"Owl" Night Long

EXPLORING THE ULTIMATE NOCTURNAL AVIAN PREDATOR

Smithsonian Associates

Dr. Robert M Johnson III

January 9, 6:45PM

https://smithsonianassociates.org/ticketing/programs/owl-night-long

Owls in Culture

Wise old owl?

Because of their large, front-facing eyes, and their keen powers of observation, owls were often considered “wise” by some ancient cultures.

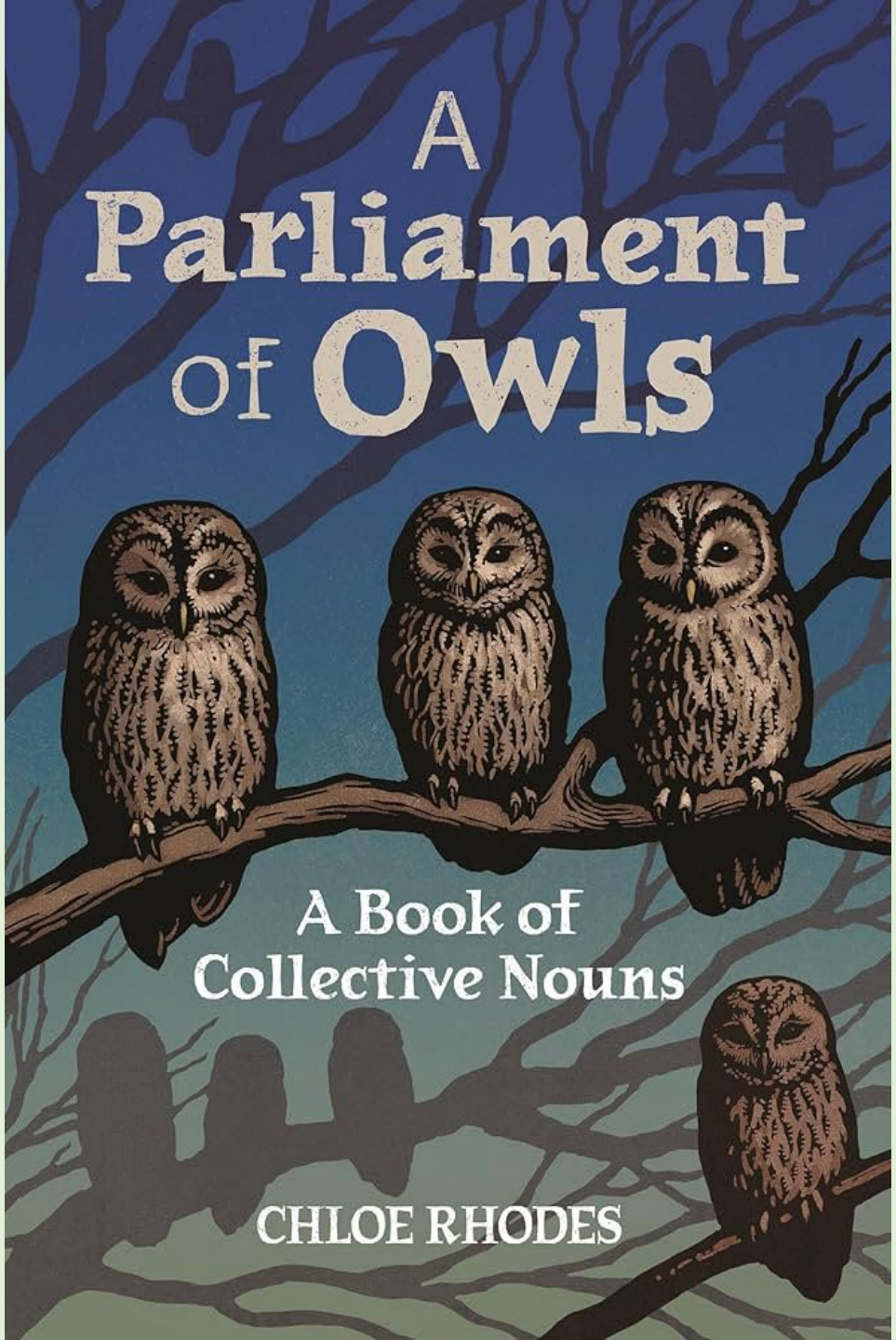
In Rome, owls were associated with Minerva, the goddess of wisdom and war.

In ancient Greece, owls were associated with Athena, another goddess of wisdom and war.

Owls Throughout History

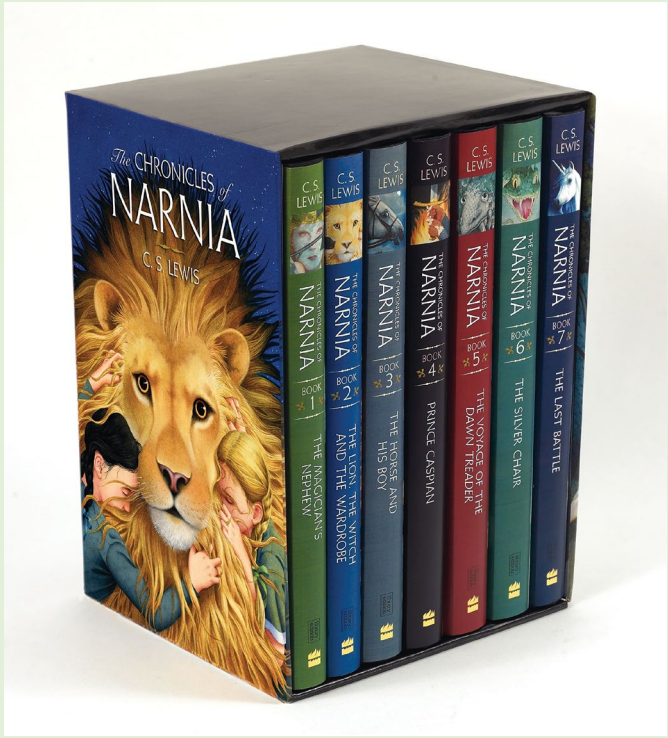
Symbol of Protection

In ancient Greece, owls were believed to have had magical powers, largely because of their ability to see in the dark. They were often displayed as a symbol of protection for both the Athenian army and the system of Greek trade (which is why owls are sometime found on ancient Greek coins).



Owls in Culture

The collective noun, “Parliament”, used for owls is relatively recent. It first came about in the written works of C.S. Lewis.



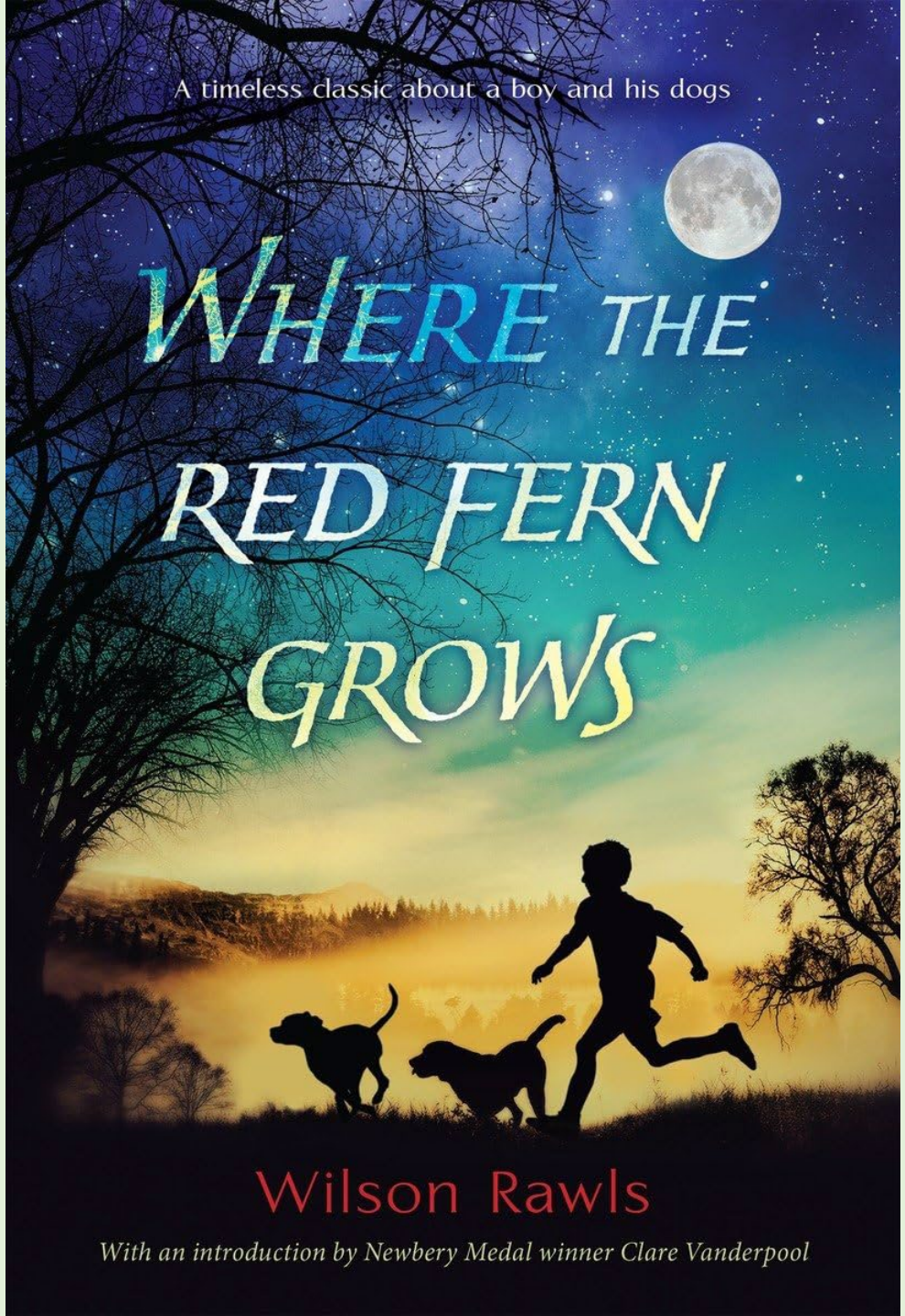
Owls in Culture

In some cultures, owls are associated with bad luck.

Apache culture states that dreaming about an owl means death.

Owls in Culture

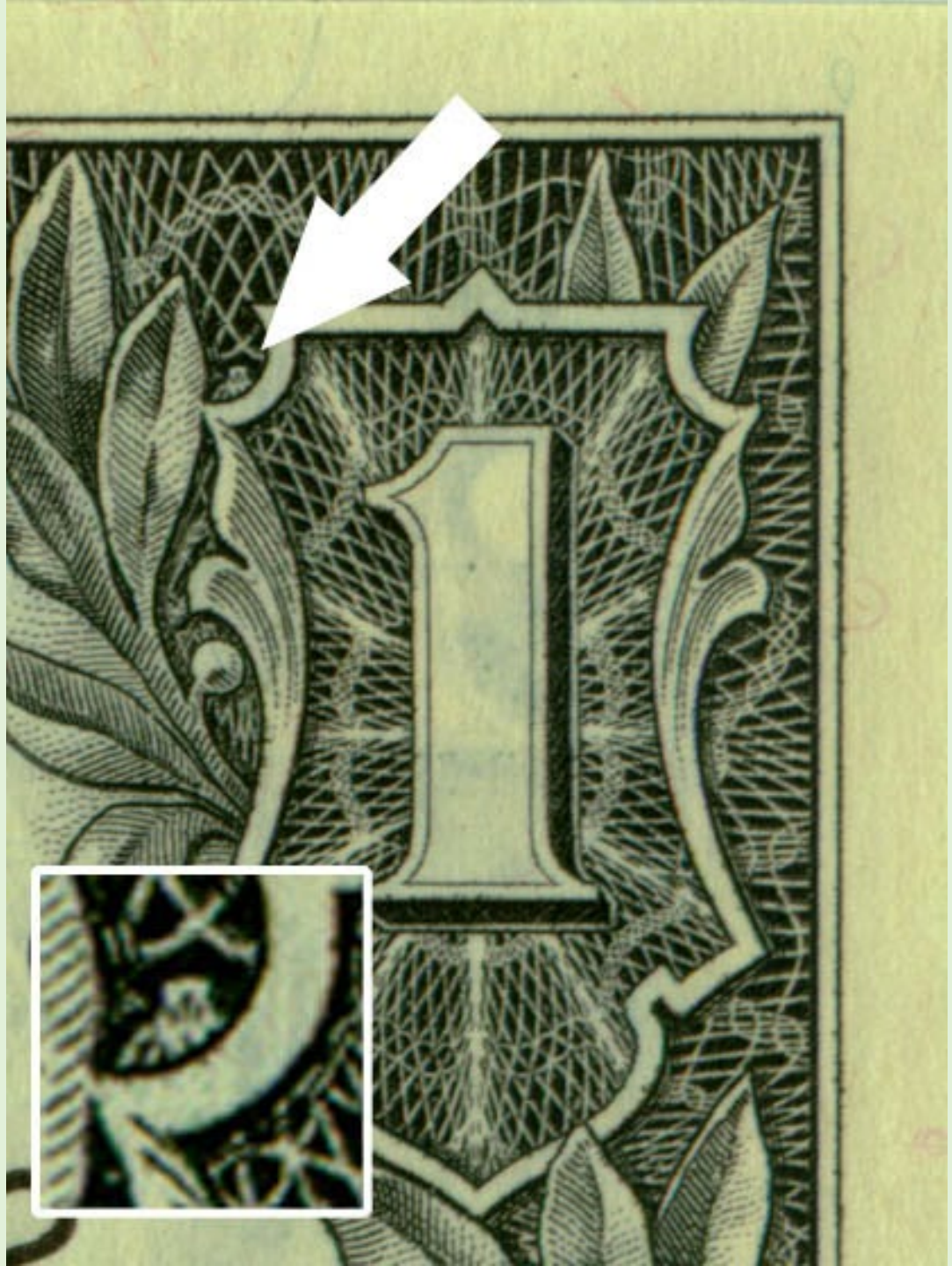
In the book “Where the Red Fern Grows”, the grandfather tells his grandson that if he hears one owl it means nothing. If he hears two owls, it means someone will die soon.



Raptors Throughout History

URBAN LEGEND

There is an internet meme showing what some people claim to be a tiny owl on the front of the U.S. $1 bill. It is believed to be part of the design of interwoven lines, but there are always conspiracy theories.



Owl on the U.S. $1 bill?

What is an owl?

(Let’s start simple.)

An owl is a bird of prey.

What is a bird of prey?

