

# Masters of the Night



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# Introduction

- ▶ For centuries bats have been found throughout folklore and mythology worldwide, connected to death and darkness.
- ▶ Bram Stoker's *Dracula* associated Vlad the Impaler with the vampire bat.
- ▶ Even today, panic and pandemonium ensue if a bat flies into a house, until it escapes, is harmed or killed.

**This presentation chronicles in stamps, cancels and other materials, the influence bats have had on many cultures' practices and beliefs, art, opera and film, aviation, and the environment.**

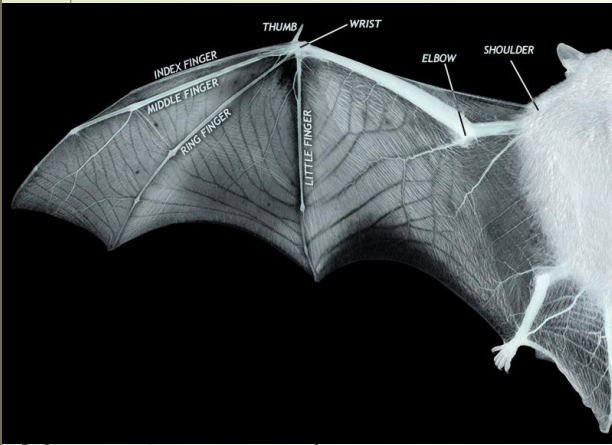
# CHARACTERISTICS OF BATS

## Habitat

- ▶ Making up around 20% of all known living mammal species, bats are the second largest group of mammals after rodents.
- ▶ Bats are found throughout the world, except in Polar Regions.
- ▶ Typical habitats cover a wide range from temperate and tropical forests, deserts, open fields, and agricultural areas, to suburban and urban environments.
- ▶ Bats also roost in various locations within these habitats, such as caves, crevices, trees, under logs, and even in buildings.



# Physical Description



- No other mammal has true wings, nor the ability of flight.
- Bat wings, much like those of birds, are modified forelimbs.
- The flight surface of a bat's wing is covered with skin and strengthened by four fingers.
- Birds' wings are covered mostly by feathers and supported by the wrist and 2 digits.
- The bat's flight membrane usually extends down the sides of the body and attaches to the hind legs.
- The hind limbs are generally short and small, with sharp, curved claws to help them cling to their roost surfaces.

# Reproduction

- Mating systems vary among species. Many temperate bats mate in the fall as they aggregate near their winter hibernacula.
- Females generally give birth to a single pup, but in some species, they may have a litter of 3 or 4.
- All parental care is provided by females.
- Bats cannot fly when they are born, so they either remain in the roost while their mothers forage, or cling to their mothers' during flight.
- Juveniles grow quickly, can usually fly within 2 to 4 weeks after birth, and are weaned shortly thereafter.

One of the largest maternity colonies is in Bracken Cave, Texas. When the mother forages, the young cluster together in the roost to keep warm. Upon the mothers' return, to successfully reunite with their own infants, they identify them by their vocalizations and scent.



# Behavior



- Bats are the only mammals with the ability of flight.
- While many bats live in colonies, some species are solitary or roost in colonies a portion of the year.
- Bats are small, have high metabolic rates, and hibernate during the winter undergoing daily torpor.
- Wing size determines maneuverability used in chasing insect prey, negotiating a dense forest at night, or hovering to gather nectar.
- Living collectively in clusters helps bats conserve heat and energy.



Hibernating Indiana Bats, *Myotis grisescens*

# Echolocation

- ▶ Bats rely heavily on echolocation to navigate and find food.



- ▶ Bats call at high frequencies, bouncing the sound off objects to produce echoes they interpret (echolocation).
- ▶ Bats control what kinds of sound they produce, and types of objects they can perceive.
- ▶ Echolocation calls vary between and within species, and even within individuals.

