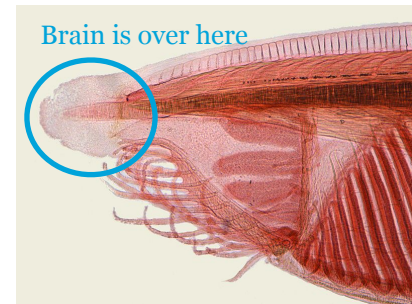
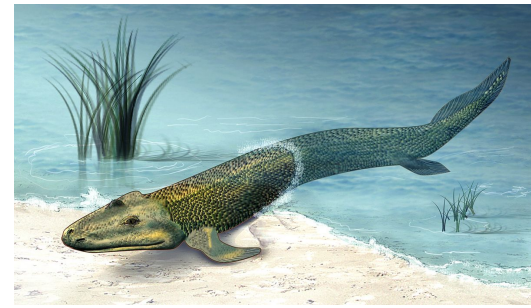
Prehistoric Animals of the Issue Your Prehistoric Origins

Have you ever wondered why we hiccup? Or why some people are color blind, and if other animals are color blind too? Perhaps why humans walk on two legs or why our hands look the way they do. It turns out, the answers to all these questions can be found if we dive into our ancient ancestors. Yes, this includes prehistoric humans, but also ancient primates, reptiles, and even fish! You see, we share a lot in common with other animals, even if you don't realize it yet. Author, professor, and fish paleontologist Neil Shubin describes it this way: "Ghosts of our ancestors are present in our bodies today." It's true! Neil Shubin and his team discovered the first *Tiktaalik roseae* specimen in Canada, a specimen that ultimately unlocked a major point in evolution—the transition between marine and land animals. From here, Shubin made major connections between fish and humans, and the other animals in between. He published his book "*Your Inner Fish: A Journey into the 3.5 billion Year History of the Human Body*", a wonderful read I must say! Let's explore a few of these connections!

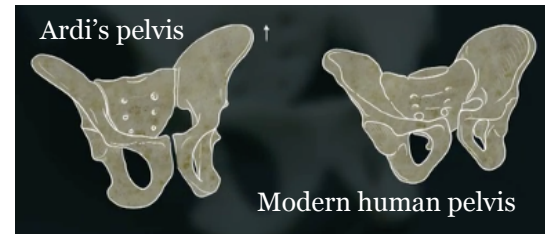
The brain, a beautiful organ that holds memory, data, can help define an individual. The brain can be traced back to the 530 million year old *Pikaia*, a primitive chordate. To view such a primitive brain these days, we can turn to lancelets, or amphiox. Lancelets are fish-like animals with a simple nerve chord and a tiny swelling at the head, the brain. Amphiox are over 500 million years old and hold the genes corresponding to basic brain organization. Now looking at sharks, we see further organization, a fore, mid, and hind brain. This pattern is also seen in humans. While the functions and form of a shark's brain is indeed different from that of humans, we can still note that the structure hasn't changed much since fish. Moving forward, we enter primates. Primates are known for their highly developed brains, especially in the areas of visual processing and motor control. In humans, we see exactly this, as well as a greater number of neurons and connections between regions of the brain. This may be what accounts for human intelligence.

23 million years ago, our primate ancestors were red-green color blind. But humans see in color, hundreds of different colors. How did humans make this transition, it has to do with opsin. Opsin is a protein found at the back of the eye in the retina and is used to detect color. Non-human primates have two types of opsin, each set to see a different wavelength of light. In addition to the two, humans have a third opsin used to detect yet another light wavelength. Coincidentally, opsin 3 is located directly adjacent to opsin 2, suggesting that opsin 2 had duplicated and mutated in order to get the third opsin. Because humans were able to see more wavelengths of color, it was easier to distinguish ripe fruit from unripe ones, young leaves from old. The location of the eyes have changed over time as well. *Tiktaalik* had eyes on top of their head, allowing them to look up without their whole body leaving the water. Once the transition to land was made, many animals evolved to have eyes on the sides of their head, which gave a landscape view. When our primate ancestors made their way to the trees, depth perception became necessary and eyes migrated to the front of the head, as seen in *Notharctus*.