BIRDS OF PREY OF THE UNITED STATES

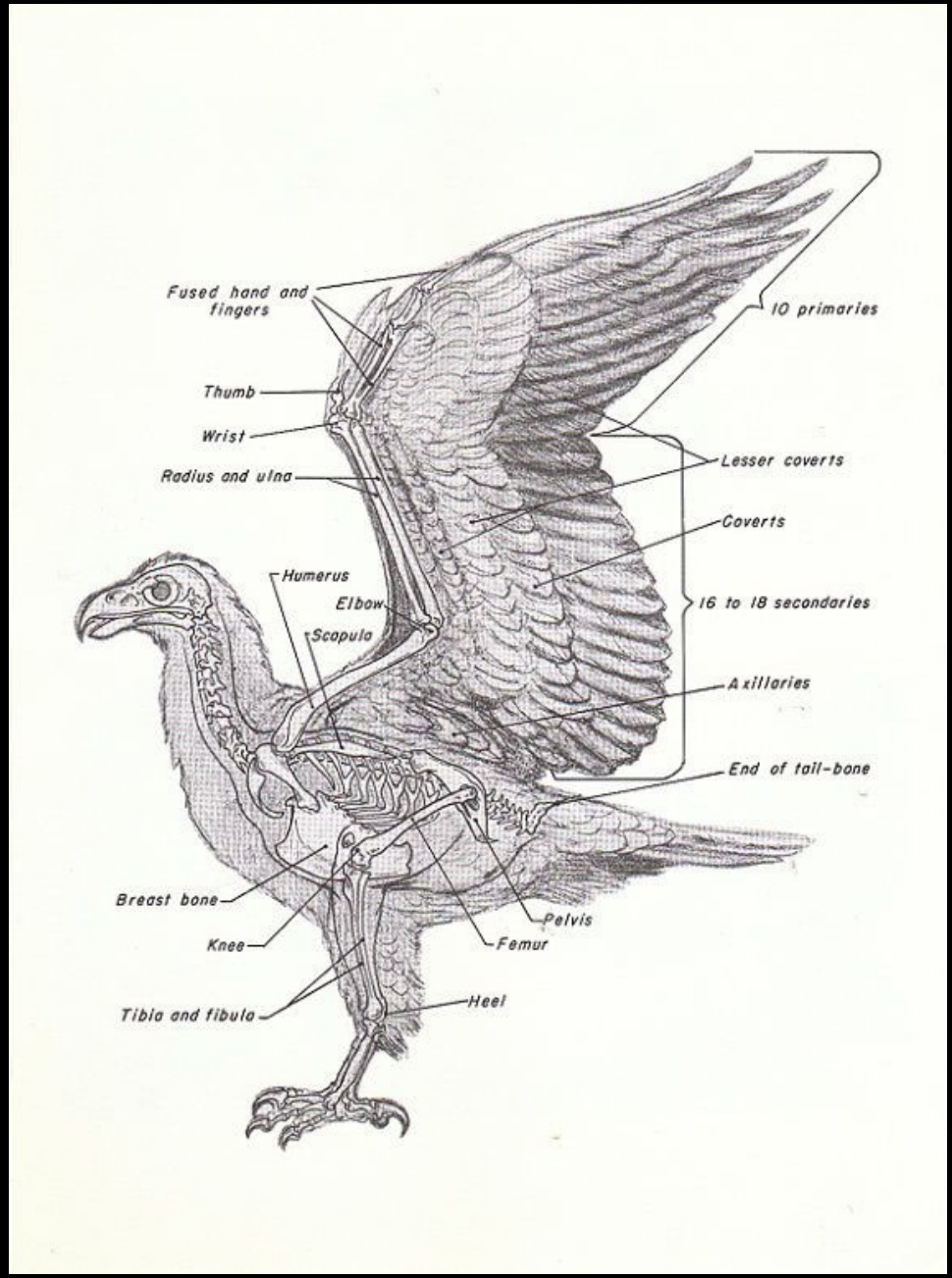
Source: https://i.etsystatic.com/10291239/r/il/1d843c/2141195213/il_fullxfull.2141195213_367g.jpg

What is a raptor?

Common Answer

Birds with:

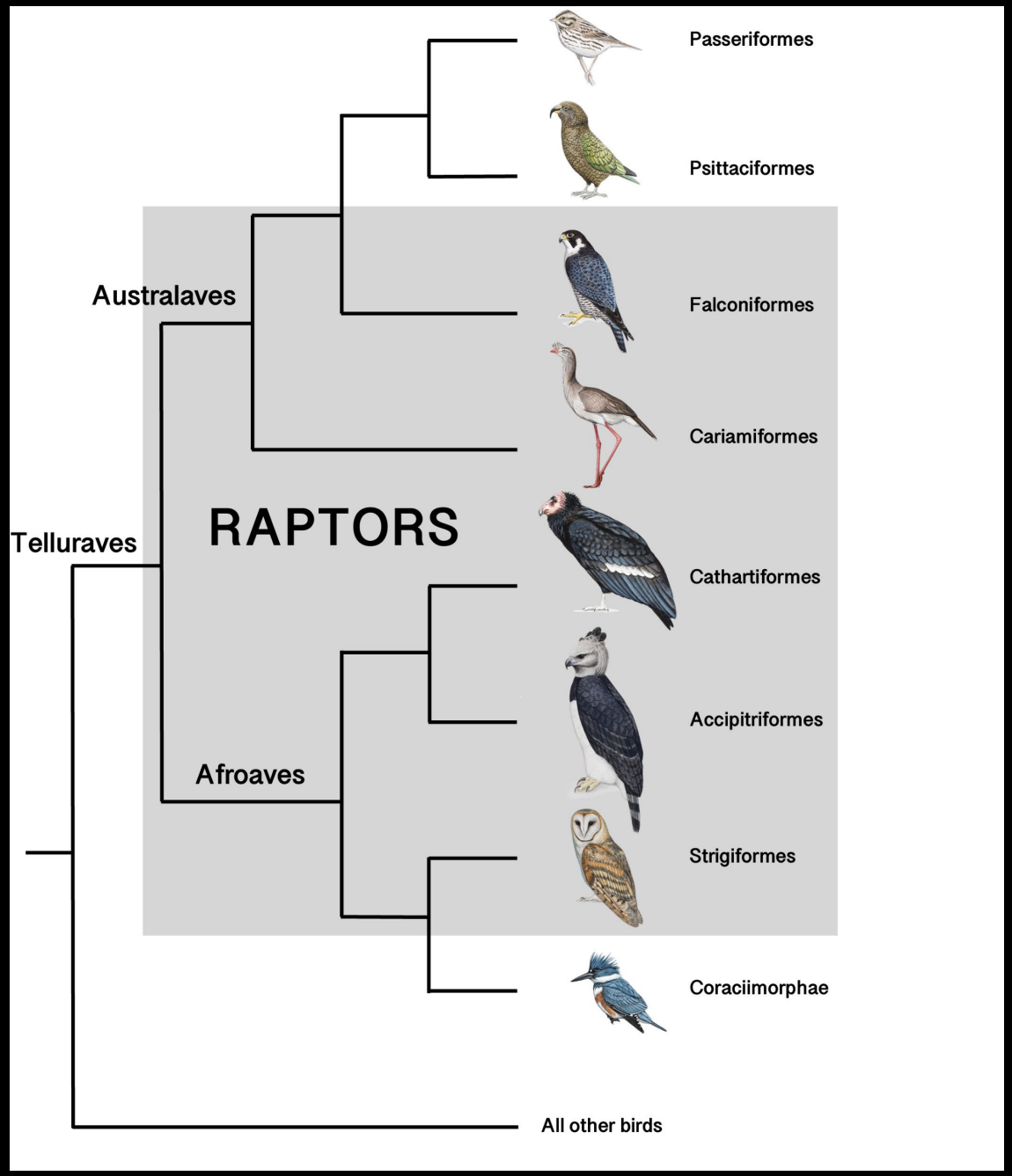
- **strong hooked beaks**
- **strong feet with powerful talons**
- **keen eyesight**
- **carnivorous diet**

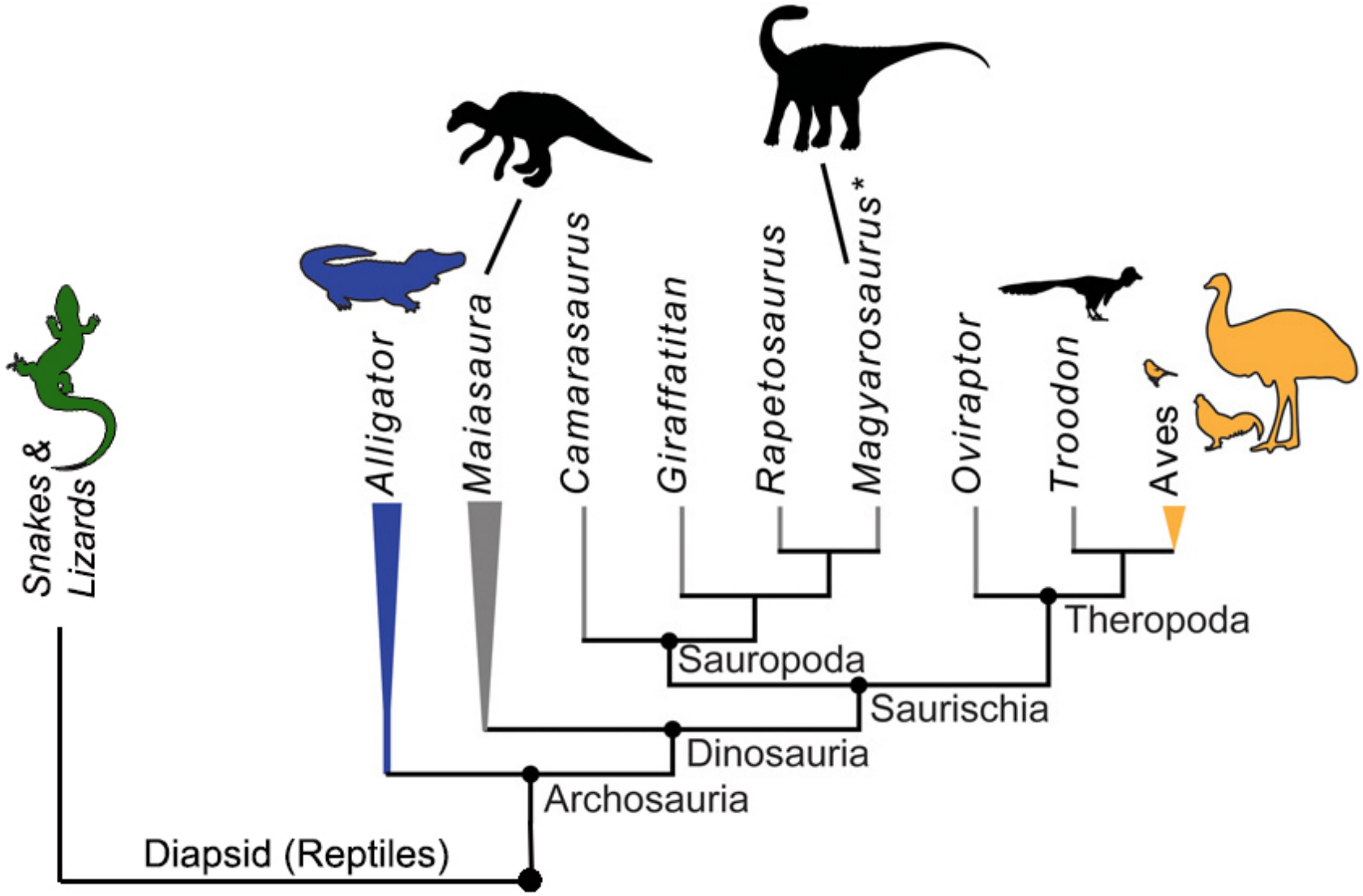


What is a raptor?

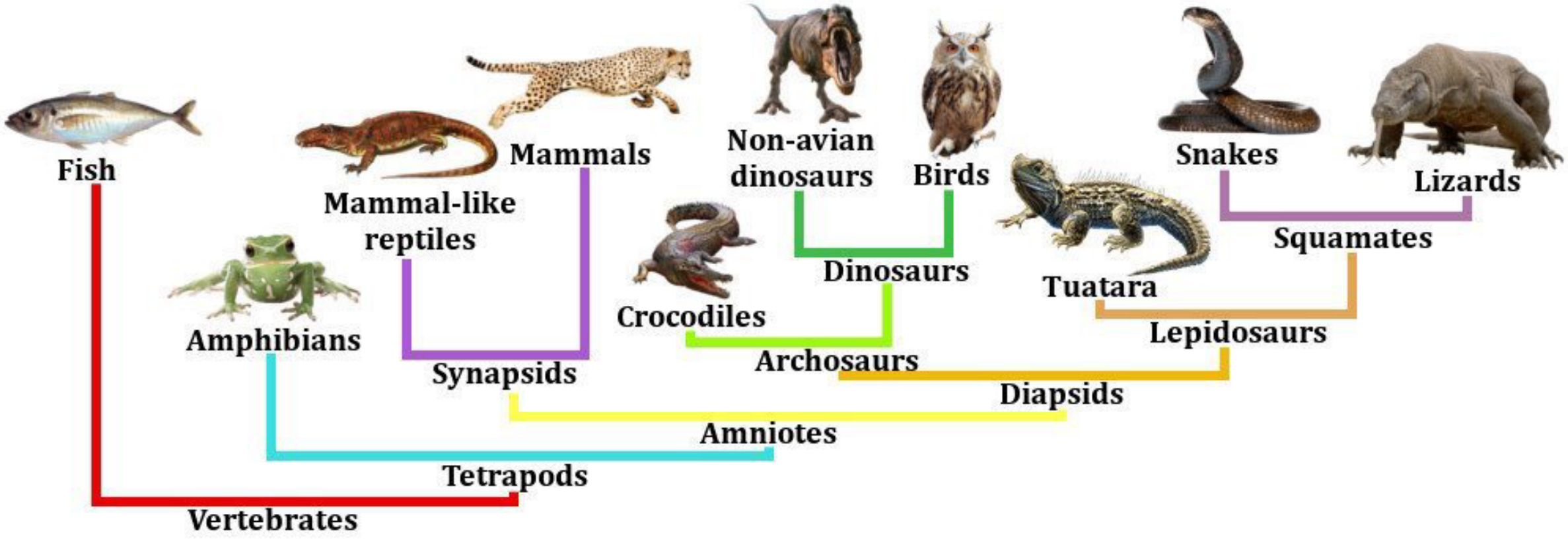
The more correct answer.

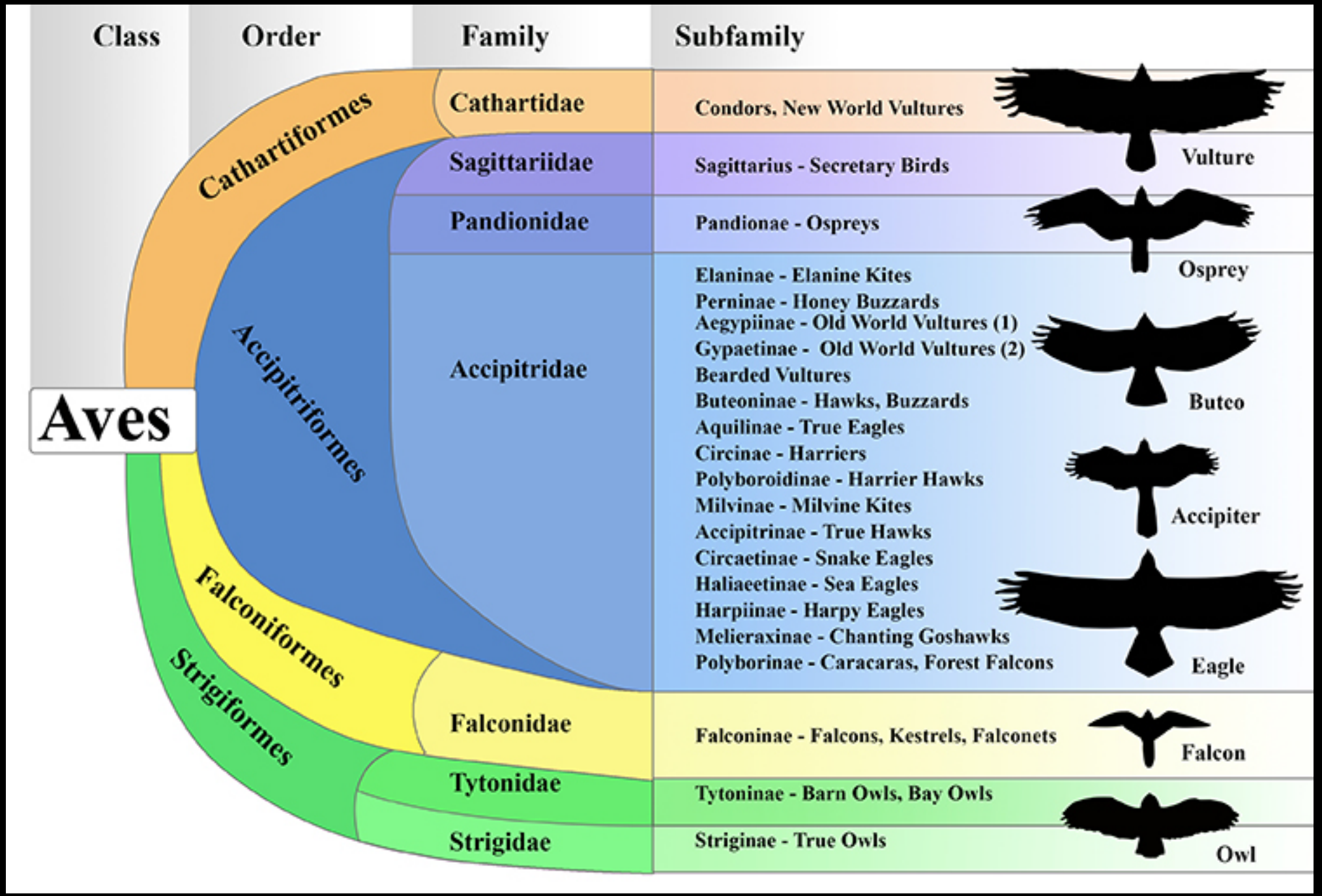
A group of primarily carnivorous birds that share a common phylogenetic heritage.