# Dietary Habits



- ▶ While bats eat a wide variety of food, the majority of species eat **insects**.
- ▶ Species which specifically eat **fruit, nectar, or pollen** are abundant and diverse in tropical regions.
- ▶ Some bats eat **vertebrates** such as frogs, rodents, birds, or even other bats.
- ▶ Several species have adapted to catch **fish**.
- ▶ Vampire bats occur only in the Neotropics.
  - ▶ They obtain **blood** by using their sharp incisors to make incisions in the skin of their prey.
  - ▶ An anticoagulant in their saliva keeps blood flowing while they feed.



# Predators

- Known predators are owls and other birds of prey, many carnivores, snakes, and other bats.

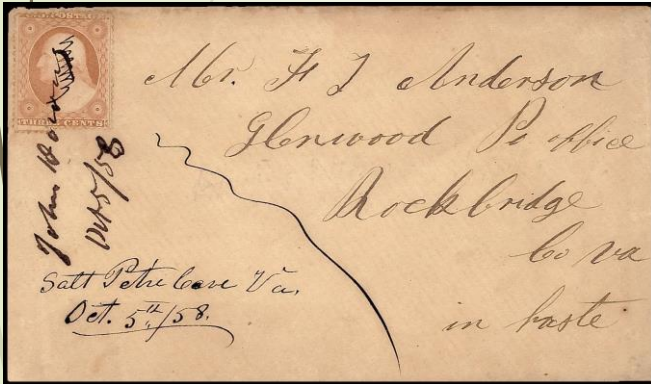
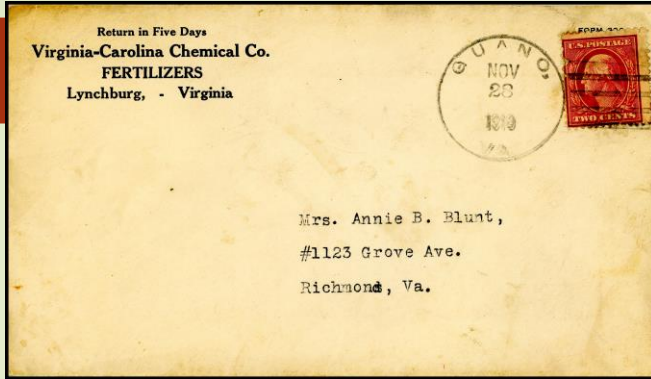


Bat Falcon and Black Rat Snake hunting Southeastern Bats

## Lifespan/Longevity

- Bats live surprisingly long lives, many over 30 years, contrary to typical mammalian lifespans which roughly correlate with body size: smaller mammals live short lives, whereas larger live longer.
- The longest-lived bat on record, a Brandt's Myotis (*Myotis brandti*) was recaptured 41 years after it had originally been banded.

# Ecosystem Roles



- Many insectivorous species prey heavily on insects that otherwise could transmit diseases or harm crops.
- Tons of guano (feces) are mined each year from caves, and is used for crop fertilizer. **In other words, some species eat crop pests and excrete crop fertilizer.**
- Bat guano was processed by the Confederate States of America for niter used in its gunpowder.
- Pollen and nectar eating bats pollinate economically important plants like Agave.
- Frugivorous bats disperse seeds, promoting the diversity of fruit-bearing trees in the tropics.
- Vampire bats' saliva has become an important focus of medical research for its anti-coagulating properties.
- Increased interest in bats has led to a booming eco-tourism industry, often surrounding large roost emergences, i.e. Mexican Free-tailed bats in Texas' Bracken Cave and the Congress Street Bridge in Austin.

# Carolus Linnaeus

(aka Carl von Linné, 1707 - 1778)

Carolus Linnaeus developed the binomial (scientific) system classifying plants and animals, giving bats their identifying genus and species names.