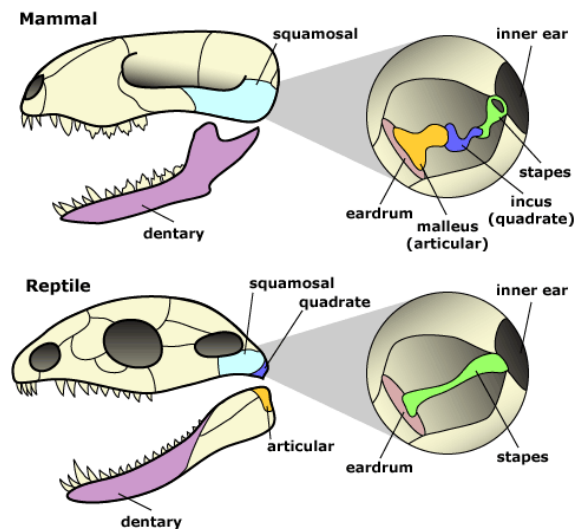
Notharctus didn't just contribute to eyes, but also to hand development. Discovered in 1870 in Wyoming territory, the 50 million year old *Notharctus* led an arboreal lifestyle, a life in the trees. *Notharctus* had a divergent thumb, that is a thumb that formed an angle with the index finger. The prehistoric primate also had nails instead of claws and lengthened fingers. Long fingers and opposable thumbs meant that *Notharctus* was capable of grasping thin branches, the places where fruit and flowers grow and where insects live. We also see a lot of animals with similar arm anatomy, homologous structures. You may think that a hand is nothing like a wing or fin. But they are indeed similar, each following the pattern of one short bone (humerus), two long bones (radius and ulna), lots of bones (carpals), and digits (fingers). These animals sharing the homologous structure that is the hand evolved some 375 million years ago from a transitional animal like *Tiktaalik*.



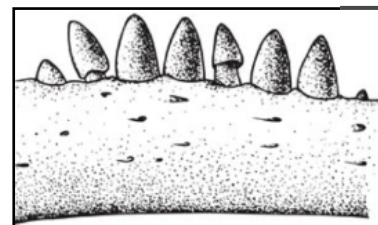
Humans are the only primate that walks on two legs. Bipedalism has been linked to a prehistoric human species known as *Ardipithecus ramidus*, or “Ardi”. Ardi was discovered in 1994 by a graduate student in Ethiopia. The excavation began with the unveiling of hand and feet bones, and continued until the full skeleton was unearthed. Ardi turned out to be a wonderful indicator of bipedalism, revealing that by 4.4 million years ago, the transition to walking on two feet was already beginning. We see significant differences and similarities when comparing the pelvises of Ardi and modern humans. The ilium (top half of the pelvis) is short and broad, an indicator that points to both Ardi and modern humans being capable of bipedalism. Looking at the ischium (lower half) of Ardi’s pelvis however, shows that Ardi was also capable of climbing. Scientists were able to conclude that while Ardi was able to walk on two legs, she was not able to do so as well as humans can today. Ardi’s feet were capable of walking, but also capable of grasping onto branches. While excavating the site where Ardi was found, scientists discovered evidence that she lived in a woodland habitat. This shows that humans began walking on two feet while still living in forested areas with trees. As evolution continued, legs began to angle inwards from the pelvis to knee. This accounts for balancing and efficient walking. This was seen in fossils such as Lucy, a 3.2 million year old *Australopithecus afarensis*. Without the angle, walking would be more similar to that of chimpanzees.



The ear’s function is to turn vibrations created by air into sound. This sound can then be sent to the brain for processing. All mammals, including humans, have three ear bones—the malleus, incus, and stapes. Reptiles and our reptilian ancestors have only one, the stapes. Here is where I think this all gets super crazy. Mammals hear with the bones that reptiles eat with. Mind blowing, let me break it down. Reptiles have a mandible, that is a jaw bone, connected to the skull by a series of small bones that form the jaw joint. Eventually, the mandible got so large, it touched the skull on its own. The previously formed joint was now vestigial, as in, it no longer served a functional purpose. But instead of disappearing all together, they changed over the next few million years. The old joint bones shrank and became the malleus and incus, which helped animals hear higher frequency sounds. Your next thought might be, where did the stapes come from, the bone that was hearing from the start? It turns out, the stapes can be traced back to fish who were making their transition to land. Unlike reptiles, amphibians, mammals, and birds, fish have no ears. Yet, they do have bones that would eventually become those used in hearing. What fish had was a hyomandibula, a large rod that connects the upper jaw to the brain case. Both the hyomandibula and stapes connect to an equivalent set of nerves. At the time when fish were making the transition from water to land, we see the hyomandibula shrinking in size, finally shifting to the location that now earns it the title of stapes. We see this transition in *Tiktaalik*, and other transitional animals. Why? Hearing in water is different from hearing on land where you are surrounded by air.