Snakes &
Lizards
Alligator
Maiasaura
Camarasaurus
Giraffatitan
Rapetosaurus
Magyarosaurus*
Oviraptor
Troodon
Aves
Theropoda
Sauropoda
Saurischia
Dinosauria
Archosauria
Diapsid (Reptiles)

The Reptile Family Tree





Carthartiformes

Accipitriformes

Falconiformes

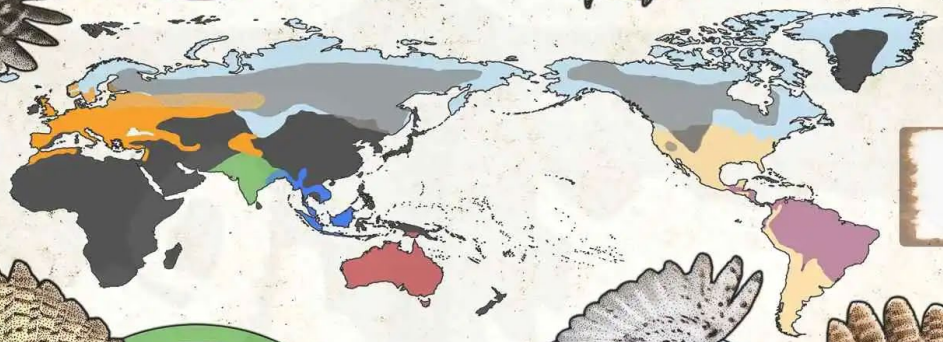
Strigiformes

Owl Species of the World

Spectacled Owl
Scientific Name: Pulsatrix perspicillata
Lifespan in the wild: 9 – 25 years
Wingspan: 12.4 – 14.6 inches (31 – 37 cm)

American Barn Owl
Scientific Name: Tyto furcata
Lifespan in the wild: 1 – 2 years
Wingspan: (31 – 37 in) 80 – 95 cm

Australian Boobook
Scientific Name: Ninox boobook
Lifespan in the wild: Up to 15 years
Wingspan:27.6 – 33.5 inches (70 – 85cm)



Tawny Owl
Scientific Name: Strix aluco
Lifespan in the wild: 4 – 6 years
Wingspan: 32 – 42 in (81 – 105 cm)

Buffy Fish Owl
Scientific Name: Cygnus columbianus
Lifespan in the wild: Up to 20 years
Wingspan: 15 – 17 inches (38 – 43 cm)

Indian Eagle-Owl
Scientific Name: Bubo bengalensis
Lifespan in the wild: 4 – 20 years
Wingspan: 50 – 60 inches (127 – 152 cm)

Snowy Owl
Scientific Name: Bubo scandiacus
Lifespan in the wild: 8 – 12 years
Wingspan: 49 - 51 inches (124 – 129 cm)

Great Grey Owl
Scientific Name: Strix nebulosa
Lifespan in the wild: Up to 20 years
Wingspan: 53.9 – 60.2 inches (137 – 153 cm)

Elf Owl
Max size: 1.9oz. (5.5”)

Blakiston’s Fish Owl
Max: 10.1 lbs.

Diet

Owls are strict carnivores. That being said, many species are quite adaptable in the number of prey items they can and will readily consume.

Although some larger owl species can hunt prey in the 5-8lb range, they tend to stick to smaller species.

Most owls have almost no sense of smell. A favorite prey item for some of the larger owls is skunks.

Skunks, move relatively slowly, they have poor eyesight, and their smell really doesn't bother the owls.

Bubo bubo

The Eurasian Eagle Owl has perhaps the largest range of any single species of owl. Due to their expansive range and adaptability in hunting, this may be the species of predator with the widest prey base. (They eat more different species of prey).

Owl Pellets

All raptors (including owls) regurgitate all of the material that they cannot digest in the form of a “pellet”. This material includes, but is not limited to:

- Bone
- Fur
- Feathers
- Rocks
- Sticks
- Snail shells
- Fish scales
- …and quite a few bird bands.

Strigiformes

(Owls)

Owls are birds from the order Strigiformes, which includes about 250 species of mostly solitary and nocturnal birds of prey typified by:

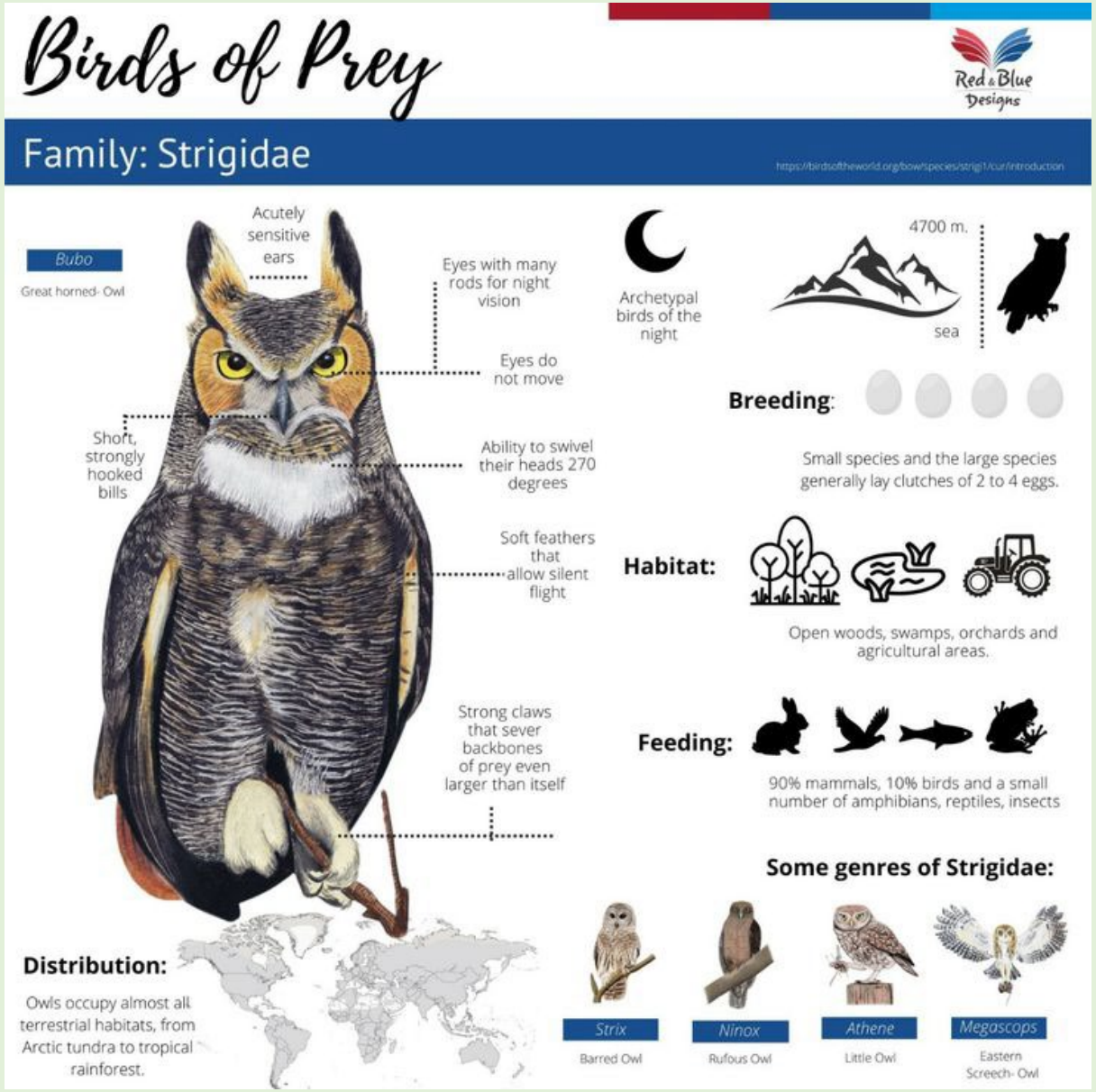
- upright stance
- zygodactyl grip
- a large, broad head
- Facial disc
- binocular vision
- binaural hearing
- sharp talons
- feathers adapted for silent flight

Pygmy Owl

Strigidae

(True Owls)

Largest family of owls. As many as 230 species in 24 genera currently exist. Found on every continent except Antarctica.



Tytonidae

(Barn Owls and Bay Owls)

This family of owls contains 27-37 different species. They are also found on every continent except Antarctica.

Nocturnal Habits

Many people associate owls with the night. While this not incorrect, owls can be active at any point.

Owls “typically” take advantage of darkness to stalk prey and avoid other predators, but owls can readily be found hunting or flying during the day.

Diurnal Habits

Some owl species (like these burrowing owls) are primarily active during the day and have very limited capability to see in low light situations.

Owlet

Baby owls are called “owlets”.

These look like Muppets.

Owlet

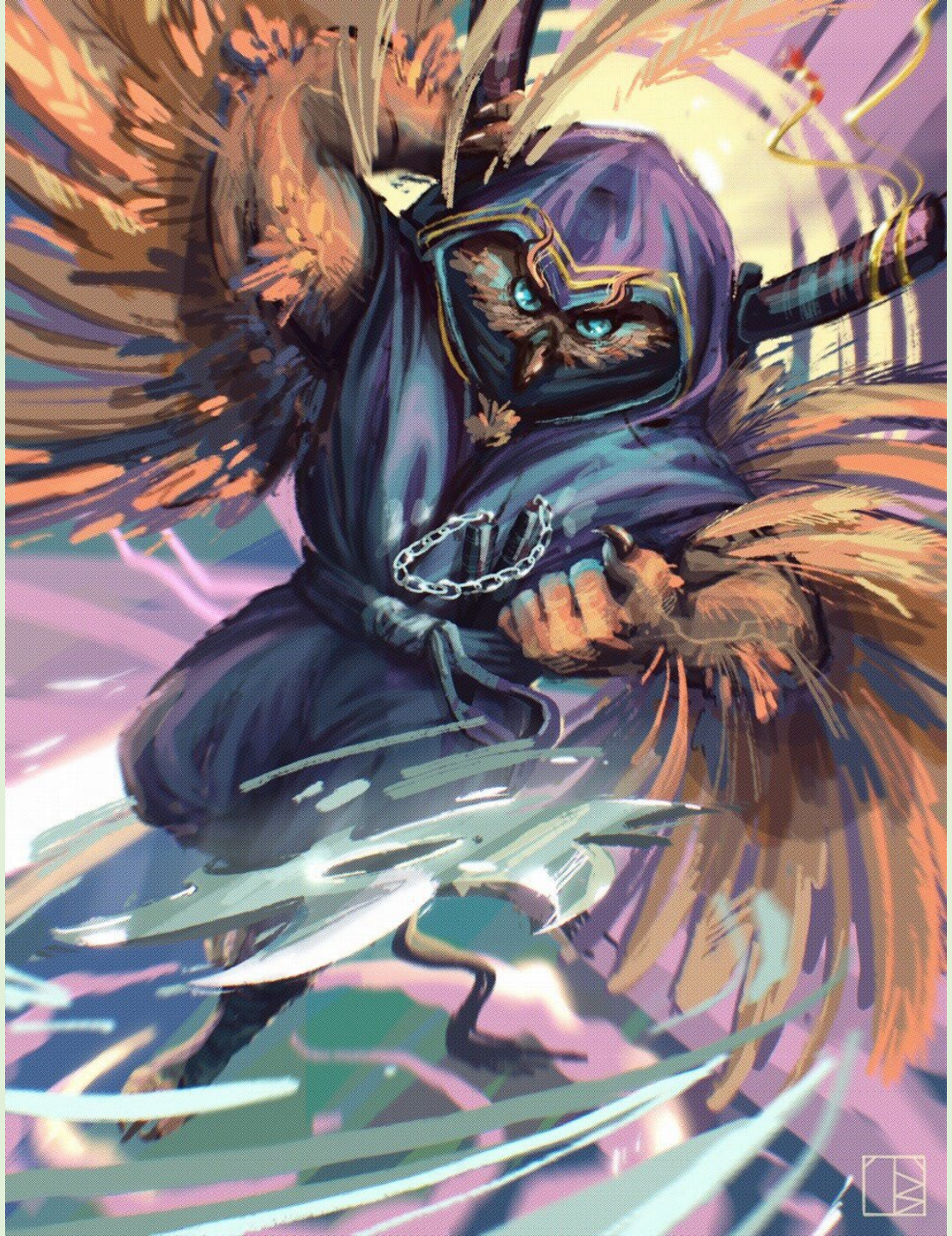
And they look like aliens!

Owls are Ninjas!

As far as predators go, owls are among the most finely honed lethal assassins….