# SCIENTIFIC CLASSIFICATION

## *Chiroptera*

- ▶ The scientific name for bats is “*Chiroptera*”, Greek for “hand wing” (“**chiro**” + “**ptera**”). Evolution has modified their wings into elongated digits, or fingers, making their wings their hands.
- ▶ Although ongoing studies suggest a more complicated classification, bats have been traditionally divided into 2 major groups, usually the sub-orders *Megachiroptera* and *Microchiroptera*, in nineteen families.

# *Microchiroptera and Megachiroptera*

## ➤ **MEGACHIROPTERA** - one family (*Pteropodidae*)

- Found only in the Old World tropics, all feed primarily on plants, fruit, nectar, or pollen. They have large prominent eyes, control their body temperature and do not hibernate.
- *Megachiroptera* bats weigh from 13 grams (0.46 oz.) up to 1500 grams (3.31 lbs.).

## ➤ **MICROCHIROPTERA** - 18 families

- While the majority are insectivorous many have adapted to other kinds of food.
- Some are carnivorous (feeding on rodents, other bats, reptiles, birds, amphibians, and even fish)
- Others consume fruit, some extract nectar from flowers, and one subfamily feeds on nothing but the blood of other vertebrates.
- They are much more widely distributed, have small eyes and use highly sophisticated echolocation. Many can change body temperatures and some hibernate.
- They can weigh up to 200 grams (7.05 oz.), although the smallest, the Bumblebee Bat, weighs only 2 to 3 grams (0.07 - 0.11oz.).

# Fossil Records

- ▶ The earliest Microchiropteran fossil bat, *Icaronycteris*, found in early Eocene (50 millions years ago) rocks from the Green River formation of Wyoming, is remarkably well preserved.
- ▶ Another fossil bat, *Palaeochiropteryx tupaiodon*, found in Messel Pit at Darmstadt is shown on a 1978 German stamp.
- ▶ The oldest known complete fossil bat, the Eocene-age *Icaronycteris* at left, exhibits specializations of the auditory region of the skull, suggesting its ability to echolocate.



# Suborder *Megachiroptera*

## Family *Pteropodidae* - Old World Fruit bats and Flying Foxes



- ▶ *Pteropodidae* has 7 subfamilies, 186 total extant species. They are known colloquially as the Flying Foxes, or Old-World Fruit bats.
- ▶ Body and wing sizes range from small (1.5" forearm) to large (8 3/4").
- ▶ This family boasts the largest bats in the world with wingspans up to 67 inches, with males weighing between 2 3/4 and 3.5 pounds.
- ▶ Strictly vegetarian, they forage for fruits, nectar, and pollen .



Straw-colored Fruit Bat (*Eidolon helvum*), Marianas Flying Fox (*Pteropus mariannus*, Tuttle, JC3116), and Bonin Flying Fox (*Pteropus pselaphon*)

# Tonga Fruit Bat

## *Pteropus tonganus*

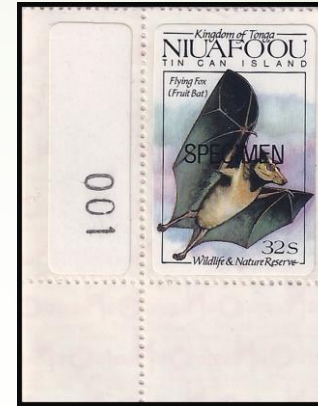


Watercolor Essay Proof

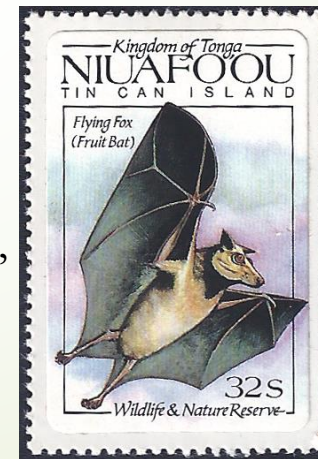


Original Watercolor Essay

Final: multi-colored, die-cut, photolithography, self-adhesive on special perforated peelable security (inscribed) backing paper.