Lastly, teeth. Teeth are the hardest things in the body and fossilize the easiest. In fact, if you look in the right time period, some rocks *only* contain teeth. Teeth can tell a lot about an animal’s lifestyle, habitat, and jaw, head, and body size. Reptiles have identical cone-shaped teeth, not specialized like that of mammals. These teeth were primarily used for tearing meat. Some 200 million years ago however, reptile-like mammals evolved to have elongated canines perfect for piercing skin and incisors for stripping off meat. In *Gorgonopsids* for example, we see teeth of equal shape, but different sizes, an indicator of specialization. This allowed *Gorgonopsid* to chew more efficiently. This meant more energy spent chasing and consuming prey. Furthermore, the master regulator gene EDA controls the development of skin, scales, feathers, mammary glands, and you guessed it, teeth. Providing insight on how related each animal is to one another.



Reptilian teeth

So it turns out humans actually have a lot in common with other animals. All it takes is a dive into prehistory to find our fish, reptile, and prehistoric primate origins.

Games

Another Wildlife Bingo: Backyard Bird Edition



Feral/rock pigeon



Mourning dove



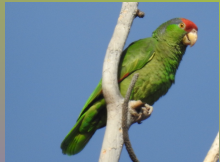
California scrub-jay



House finch



Lesser goldfinch



Red-crowned parrot



Turkey vulture



House sparrow



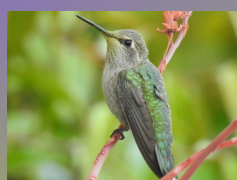
Northern mockingbird



Acorn woodpecker



American crow



Anna's hummingbird



Great-horned owl



Hooded oriole



California towhee



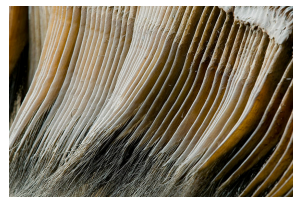
Red-tailed hawk

All photos are mine except the house sparrow and great-horned owl.

Zoology Term of the Issue

Baleen, noun

A material made of calcified keratin and reinforced with proteins, baleen is a filtering system used by the baleen whales (systematic name *Mysticeti*). Baleen whales include the blue, gray, bowhead, right, humpback, and pygmy right whales. Baleen whales are widespread, with most favoring Arctic and Antarctic waters. Here, prey such as krill and plankton are abundant. Baleen is attached to the upper jaw and is divided into two forms, main baleen plates and accessory plates. The main plates are large while the accessory plates usually form small hair-like structures. In order to harvest the prey, whales take in gallons and gallons of water rich in krill and plankton. The whale will close its mouth and press its tongue against the palate, forcing water out. This leaves behind the prey, which is then swallowed. Blue whales, for example, consume some 1,100 pounds of krill at a time.



Name the Animal!



This species is common throughout California, living in most biomes except for very high elevations and most deserts.

This lizard is diurnal, meaning they only come out during the day time and sleep at night.

As far as Los Angeles lizards go, this one's size may surprise you. This species can grow to be around a foot long!

This lizard's tail can be longer than the rest of the body. The tail can also detach if the individual feels threatened. This lizard can also shed its skin!

Unlike many lizards, this species does not bask in direct sunlight, instead they go to sunny areas with some cover.

They have strong jaws, being able to inflict painful bites. Their jaws help them catch prey, which includes small mammals, birds, insects, spiders, bird eggs, snails, scorpions, and even others of their species. Yep, this lizard is a (documented) cannibal!

They like to slide their body as a form of locomotion.

The lifespan of this lizard is 15 years.

Name hint: a direction + a reptile genus + its reptile group

Find the answer on page 12!