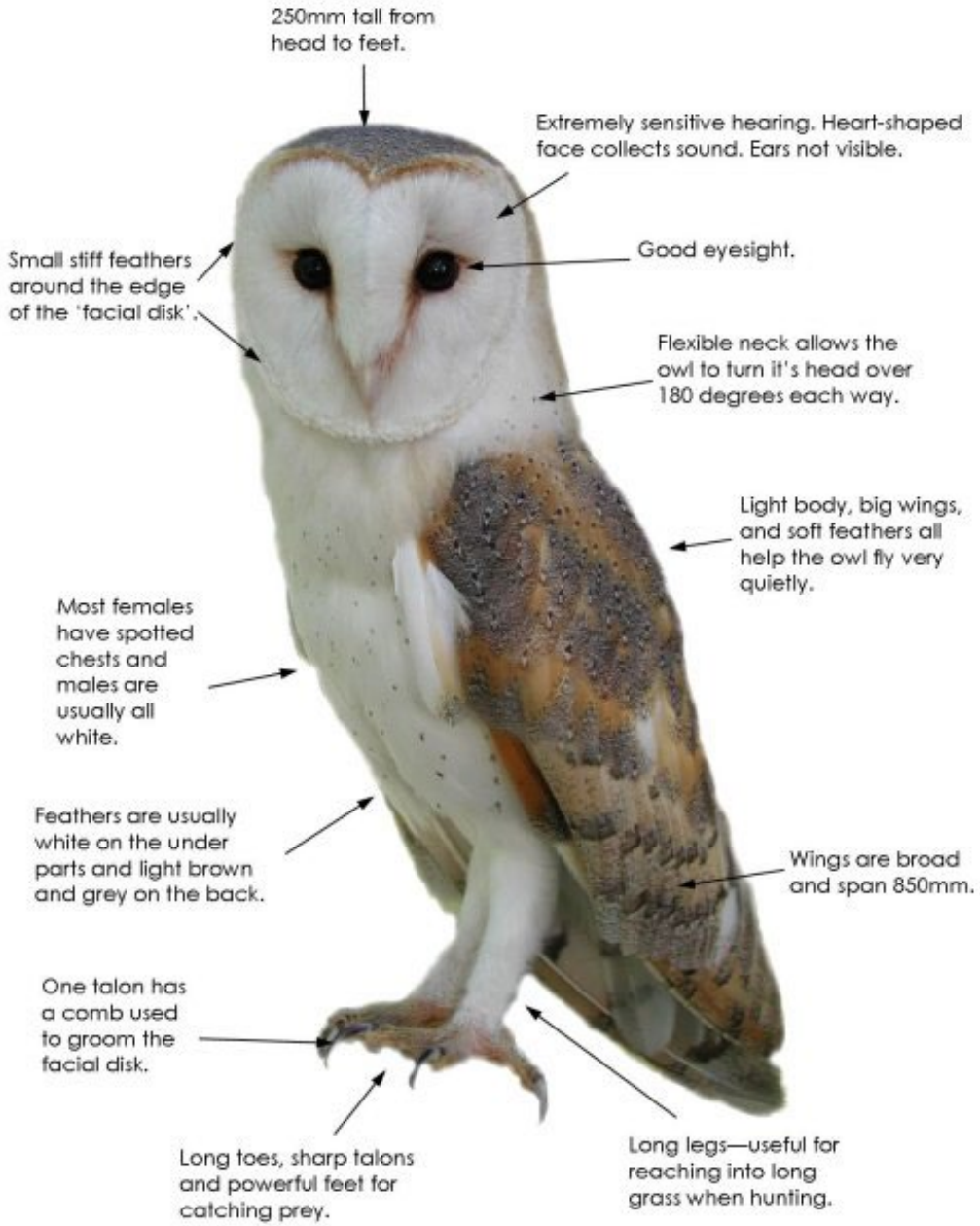
…..even though they’re cute.

Let’s look at the adaptations that make them so lethal.



Specialized Feathers

Owls utilize specially adapted feathers for many purposes, including aerodynamic flight, insulation, camouflage, and stealth.



https://www.barnowltrust.org.uk/barn-owl-facts/facts_adaptations-diagram/

Specialized Feathers

Much of an owl's true shape is masked by feathers.

Fun fact: owls have long legs... they're just hidden

Sexual Dimorphism

Unlike most other bird species, with raptors, the females are substantially larger than the males. Their plumage remains the same and is not discernable by sex.

Male pheasant much brighter in color and larger than the female.

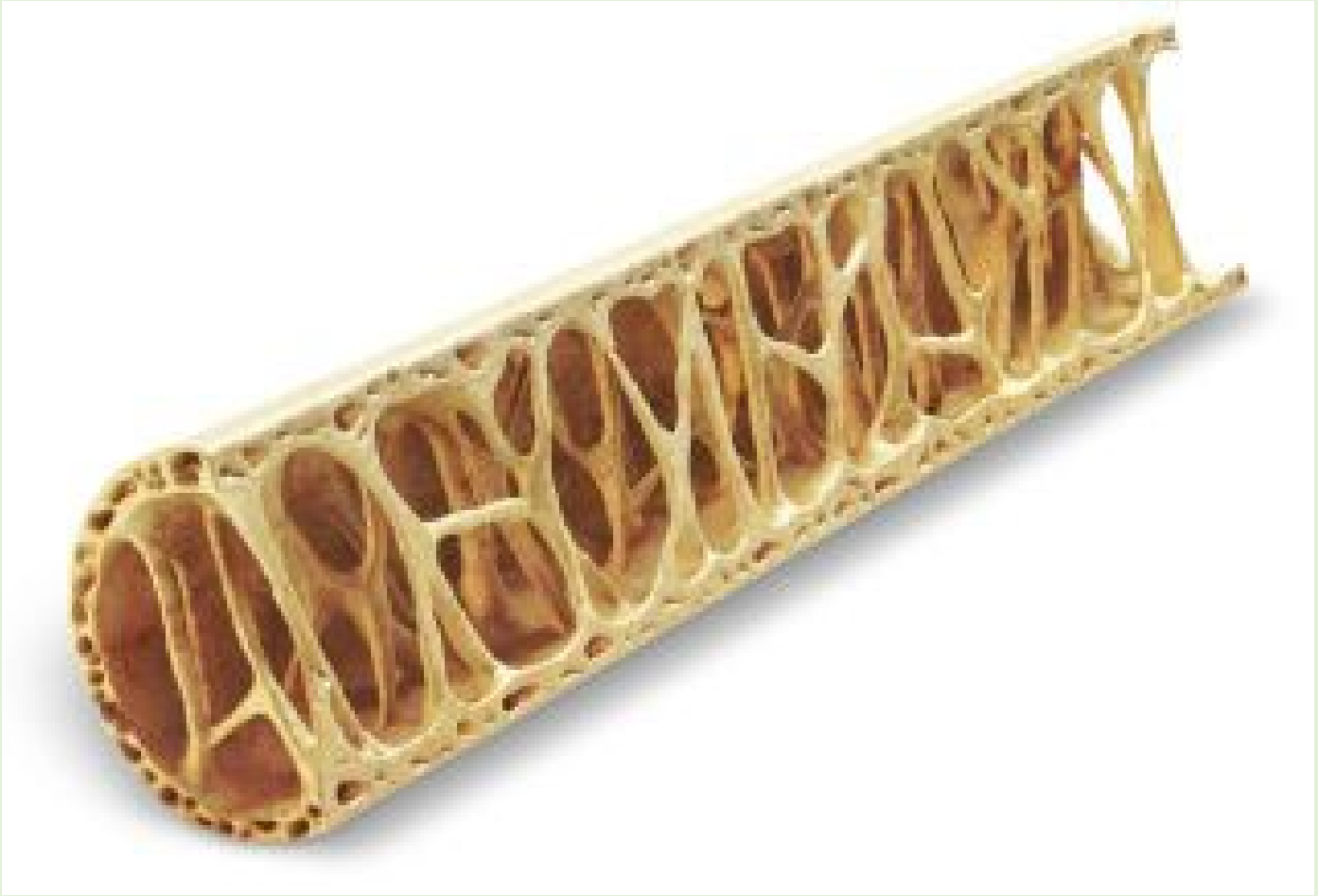
Female Great Horned Owl (right) is about 20% larger than the male and have almost identical markings.

Adaptations Most Raptors Have in Common

- **Lightweight Bones**

Raptor bones are *pneumatic* in structure. They are not truly hollow (like a straw) but have minimal calcified cross structures which make the bone both light weight and very strong.

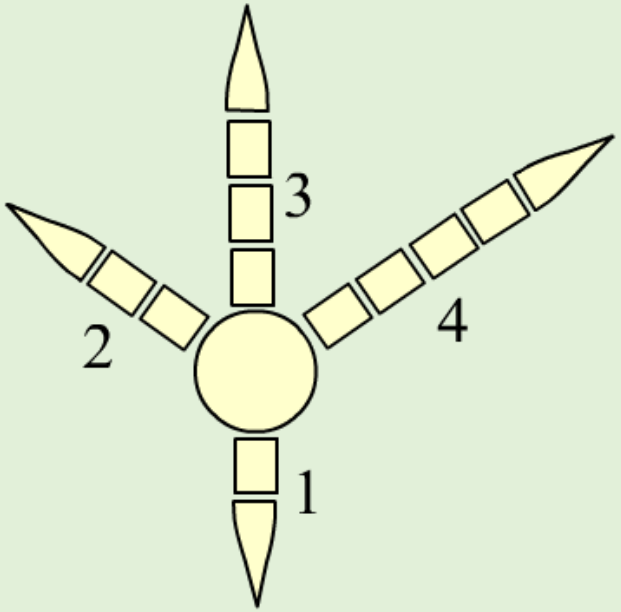
Reducing weight is necessary in flight.



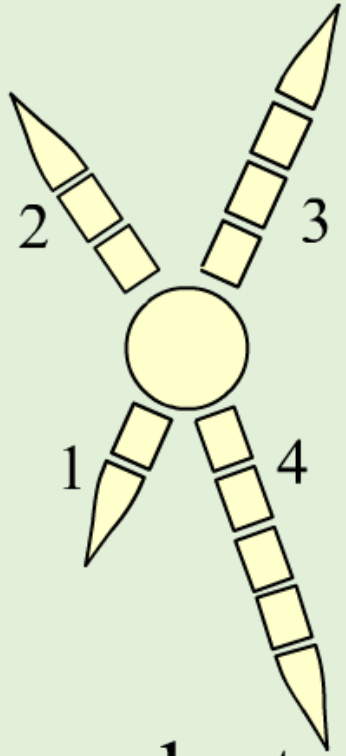
Zygodactyl Feet

Owls have a “zygodactyl” grip, meaning that they grip with two toes forward and two toes backward.

This contrasts with most other birds that have an “ansiodactyl” grip; three toes forward and one toe backwards.



Anisodactylie



Zygodactylie

Zygodactyl Feet

Grip Strength

Owls typically have very strong grip strength. Short and heavily muscled toes give them the great ability to subdue their prey, even compared to other raptors of a similar size.

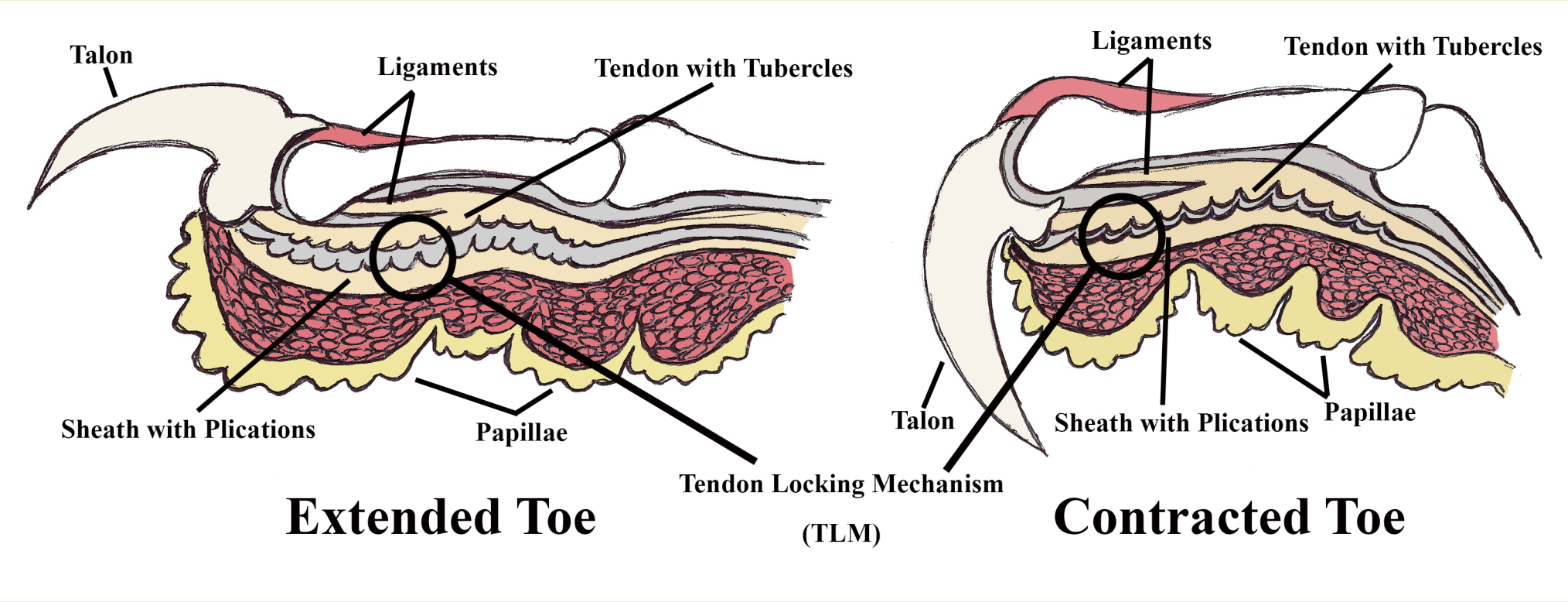
Great Horned Owl: 200-500 PSI

Vs.

Bald Eagle: 200-300 PSI

Tendon Locking Mechanism

The Tendon Locking Mechanism (TLM) allows owls to grasp prey and hold the grip without continually applying muscle pressure. (Think of vice grips.)



Owl Eyes Are Amazing!

Binocular Vision

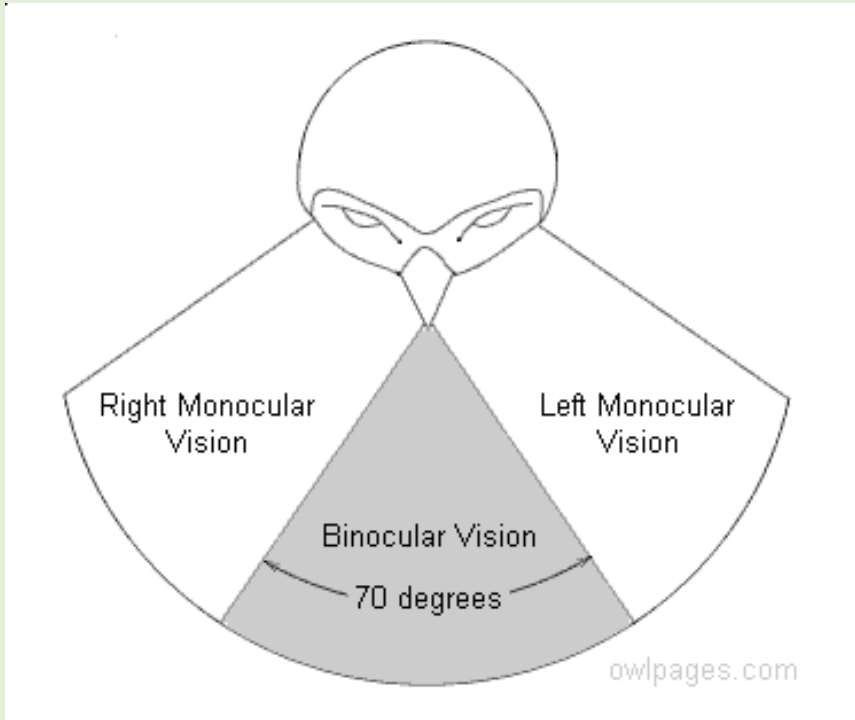
Owl eyes are oriented towards the front of the face, with overlapping visual fields that provide binocular or “3-D” vision.