Specimen #1



Progressive color gutter strip with error where circles for colors “2 & 3” are reversed.



## Suborder *Microchiroptera*

- ▶ 930 species in 18 families are found worldwide from the tropics to temperate regions.
- ▶ Below is a Proboscis bat (*Rhynchonycteris naso*) in the Sac-winged or Sheath-tailed bat family, *Emballonuridae*.
- ▶ They often roost in vertical rows with individuals about 10 mm apart.



Photographed on the San Juan de Nicaragua River 2007

# Family *Noctilionidae* - Bulldog bats

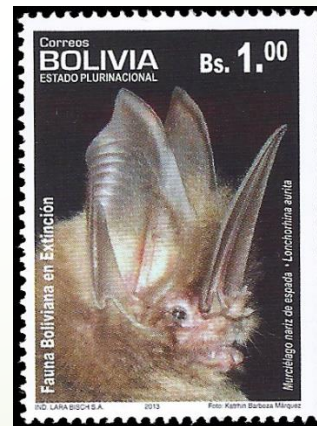
- ▶ *Noctilio leporinus* consume fish, frogs, and crustaceans.
- ▶ They drag their unusually large and sharp claws gaff-style through ripples made on the surface by fish to capture them.



Greater Bulldog Bats or Greater Fishing Bat (*Noctilio leporinus*) (Tuttle, JC3450)

# Family *Phyllostomidae* – American Leaf-nosed bats, including Vampire Bats

- These represent one of the most morphologically diverse bat families, with at least 160 species, 7 subfamilies and more than 55 genera.
- Commonly known as New World Leaf-nosed bats, they have adapted to a wide range of environments and diets.



Common Sword-nosed Bats (*Lonchorhina aurita*, Tuttle, JC3119) and Tent-making bat (*Uroderma bilobatum*)

# Common Vampire Bat

## *Desmodus rotundus*

- ▶ Vampire bats occur only in the Neotropics.
- ▶ They obtain blood by using making incisions in the skin of their prey.
- ▶ An anticoagulant in their saliva keeps blood flowing while they feed.



# Long-nosed Bat

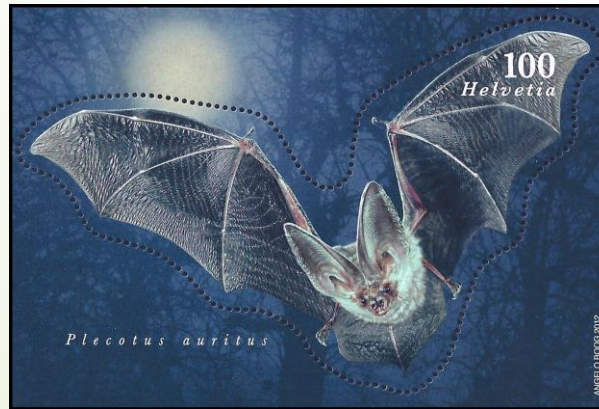
## *Leptonycteris curasoae*

- Highly gregarious, Southern Long-nosed bats roost in caves and abandoned mines, often with a number of other species.
- Agile fliers, they feed on nectar, pollen, and fruit, 90% of which is derived from various species of cactus. They also feed on *Agave* and *Ceiba* when those plants are in bloom.



# Vespertilionidae – Evening and Vesper Bats

- ▶ *Vespertilionidae*, more commonly known as “Evening or Vesper bats”, are the largest family in order of Chiroptera, with as many as 407 known species, 48 genera, and 6 subfamilies.
- ▶ They are the most widespread family, well-established on every continent except Antarctica, and roost in a variety of places.
- ▶ Winter hibernation is more common among temperate species, such as the Little Brown and Big Brown bats, which often hibernate underground or in caves.