Women in Zoology and Conservation

March is Women's History Month and I am so excited to share with you some of the phenomenal women that have inspired me to pursue the field of zoology. Getting women in the work force hasn't been easy, especially in the fields of science, math, technology, and engineering. An astounding 28% of the STEM workforce is made up by women. Women have made critical contributions in STEM throughout history, from the first woman to study mathematics Hypatia of Alexandria. To Marie Curie, a chemist and physicist who discovered the elements radium and polonium and the first person to ever win two Nobel Prizes. Jane Goodall, who studied the chimpanzees of Gombe National Park in Tanzania and who continues to inspire hope and change in the younger generations with her Roots and Shoots program. Emmanuelle Charpentier and Jennifer Doudna who discovered the use of the enzyme Cas9 in CRISPR and recently won the Nobel Prize in chemistry, marking the first time the prize was only awarded to women. All of these women, and more, have played such important roles in advancing our understanding of the world. They continue to inspire us with their power, energy, and optimism. Now, let us explore a few more women who have paved the way for others in the field of zoology!

Dr. Eugenie Clark (1922-2015)

Dr. Eugenie Clark was an American ichthyologist, a scientist specializing in the study of fish. She made many contributions to the study of shark behavior, hence her nickname "Shark Lady". In addition, she studied the order *Tetraodontiformes* (an order containing most tropical fish, including triggerfish, puffer fish, etc.). Dr. Clark strongly supported scuba diving for research purposes. In fact, she was one of very few ichthyologists of her time that studied species using this method. She conducted a total of 72 submersible dives and countless more with the use of scuba gear. Dr. Clark preformed a lot of research in the Red Sea, a place that was seldom explored during her time. In 1953, she authored the book *Lady With a Spear*, which later inspired philanthropists Anne and William Vanderbilt to fund a small lab for Clark to conduct research, called the Mote Marine Laboratory. Dr. Clark taught at the University of Maryland from 1968-1992, a total of 24 years. She also gave lectures around the globe to promote the greater understanding of sharks and the marine environment. In addition, she was a pivotal author for National Geographic, as well as other publications. Her last dive was completed at age 92, a year before she passed. That just goes to show you how dedicated Dr. Clark was to her field of study!



Dr. Sylvia Earle (1935-)

Dr. Sylvia Earle is an American marine biologist, explorer, author, and lecturer. She is most known for her research in marine algae and her promotion of ocean conservation. In 1979, she set the record for deepest untethered dive at an astonishing 1,120 feet underwater! In 1965, she became the resident director at Cape Haze Marine Laboratories. In 1967, Dr. Earle became a research fellow at Harvard University. She also discovered undersea dunes in the Bahamas in 1968. In 1970, Dr. Earle led an all female research team as part of the Tektite II experiment. This was during a time when females had just begun to enter fields (such as science) that were usually male dominant. She later became a curator of marine biology at the California Academy of Sciences in 1976, then the curator of phycology (study of algae) in 1979. Dr. Earle was the co-designer of the submersible *Deep Rover* in the early 1980s. From 1980 to 1984, she served on the National Advisory Committee on Oceans and Atmosphere. In addition, Dr. Earle became the chief scientist at NOAA from 1990-1992, a position that had never been filled by a woman. In 1998, she became National Geographic's first female explorer in residence. That same year, Dr. Earle was named the first "Hero of the Planet" by Time Magazine. In 2009, she founded the Mission Blue Foundation, a global organization that promotes public conservation and access to protected areas of the ocean. Dr. Sylvia Earle continues to advocate for ocean conservation and give lectures around the world.



Dr. Roger Arliner Young (1889-1964)

Dr. Roger Arliner Young was the first female African American to earn a PhD in zoology. She attended Howard University in 1916, during which she decided to switch her major from music to zoology. Dr. Young graduated in 1923 with a Bachelor's degree in zoology, then a Master's degree from the University of Chicago. She co-authored numerous scientific articles with famed African American biologist Ernest Everett Just, though she did not receive the credit for doing so. In 1924, she published her first article, *On the Excretory Apparatus in Paramecium*, which was featured in *Science Journal*. This made her the first female African American to publish something of this field. In 1949, Roger Arliner Young became Dr. Roger Arliner Young when she received her PhD in zoology from the University of Pennsylvania. After that, she continued her research in the fields of marine biology, studying how sea urchin eggs can be affected by radiation, as well as the hydration and dehydration of living cells.