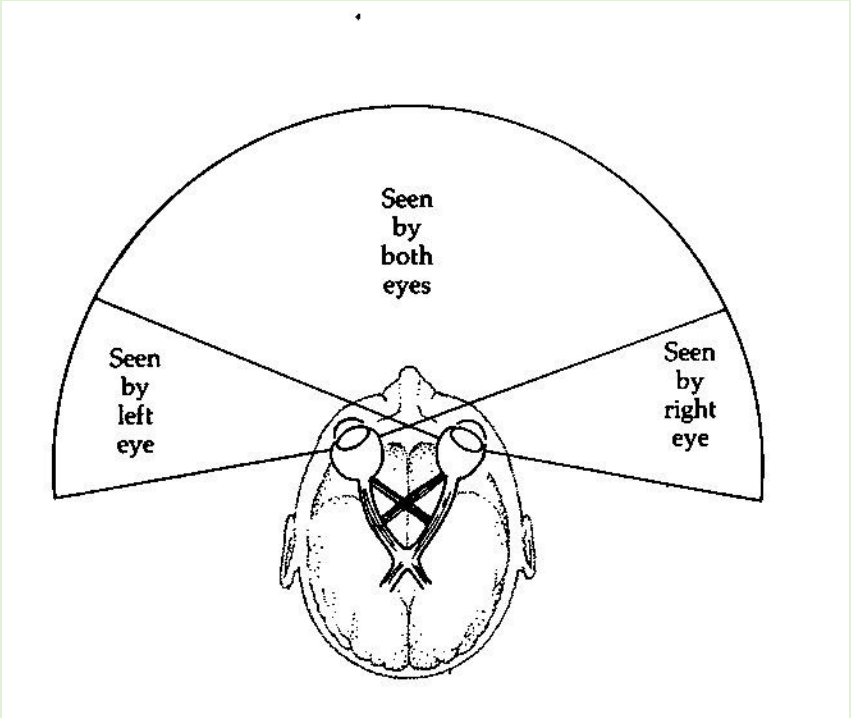
Forward facing eyes are fairly common among predators, giving them an advantage of greater detail and depth of field.

Prey species tend to have eyes towards the sides of their heads to provide a wider field of view, to detect potential danger.

Owl Field of View

Owls have a binocular vision, but a limited field of view.

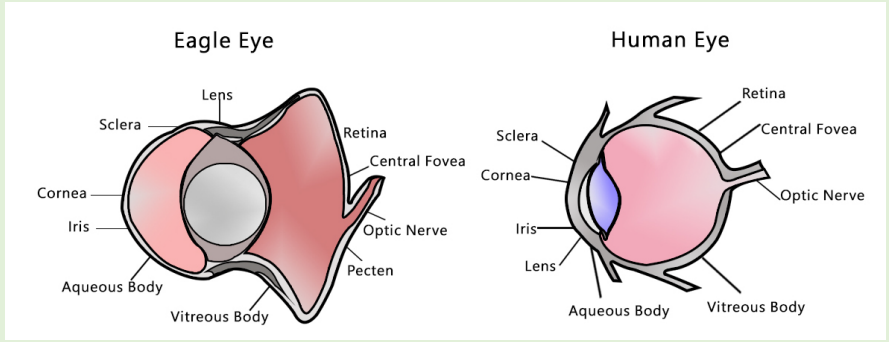


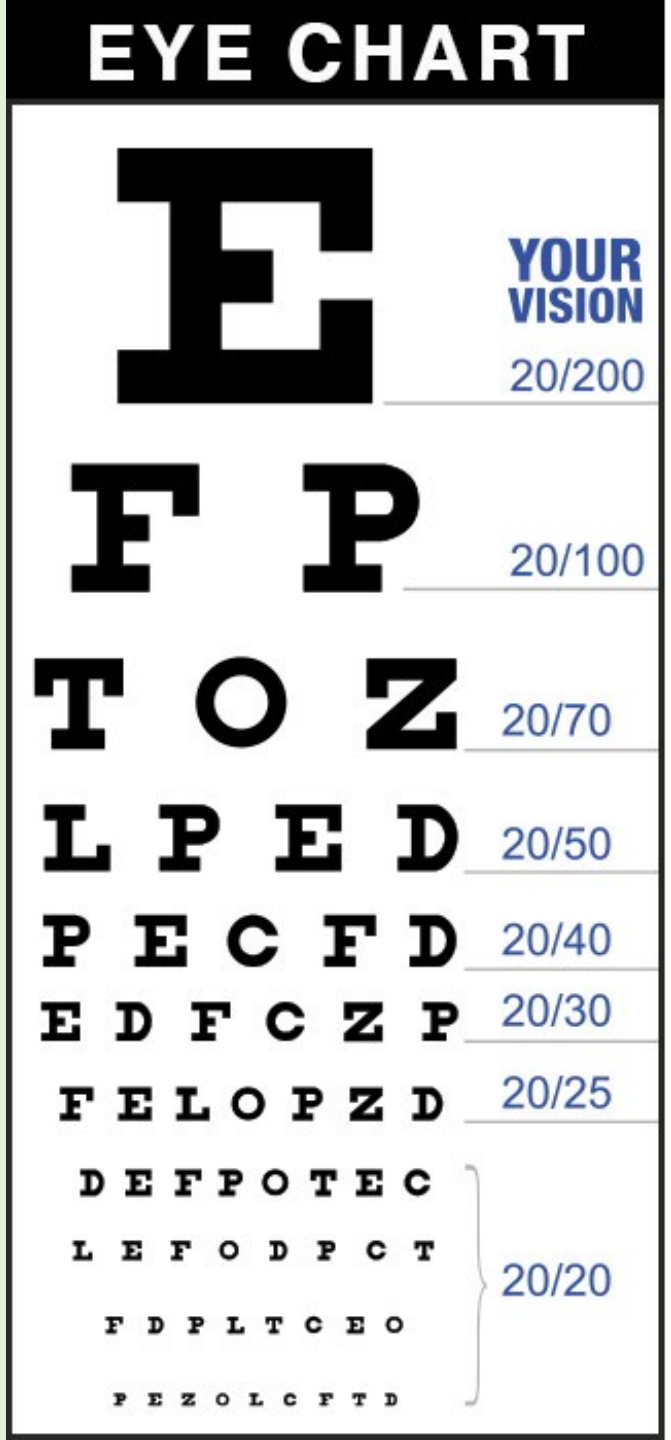


Visual Acuity

Raptors have better vision than humans. It is not that their eyes are more magnified, rather they have greater visual acuity. They can detect more detail with roughly the same field of view. (Think of higher resolution.)

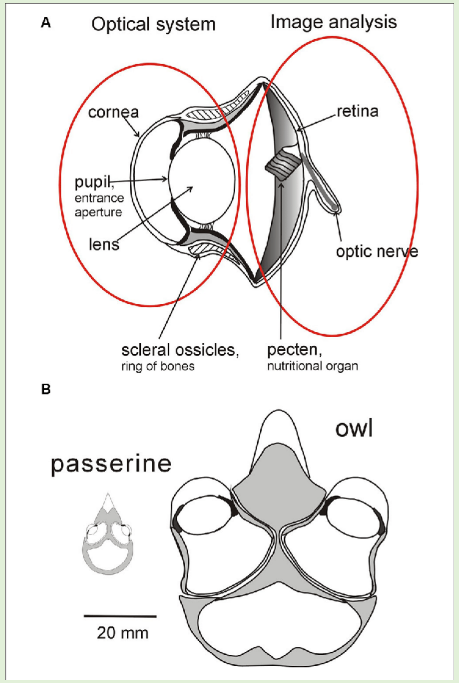
Their brains are also capable of processing those images much more quickly. They are able to obtain a better feel for their surrounding at a glance than humans. They are therefore able to react more quickly.

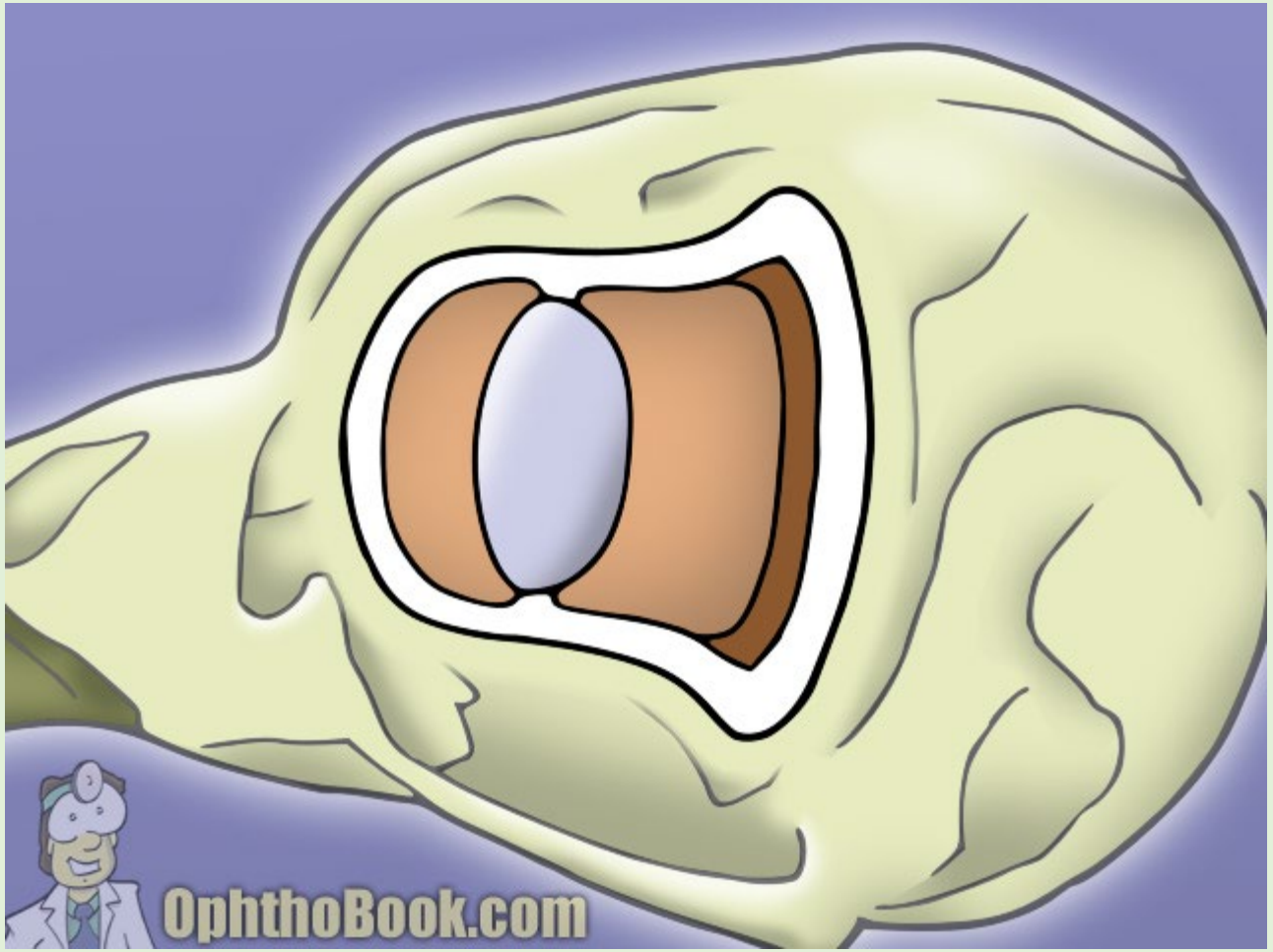




Eye Size

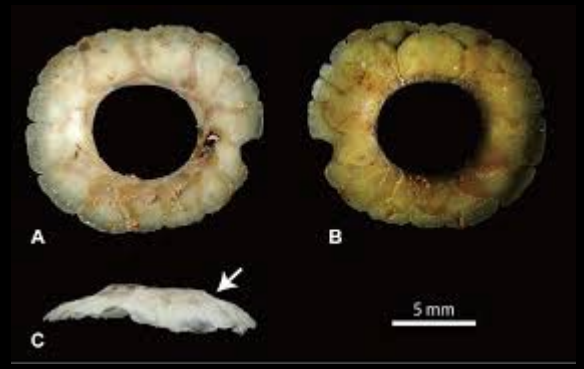
Owls have very large eyes relative to their body size. An owl's eyes may make up to 5% of the total body weight (whereas, it's about .0003% for humans.)





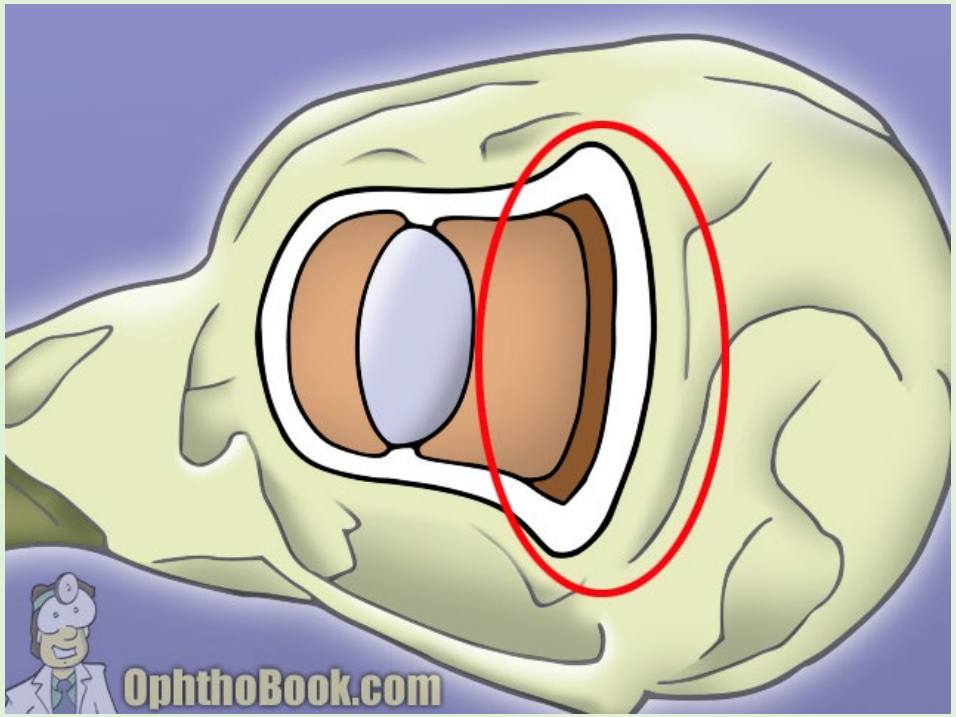
Eye Size

Owls typically have such large eyes that they have developed a “sclerotic ring” to keep the eyes stable and attached.



Eye Size

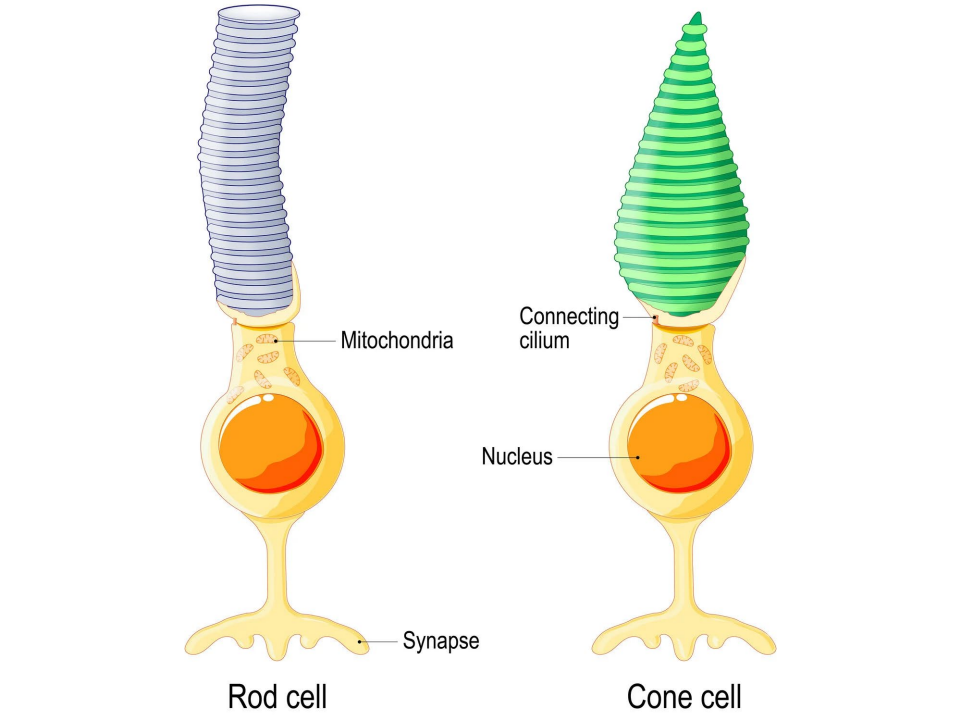
In some owls, the base of the eye can be seen by looking through the owl's ear canal.