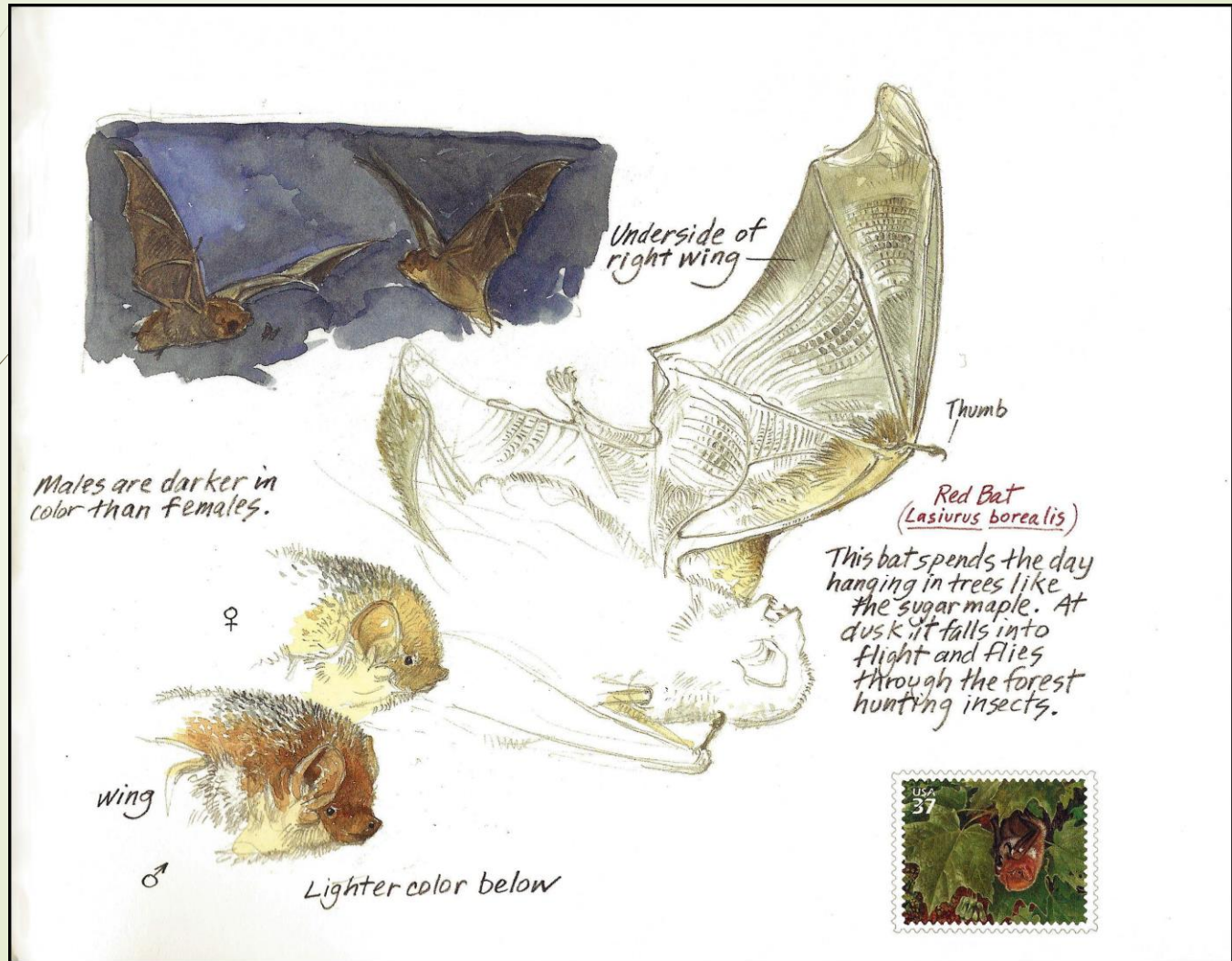


Spotted Bats (*Euderma maculatum*, Tuttle, JC3127), Brown Long-eared Bat (*Plecotus auritus*), and Pipistrellus)