Dr. Chang Meemann (1936-)

Dr. Chang Meemann is a Chinese paleontologist and evolutionary biologist. In 1983, she became the first female to become president of the Institute of Vertebrate Paleontology and Paleoanthropology. Dr. Chang has three species named after her: an extinct bony fish genus by the name of *Meemannia*, a theropod dinosaur called *Sinovenator changii*, and an extinct bird called *Archaeornithura meemanna*. She became a member of the Chinese Academy of Sciences in 1991. Much of her research details how marine vertebrates adapted to life on land. Dr. Chang Meemann has been recognized by UNESCO and the L'Oréal Foundation as one of the five most outstanding women scientists from around the world.



Rachel Carson (1907-1964)

Rachel Carson was an American marine biologist, ecologist, conservationist, and author. She had been pursuing her doctoral degree in college until she had to stop in order to take care of her ill father and sister. She later went on to teach at the University of Maryland for 5 years, beginning in 1931 and ending in 1936, as well as Johns Hopkins University (which she had previously attended) during the summers of 1929-1936. In 1936, Carson became the second woman to be hired by the U.S. Bureau of Fisheries, where she worked for 15 years. Rachel Carson is the author of many books, including *Under the Sea Wind* in 1941, a book that introduces the reader to marine life, *The Sea Around Us*, an award winning book on the study of the ocean in 1951, and *The Edge of the Sea* in 1955, a publication that describes where life in the sea and life on land meet. *Edge of the Sea* has been nominated for the *National Book Award of Nonfiction*. Most importantly, she wrote *Silent Spring* in 1962, a detailed publication that warns of the indiscriminate use of pesticides and their threats to the environment. *Silent Spring* is said to have launched the Modern Environmental Movement, which began in the 1960s. In her book, and elsewhere, Carson strongly advocated against pesticides, specifically DDT, a highly toxic synthetic insecticide. This feat was very risky because she was a woman. Pesticide companies wrote newspaper articles and went on TV, insisting that pesticides were harmless and that Rachel Carson's facts were wrong. The facts were all true and DDT was banned in 1972 in the United States, something Carson never got to witness. She died in 1964 due to breast cancer that went too long untreated by doctors. In 1980, she was awarded the Presidential Medal of Freedom posthumously. Rachel Carson's home is now considered to be a national historic site. Various awards bear her name, including the Rachel Carson Prize for American Academic Books, the Rachel Carson Prize for female environmentalists (presented in Norway), and the Rachel Carson Award, presented by the National Audubon Society, which honors American female environmentalists.



I hope you have found some awesome female heroes, because I sure have along the way. May women continue to empower. Happy Women's History Month!

Check out this Women in STEM quiz that I coded: https://editor.p5js.org/biology_is_life/sketches/APqhI1UKb

Zoology Debunkers: Primate Classification Part 2: Monkeys and Prosimians

Last issue we covered the first half of primate classification, the greater and lesser apes. Here, we will discuss the monkeys and prosimians. These are certainly two very diverse and fascinating classifications. Many monkey and prosimian species face some level of extinction. The aye aye (a lemur) is endangered, with habitat destruction being the primary threat, but also locals hunting them for food and because of their relation to a taboo. The Tonkin snub-nosed monkey, an Old World Monkey, is critically endangered, with around 80-100 individuals remaining in the wild. Habitat loss, killing for not scientifically proven traditional medicines, and hunting as a food source are all threats the Tonkin snub-nosed monkey faces.

Old World Monkeys (family *Cercopithecidae*)

Old world monkeys are monkeys that originate on the continents of Africa and Asia. All Old World monkeys have tails, but are not prehensile. Old World monkeys tend to walk on all fours. The old world monkey grouping includes the two subfamilies *Cercopithecinae* and *Colobinae*. *Cercopithecinae* includes around 71 total species of macaque, baboon, mangabey, guenon, and patas monkey. Most spend their nights sleeping in trees or cliff faces. Days are spent foraging on the ground. This is collectively known as a semi-terrestrial lifestyle. Sexual dimorphic characteristics are prevalent in new world monkeys, mainly in size. Adult males can be double the size of the female. Males have long canine teeth, which they use for fending off predators and in male to male combat over mates. Old world monkeys have cheek patches that are used to store food, which can include fruit and meat. The largest of the male baboons will occasionally hunt other monkeys and young chimpanzees as a food source.