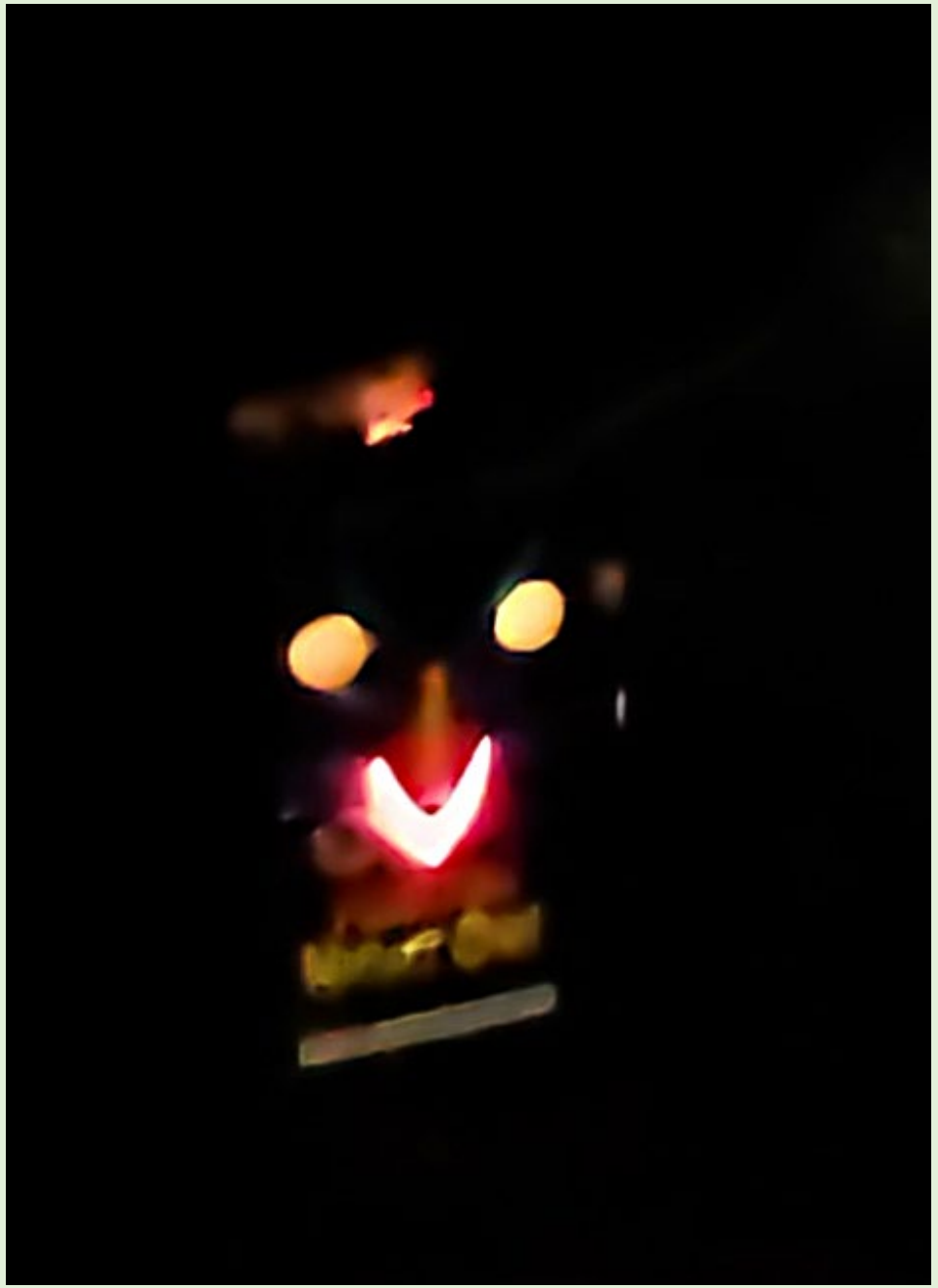
https://www.livescience.com/61673-owl-eye-seen-through-ear.html

Tapetum Lucidum

Most owls have a layer behind the retina called the “tapetum lucidum”. This reflective layer bounces light back across the photo receptor cells (rods and cones) and increases the amount of perceived light.

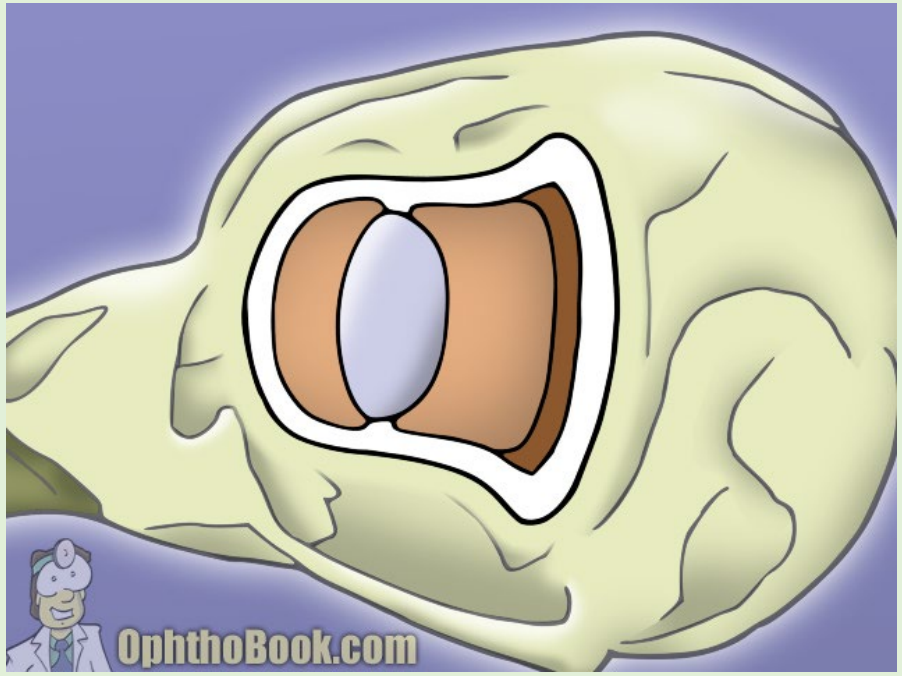


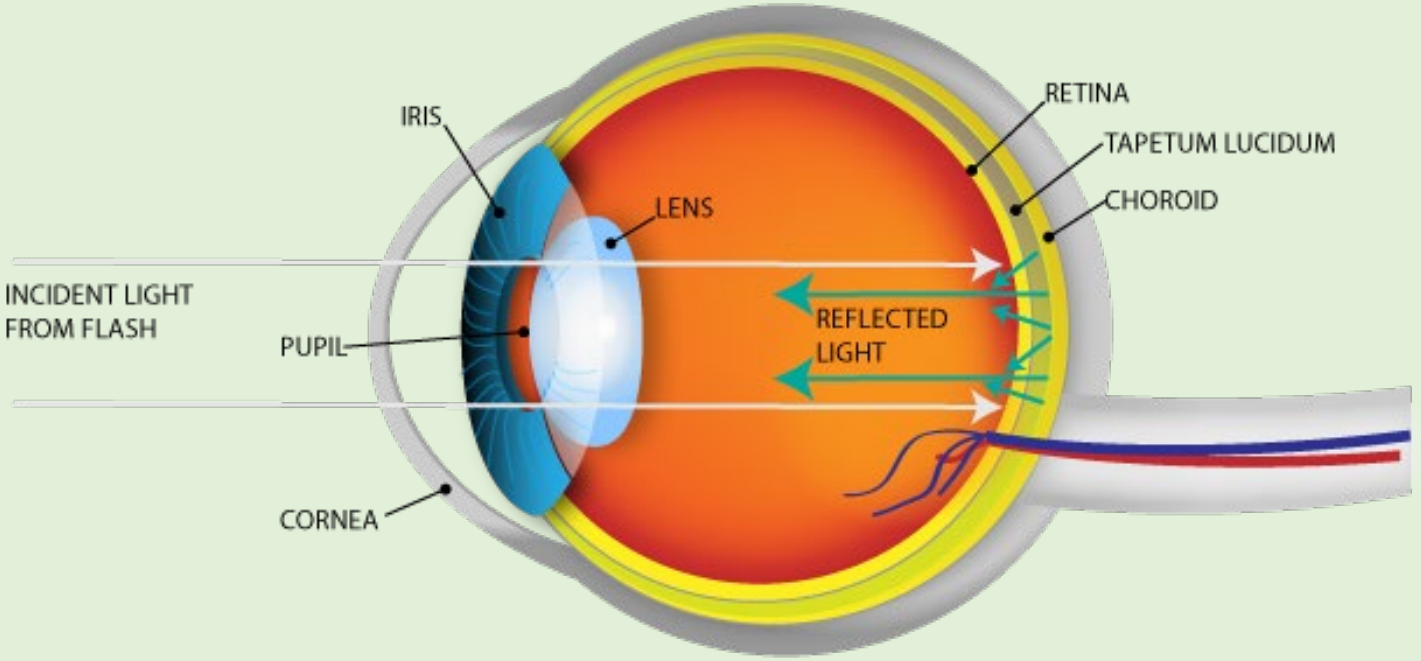
Tapetum Lucidum



Surface Area

Since owl eyes are largest closest to the optic nerve, there is more surface area for photo-receptive cells. Some owls may have as much as 100 times better night vision compared to humans.





Pupillary Dilation Range

Owl eyes have a far greater range (than most animals) of contracting and dilating their pupils. This allows them to be active both during the day and at night.

This is an extreme example, likely the result of neurological damage.

Voluntary Pupil Dilation

Owls (as well as most birds) have voluntary control of how much they contract (or dilate) their pupils.

For humans, this is an involuntary response to environmental conditions.

Three Eyelids

Owls have three eyelids.

- Upper eyelid is used to blink and is significantly larger than the lower lid (this is not true with other birds).
- Lower eyelid is typically only used (in conjunction with the other lid) while sleeping
- Nictitating membrane is a translucent inner membrane used for moistening and protecting the eye. It moves diagonally across the lens.

Nictitating Membrane

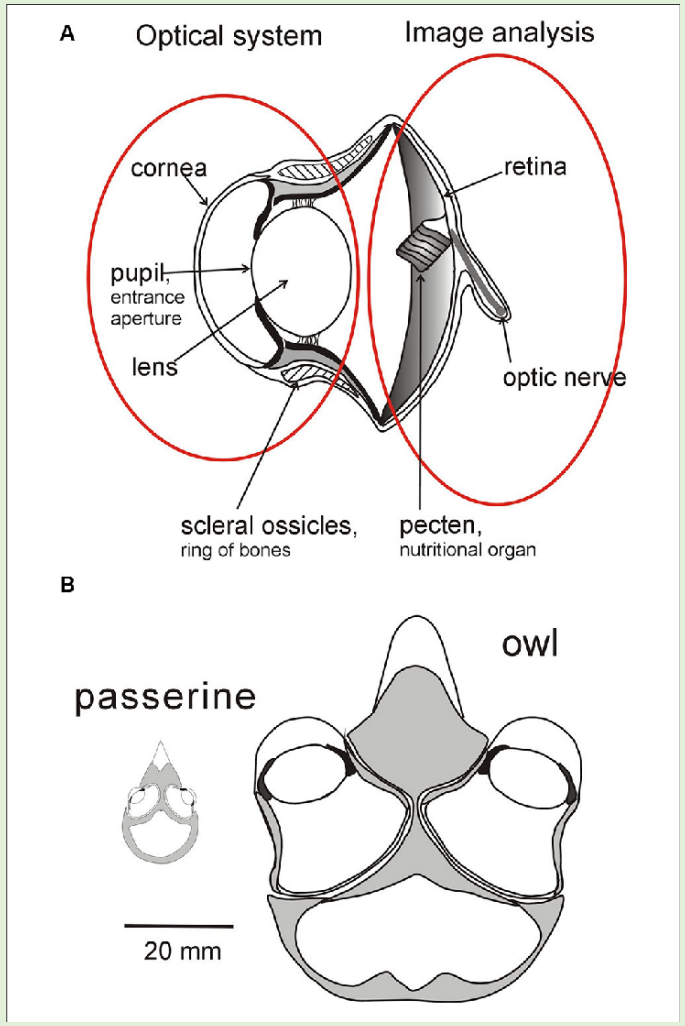
Far-sighted Owls

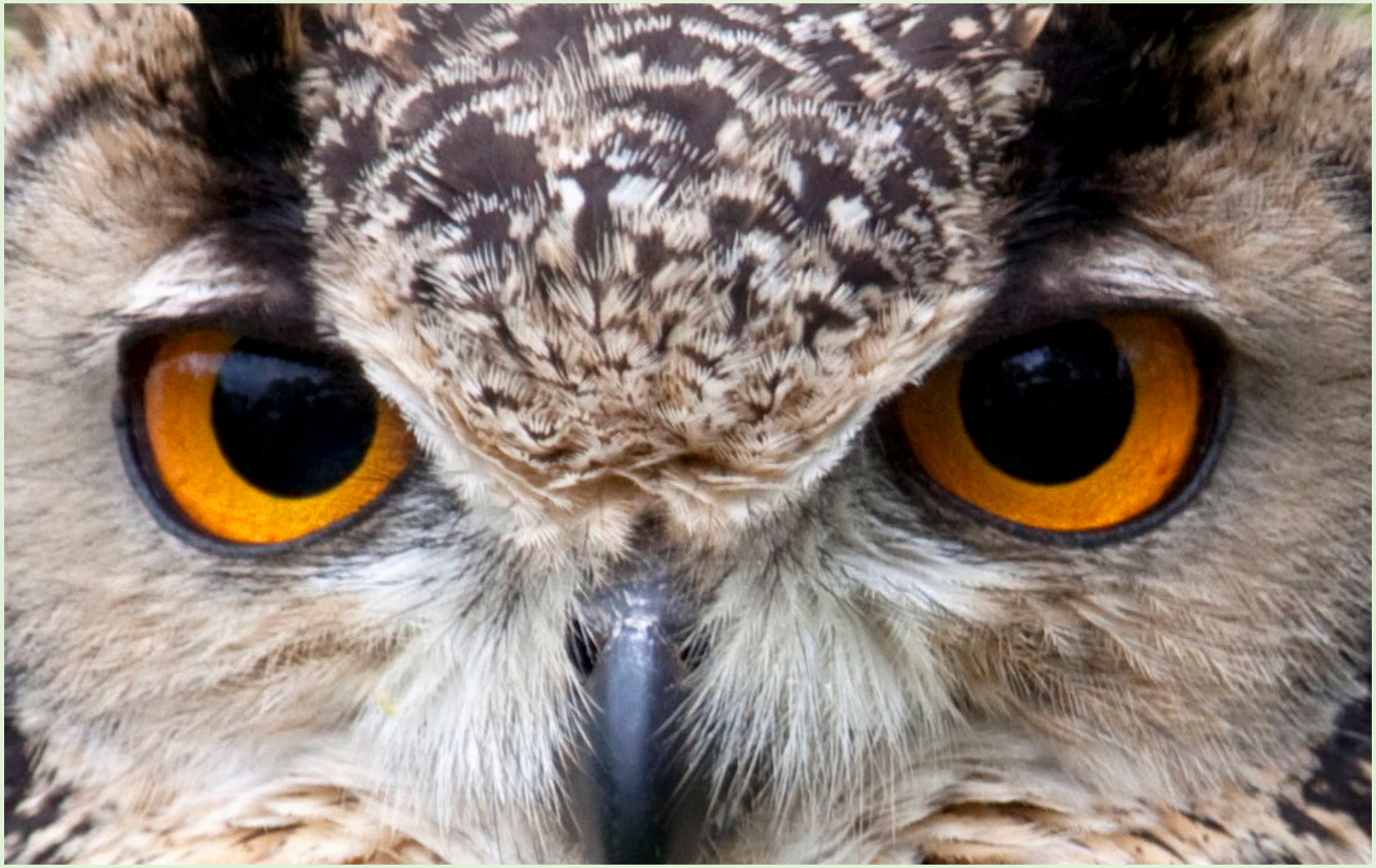
With increased night vision and visual acuity, there is a trade off. Most owls are far sighted, meaning they cannot see an object close to their face.