# Red Bat, *Lasiurus borealis* with twins



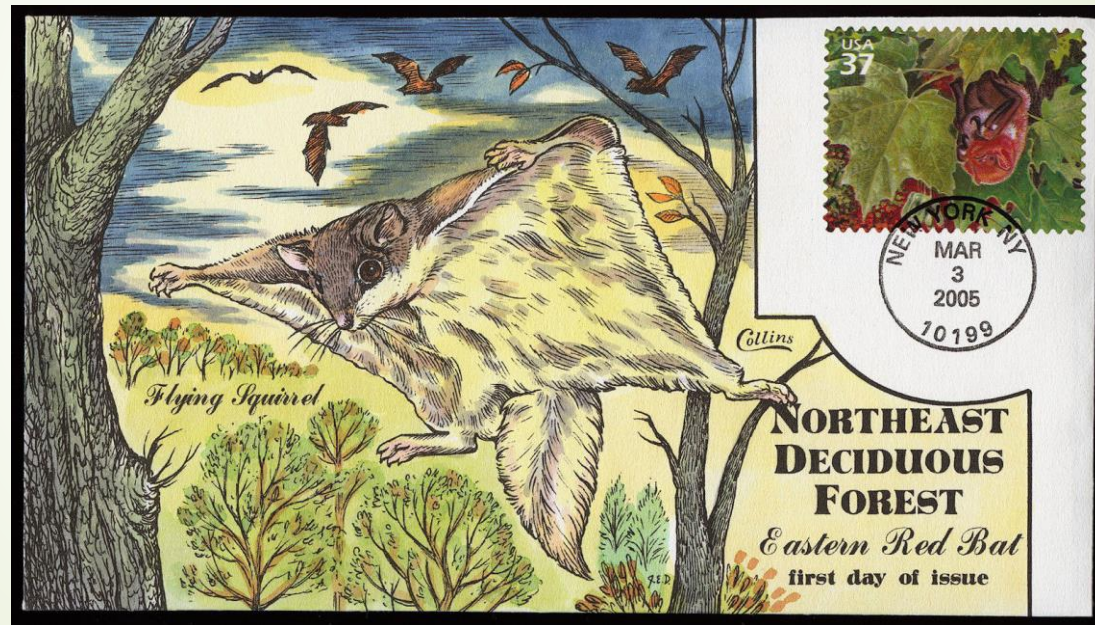
# Red Bat from the Artists Sketchbook





# Flying Squirrels

- ▶ Do not fly, only glide. Found in the same trees where the red bat lives



# Hoary Bat, *Lasiurus cinereus*

- Hoary bats, the most widespread of all bats in the United States, are the only bat found in Hawaii.
- They fly in large groups during periods of breeding and migration.
- They are believed to migrate through Florida from late October to late November, and February through early May.
- They are medium to large, with a head and body length of 2½ to 5½ inches.
- Moths (*Lepidoptera*) make up the bulk of their diet.



1995 - Canada and Mexico Joint Issue



# Big Brown Bat

*Eptesicus fuscus*



# Citizens Stamp Advisory Committee



**As Issued.** Long misunderstood, bats are harmless and essential to nature's balance. They consume billions of costly farm and forest pests, pollinate flowers, and carry seed to new locations.

**Second Choice:** Nearly a thousand species of bats come in an amazing variety of appearances, some being as distantly related as a grizzly bear is to a sea otter.

# *Rhinopomatidae* – Mouse-tailed Bats

- Because of their extended free tail, which is nearly as long as the length of their head and body together, this bat is known as “Mouse-tailed” or “Long-tailed” .
- They live in treeless arid regions, and roost in caves, rock clefts, wells, houses, and pyramids.
- They are insectivorous and their diet consists primarily of beetles and moths.