Old World monkeys also include the subfamily *Colobinae*, which includes 61 species of colobus monkeys (Africa) as well as the langur and proboscis monkeys (South Asia). Each of these monkeys are herbivores, having a strictly vegetarian diet. Colobines lack cheek pouches. They do however, have sacculated stomachs, stomachs with multiple compartments that help the animal break down plant cellulose more efficiently, thereby gaining more usable calories. Long intestines increases the absorption of nutrients as well. Proboscis monkeys are probably the most dramatic form of sexual dimorphism in Colobines, with the males having a long nose that acts as a resonating chamber. The nose allows the male to make loud sounds that are used to warn group members of predators. Females and young have shorter noses that do not resonate sound.

New World Monkeys (superfamily *Ceboidea*)

New World monkeys are those found in South and Central America. New World monkeys are split into five families: *Callitrichidae*, *Cebidae*, *Aotidae*, *Pitheciidae*, and *Atelidae*. The parvorder *Platyrrhini* refers to this group of primates having flatter noses. It is estimated that New World and Old World monkeys diverged some 40 million years ago. The family *Callitrichidae* contains marmosets and tamarins. Marmosets and tamarins feed on insects, small vertebrates, and fruit. Like many primates, marmosets and tamarins live in groups, generally consisting of breeding pairs and offspring including infants. Callitrichids are considered highly flexible in their social structures, with most groups having one breeding female and multiple adult breeding males that assist in taking care of the infants. *Cebidae* includes the capuchin and squirrel monkeys. Members of this family live almost exclusively in the



Olive baboon
Papio anubis



Proboscis monkey
Nasalis larvatus



Columbian night monkey
Aotus lemurinus

trees. *Aotidae* comprises of night/owl monkeys, a single genus with eight species. They are the only nocturnal monkeys under the New World classification. Night monkeys have a sac below their chin which they inflate for vocalizations. *Pitheciidae* includes the titis, sakis, and uakaris. This grouping has a dental morphology that reflects their diet of hard, heavily protected fruits. Finally, *Atelidae* includes howler monkeys and monkeys with prehensile tails, such as spider, woolly, and muriquis monkeys. Prehensile tails allow the monkey to grasp onto tree branches.

Prosimians (suborder *Strepsirrhini* and family *Tarsiidae*)

Prosimians contain lemurs, lorises, and tarsiers. Prosimians are considered to be “primitive” to the other primate classifications, having evolved before the monkeys. This is hinted in the name itself, with “pro” meaning before and “simian” referring to the simians (monkeys and apes). Taxonomically, the two groups are *Prosimii* for prosimians and *Anthropoidea* for the simians. In classical classification, tarsiers are grouped with the prosimians, but recently, there has been a counter classification. Cladistic classification places tarsiers with the simians. The groups then get renamed, with prosimians - tarsier becoming *Strepsirrhini* and simians + tarsier becoming *Haplorhini*. Cladistic classification is a form of grouping animals based on measurable shared characteristics. This would imply that the the groups being compared would have recently diverged from a common ancestor. For the purpose of this article, we will group tarsiers with lemurs and lorises in the suborder *Prosimii*.

Present day lemurs are divided into four families and two subfamilies. Lemurs evolved independently on Madagascar, which led to great diversity within the classification. Lemurs have what is called a tapetum lucidum behind their retina. The function of the tapetum lucidum is to reflect and thereby increase the amount of light. This allows all nocturnal lemurs to see quite well at night. The family *Cheirogaleidae* includes the mouse and dwarf lemurs, the smallest of the primates. All 25 or so species are nocturnal, having large eyes that let light in. During drier seasons, *Cheirogaleidae* will sustain themselves on fat stores located at the base of the tail. The family *Lemuridae* contains 5 genera and around 20 species. Members of *Lemuridae* have larger olfactory systems than other primates, attributing to their keen sense of smell. Lemurs in this family feed exclusively on plant material. All live in the trees, but will move by ground too. Ring-tailed lemur groups will walk around together on the ground. Male ring-tails mark territory with the help of scent glands located at the wrist, chest, and scrotum. *Indridae* contains three genera— indri, sifaka, and woolly lemur. Each is arboreal and will also make commutes on the ground. The sifaka (genus *Propithecus*) for example, have legs that are spaced out in a way that allow them to jump large distances between trees. However, walking on the ground is done quite differently compared to other lemurs, as long legs and short arms make motion on all fours impossible. Sifakas have to jump sideways in order to get around on the ground, which usually isn't for very long. Unlike other lemurs, members of *Indridae* lack a lower canine and having an upper and lower premolar. *Daubentoniidae* contains one species, the aye aye. Aye ayes are strictly nocturnal. They have claws instead of nails and an elongated third digit. Their teeth resemble that of rodents and are used to gnaw off pieces of bark. From there, the aye aye can insert their elongated third digit into the hole and fish out insects to eat.