They compensate by using specially adapted “bristle” feathers near their beak to feel close objects (ex. food).

Fixed Eyes

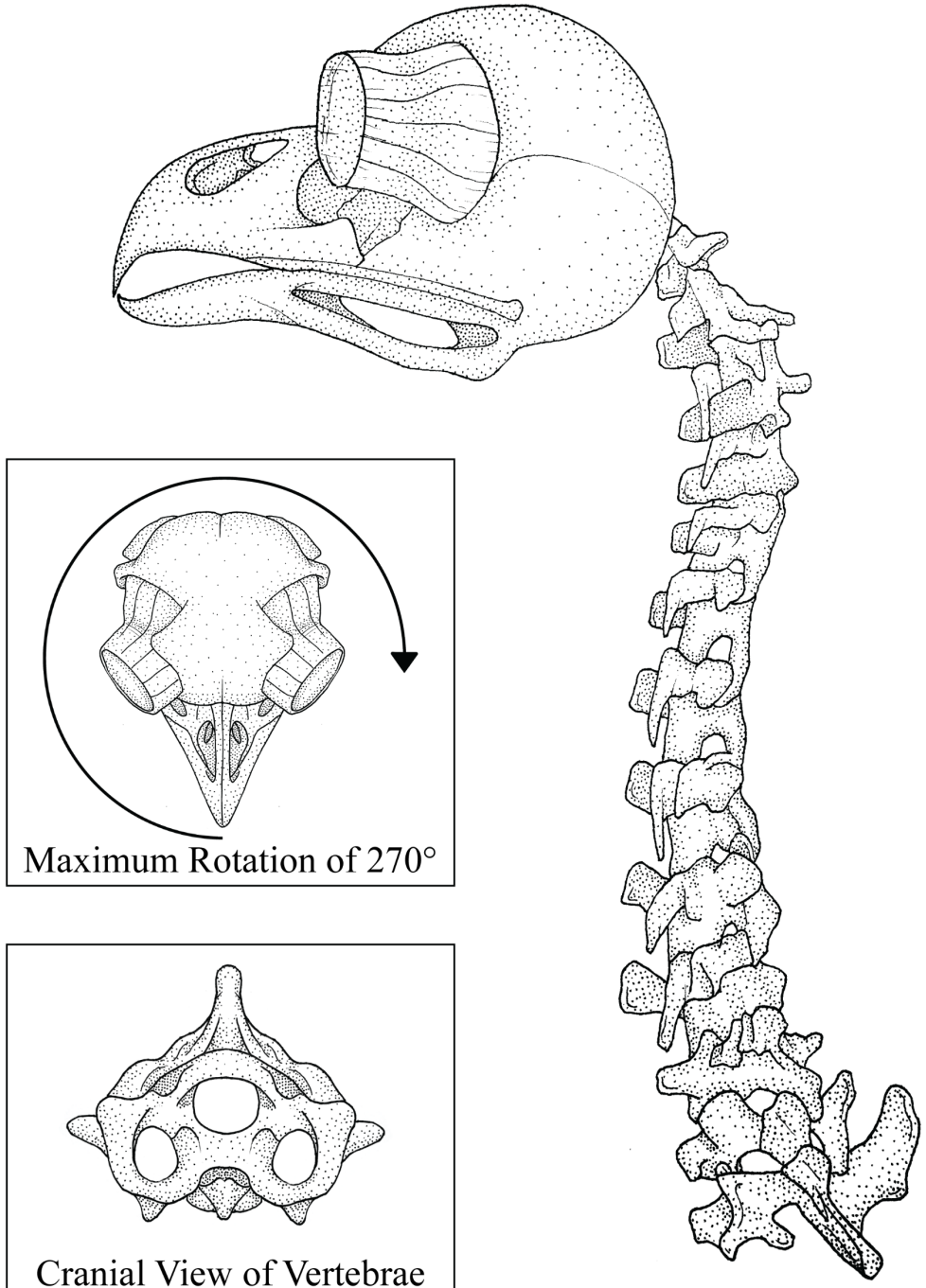
Owl eyes are not capable of moving within their sockets.
They cannot look in another direction without moving their heads.





Highly Mobile Neck

An adaptation to compensate for lack of eye movement is a highly mobile neck. Owls can turn their heads up to 270 degrees in each direction (540 degrees total). This is accomplished because owls have 14 cervical vertebrae, twice as many as humans.




© 视觉中国

Facial Disc

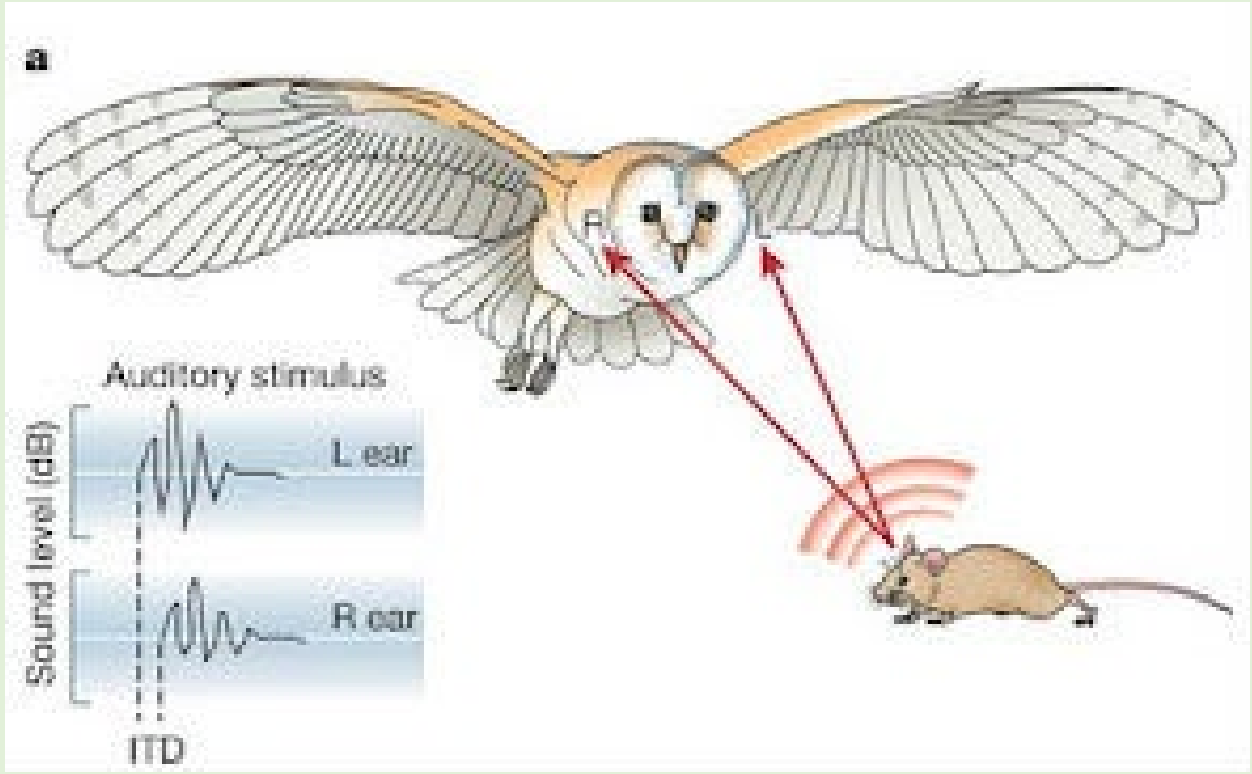
Owls have specially adapted facial feathers that create a “parabolic dish” shape.

Like a parabolic microphone, this helps focus sound.

Facial Disc

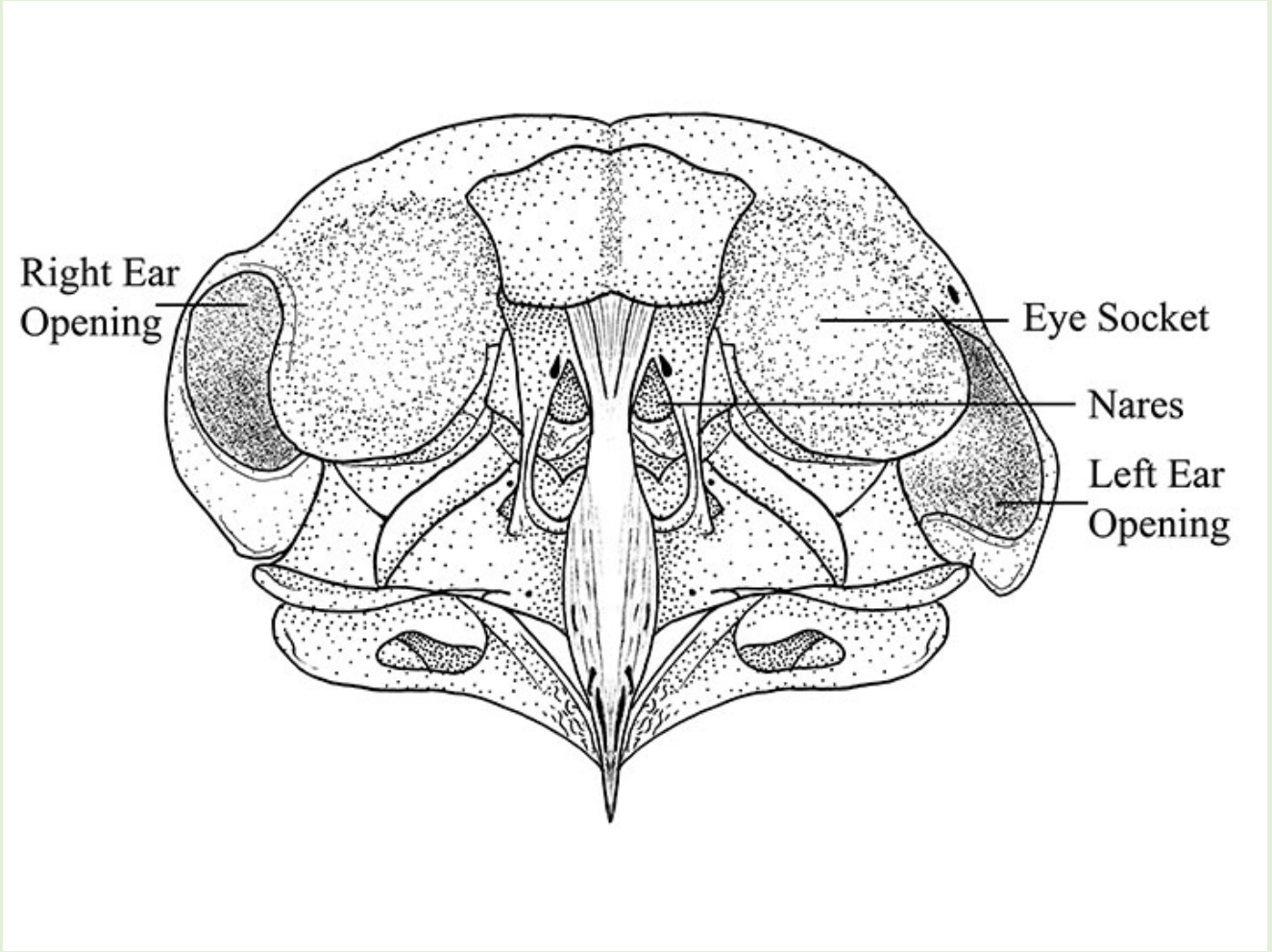
3-Dimensional Hearing

In addition to having excellent night vision, research has shown that some owls are able to hunt in complete darkness without being able to see. Slightly offset earholes on the sides of the head, behind the eyes, in combination with a parabolic shaped face allows the owl to “triangulate” their prey without the aid of vision.

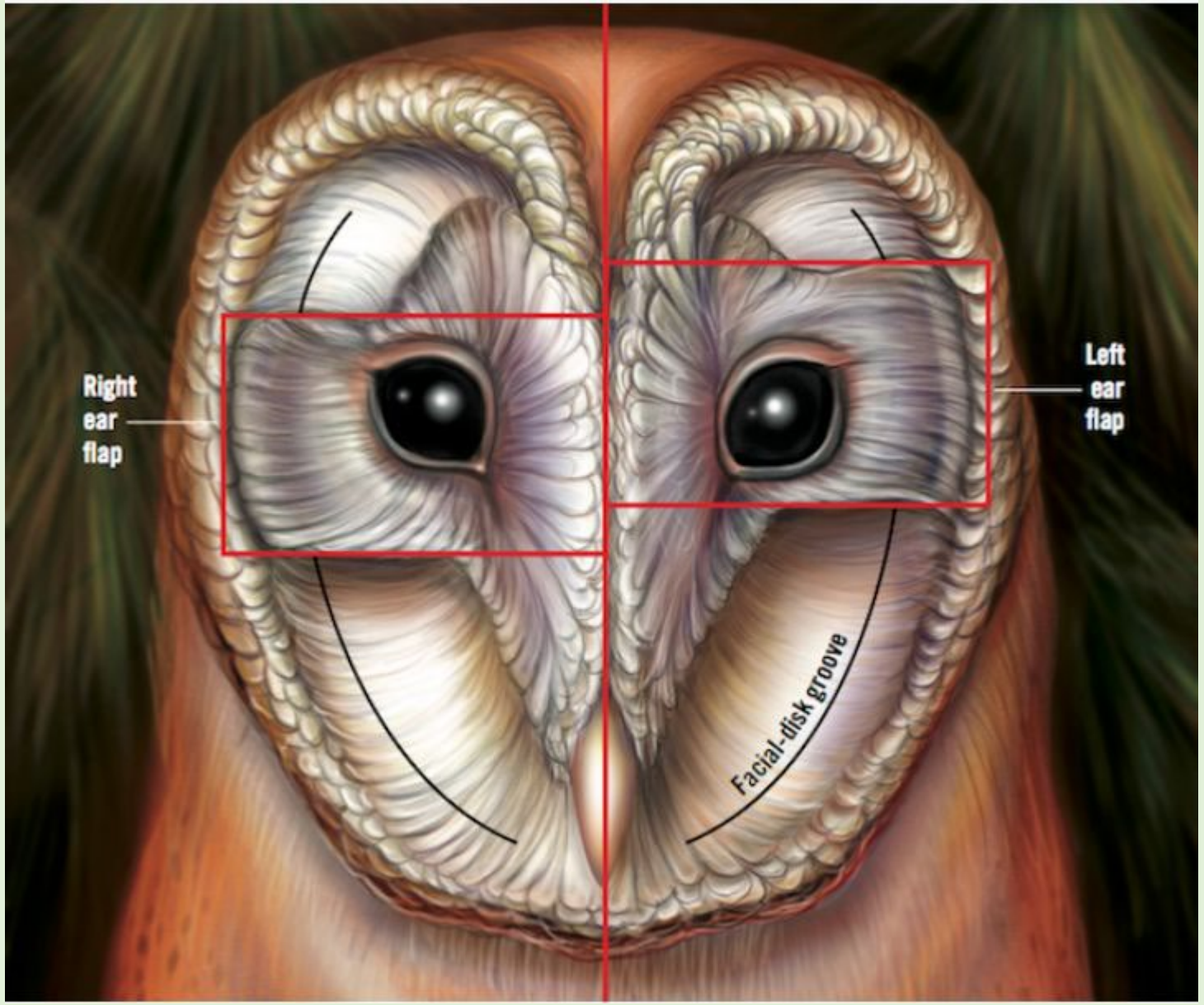


Offset Ear Openings

Offset ear openings ensure that sound enters each ear at a slightly different time.



Offset Ear Openings



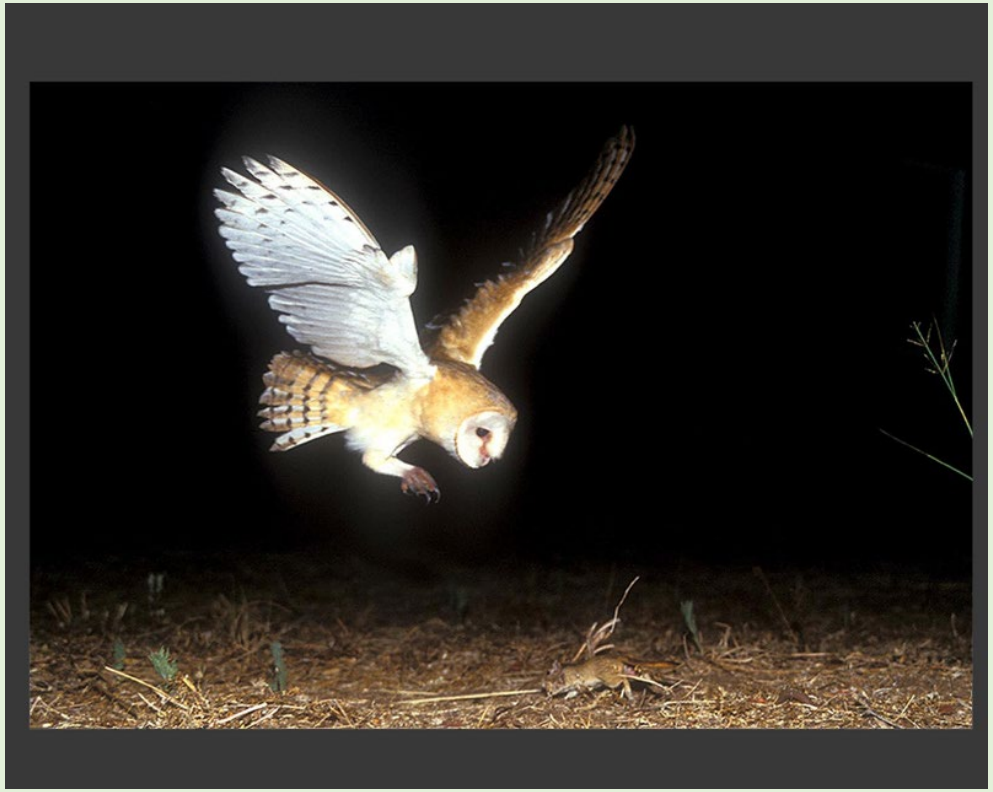
3-Dimensional Hearing

Payne and Drury (1958) were the first to demonstrate the ability of the barn owl (Tyto alba) to locate mice acoustically in total darkness.

https://www.americanscientist.org/article/how-the-owl-tracks-its-prey

Owls Fly Silently

Owls are equipped with highly developed stealth technology that helps them swoop on prey undetected, a study has shown. The nocturnal hunters have feathers that absorb aerodynamic sound and disrupt the turbulence that typically occurs when a bird beats its wings.



Owls Fly Silently

Some owls even have feathers on their feet to reduce noise during flight (as well as provide insulation).

Camouflage

In addition to being stealthy hunters, many owls have also developed very effective camouflage.

Eye Spots

Some owls have developed eye spots, or “ocelli”, to deter other predators.

The number one predator of owls, is OTHER OWLS.

Some species, like this Pygmy Owl, has spots on the back of its head.

Ear Tufts

Ear tufts, also known as “plumicorns”, have nothing to do with hearing. They are used more to convey attitude and intention during breeding. It may also be used as camouflage.

Not all owls have ear tufts.

Long Eared Owl

Ear Tufts

Why are Owls Important?

Bay Owl

Why Raptors are Important

Pest Control

- According to the U.S. Department of Agriculture, between 20% to 40% of global crop production is lost to pests annually.

Why are Owls Important?

Environmental Barometer

- Because raptors are typically high on the food chain, and they are sensitive to environmental pressures, they can be indicators of an unhealthy environment.

How are Raptors Doing?

- 18% of raptors are threatened or endangered
- More than half of the species populations are declining
- Raptors that require forests are more likely to be threatened
- Some raptors have been recovering over the past few decades

Threats to Owls

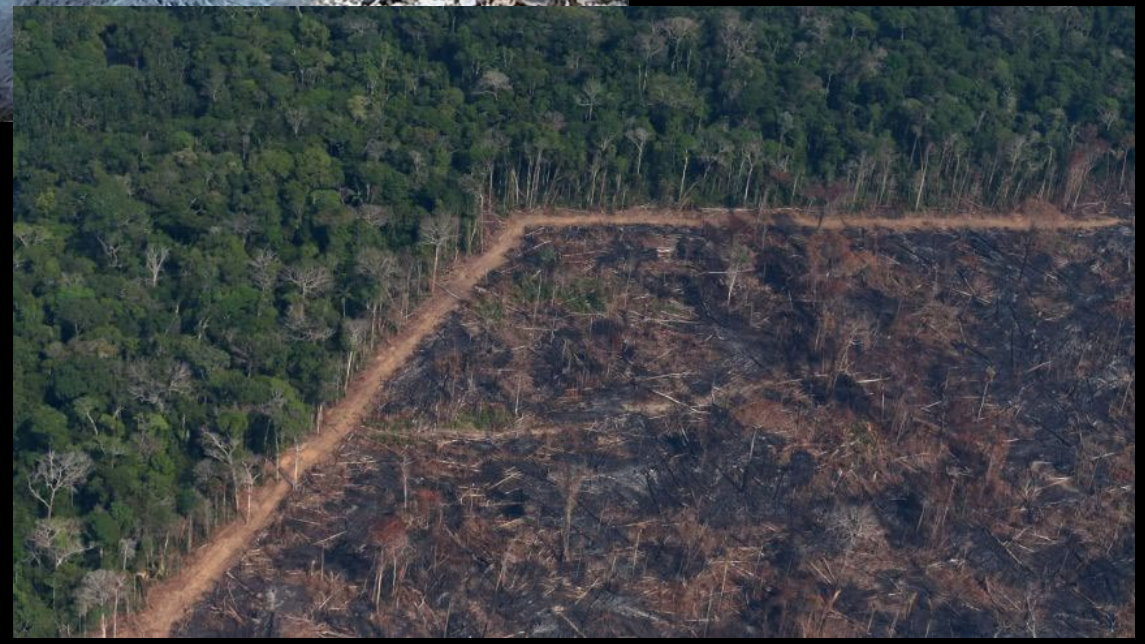
Persecution by Humans

Owls are often dispatched as potential threats to livestock and pets. Although some owls do pose a slight risk for smaller animals, the threat is not equal to the human response.

Threats to Owls

Deforestation/Loss of Habitat

Forest dwelling raptors are more susceptible than most to human development, especially because of the rate primary forests are being cut down for lumber and farmland.



Threats to Owls

Electrocution & Wind Turbines

Human society is heavily reliant on electricity. Not all of our equipment is avian friendly. The U.S. Fish and Wildlife Service estimates that as many as 57 million birds (including owls) die each year because of electrocution or collisions with power lines.

Although wind turbines are a more sustainable method of power production than fossil fuels, they still have a deadly impact on birds.

Threats to Raptors

Vehicle Collisions

Similarly, the U.S. Fish and Wildlife Service estimates that as many as 340 million birds (including owls) die each year because of collisions with automobiles, putting it in the top 5 causes of avian death in the United States.

Threats to Raptors

Bioaccumulation

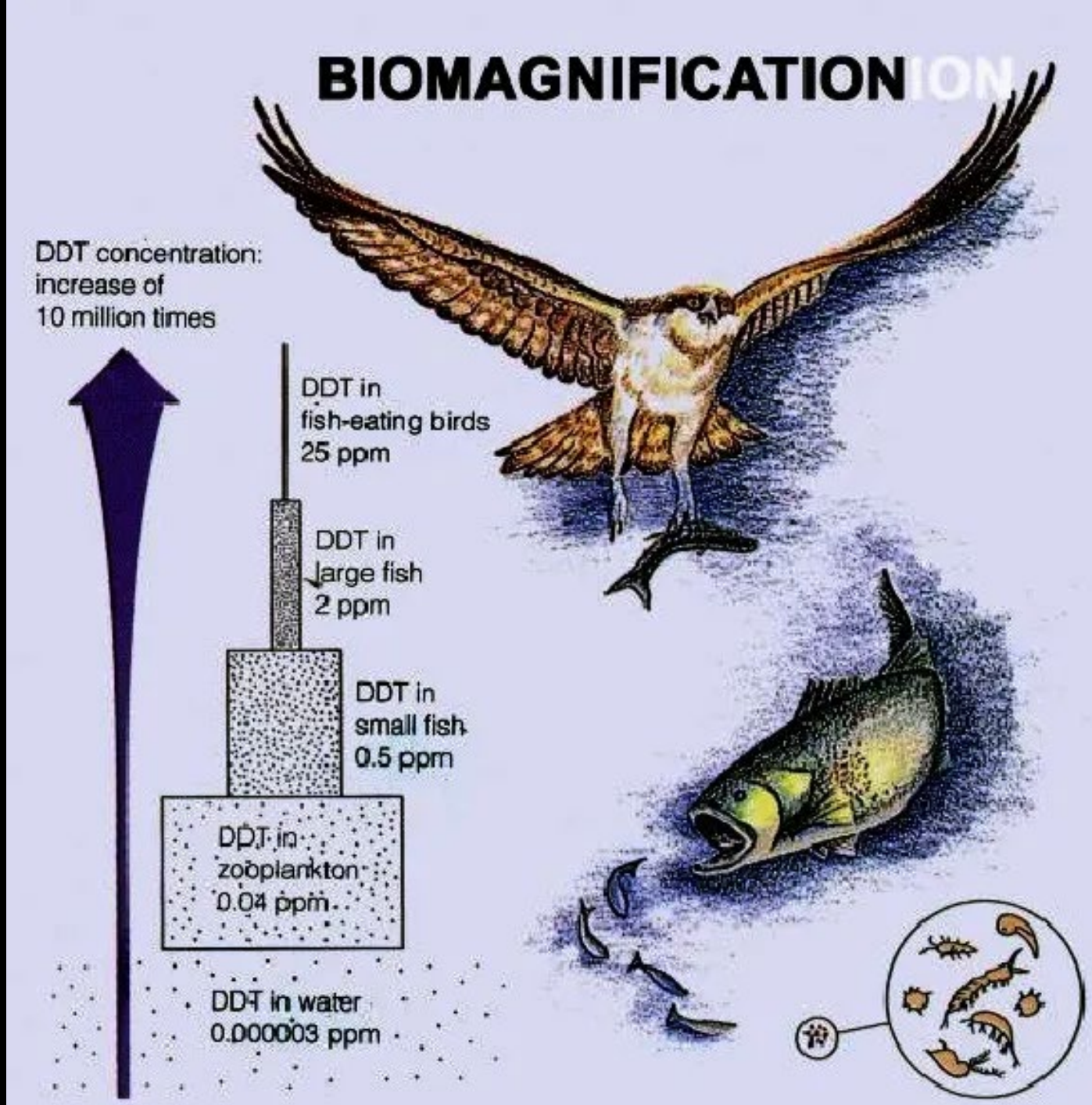
As top predators, raptors are sensitive to toxins in prey animals, including mercury and lead.

During the 1940's through the 1960's, American farmers used a pesticide known as DDT. As the chemical bioaccumulated in subsequent trophic levels of the food chain, the amounts of DDT in some raptors caused devastating effects.

Egg shells of breeding raptors lost their structural integrity, causing them to break while being incubated. Bald eagles, peregrine falcons, and Swainson's hawks nearly became extinct in the U.S.

Threats to Raptors

Bioaccumulation



Hope for Raptors

Recovery

Although for many owl species there is a continuing decline in populations, most are doing fairly well. Those species that are strictly dependent on specific habitats and prey are most susceptible to pressure.

Of the approximately 250 species of owls, currently 24 are considered vulnerable, 13 are endangered, and 3 are critically endangered.

Blakiston’s Fish Owl

Hope for Raptors

Living Close to Humans

A number of owl species have become quite comfortable living in proximity to humans. Because these species tend to be more nocturnal in nature, they are able to share our space with relatively little confrontation.

Great Horned Owl

How You Can Help

Do NOT pick up the baby!

Every year, thousands of fledgling owls are brought to rehab facilities by well meaning individuals.

Here are the facts. Once owls get to a certain size, and they are either near fledging, they tend to jump out of the nest or tree as they are trying to learn to fly. This is VERY common.

An owl on the ground does not mean that it has been abandoned by its mother. Odds are, the mother is somewhere nearby and is taking care of its youngster.

Unless there is visible injury or there is immediate danger, the best thing to do is leave it alone.

Every year, wildlife rehab centers in the U.S. receive thousands of “rescued” owlets that were not in need of rescue.

Not only does this disrupt the normal life cycle of these owls, it decreases the resources available for wildlife in actual need.

How You Can Help

Contribute

Most states have at least wildlife rehabilitation center, many of which help wild raptors. They are regularly in need of supplies and financial support.

How You Can Help

Volunteer

You can volunteer at a raptor rehabilitation center or become part of a raptor transportation network.

Useful Resources

Owl Species of the world:
https://www.owlpages.com/owls/species.php

Owl Research Institute:
https://www.owlresearchinstitute.org

Barn Owl Trust:
https://www.barnowltrust.org.uk/

Cornell Lab of Ornithology:
https://www.barnowltrust.org.uk/

Owl artifacts at the Smithsonian:
https://www.si.edu/spotlight/owls?page=1&iframe=true

IUCN Red List (type “owls” into search bar):
https://www.iucnredlist.org/

List of owl rehab centers in the U.S.:
https://www.internationalowlcenter.org/rehabberlist.html

How to become a injured wildlife transporter:
https://www.wildliferescueleague.org/volunteer/transporter/

Hungry Owl Project:
https://www.hungryowls.org/