The family *Loridae* is divided into two subfamilies, *Lorinae* and *Galaginae*, the lorises, pottos, and galagos (also known as bushbabies). Lorises (slow and slender lorises) inhabit Southern Asia, mainly India and Indonesia. They are nocturnal and slow-moving. Pottos are also nocturnal and inhabit parts of central Africa. Pottos are arboreal, in fact they have blood storage in their hands and feet, which allows them to grip onto branches for extended periods of time without feeling any muscle fatigue. Bushbabies feed on insects, small mammals, fruit, and plant material.

Tarsiidae contains the four species of tarsier. Tarsiers are small nocturnal prosimians with very large eyes and an acute sense of hearing. They are insectivores and carnivores. The placenta of tarsiers resembles that of the simians, while the uterus is more lemur-like. Tarsiers inhabit Malaysia, Indonesia, and the Philippines.



Coquerel's sifaka
Propithecus coquereli

Resources

- <https://www.cnps.org/gardening/patio-and-container-gardens-5423>
- <https://chipjobobo.wordpress.com/2020/08/30/howdotwiganolelessleep/>
- <https://www.iucnredlist.org/species/178657/18977601>
- <https://www.storyofstuff.org/#>
- <https://wildlife.ca.gov/Conservation/Birds/California-Condor>
- <https://www.nwf.org/Our-Work/Wildlife-Conservation/Success-Stories>
- <https://www.allaboutbirds.org/news/bird-cams-faq-california-condor-nest/>
- <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=170382&inline>
- <https://naturalhistory.si.edu/education/teaching-resources/life-science/early-life-earth-animal-origins>
- <https://askabiologist.asu.edu/explore/biomes>
- <http://www.pbs.org/your-inner-fish/interactives/explore-your-inner-animals/>
- <https://ncse.ngo/chew-story-your-ears-only-part-1-0>
- <https://www.nps.gov/chis/learn/nature/southern-alligator-lizard.htm>
- https://www2.palomar.edu/anthro/primate/prim_6.htm
- <https://animaldiversity.org>
- <https://animals.fandom.com/wiki/Cebidae>
- <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/callitrichidae>
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- Allaby, Michael. A Dictionary of Zoology. Oxford University Press, 2014.
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- <https://www.neprimateconservancy.org/tonkin-snub-nosed.html>
- <https://www.zoonewengland.org/franklin-park-zoo/our-animals/mammals/primates/potto>



Thank You for reading this month's edition of "News for the Dedicated Zoologist"! I hope you enjoyed it.



Wait, keep reading!

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Name: _____

Question: _____

Email (also optional): _____

Please give this piece of paper to Morgan Gaskell **or** send the information to biologyislife@50-50.com **or** fill out this Google Form:

<https://forms.gle/XzCdmzkLyncKEVB7A>

Answers- Name the Animal!

The animal on page 8 is a Southern alligator lizard



Ash-throated flycatcher and common side-blotched lizard seen at Hahamongna Watershed Park



Backyard Sighting!



April 17, 2021
Fiery skipper
(*Hylephila phyleus*)

NEWS FOR THE DEDICATED ZOOLOGIST



Northern mockingbird carrying insect seen in Los Angeles

“Those who dwell among the beauties and mysteries of the Earth are never alone or weary of life.”

-Rachel Carson
Marine biologist and conservationist



We Love Your Questions, keep them coming!

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Get ready for the June-August issue of *News For The Dedicated Zoologist!*