Lesser Mouse-tailed Bats (*Rhinopoma hardwickei*, Tuttle, JC3110)

# *Craseonycteridae* – Hog-nosed or Bumblebee Bats

- This family contains only 1 species, *Craseonycteris thonglongyai*, first discovered and described in 1974.
- It is the smallest known mammal, weighing only two - three grams at maturity, about the weight of a penny.
- It is extremely rare, having been observed only in Thailand and, most recently, in Burma (Myanmar).



Kitti's Hog-nosed Bats (*Craseonycteris thonglongyai*, Tuttle, JC3144)

# Stylized Bats and Symbolism

When something is referred to as “stylized”, it means it’s represented in a non-conventional form.



Vampire Bite on Queen Elizabeth – Plate Error



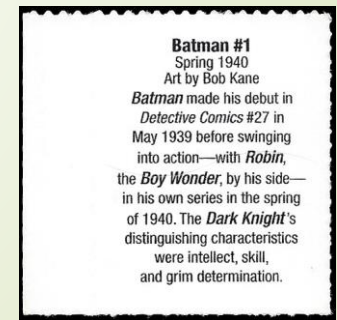
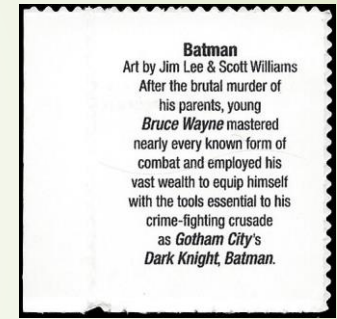
# Earliest Stylized Bats of China

- ▶ The first postage stamps depicting a stylized bat were issued in 1894 by the Imperial Chinese Post to honor the 60<sup>th</sup> birthday of the reigning monarch TZ'U HAI.
- ▶ Of the nine “Empress Dowager” Commemorative Stamps, the 1-candareen and the 9-candareen have a circular central design with five stylized bats representing the five fortunes – health, wealth, long life, good luck, and tranquility.

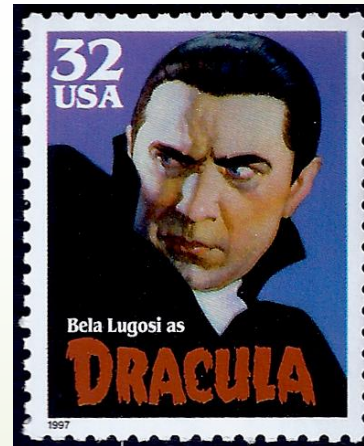


# United States Stylized Bats

- Far from familiar everyday mammals, bats remain creatures of mystery and a symbol of Halloween, for which in fact, Batman is a popular costume.

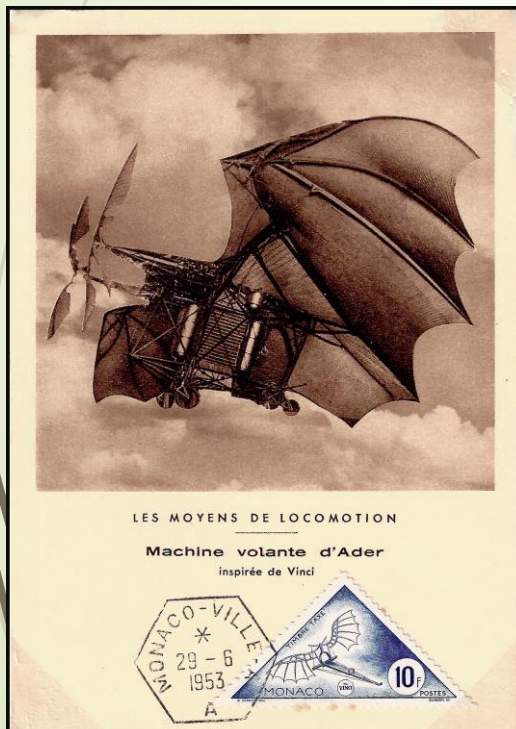


# Opera and Film

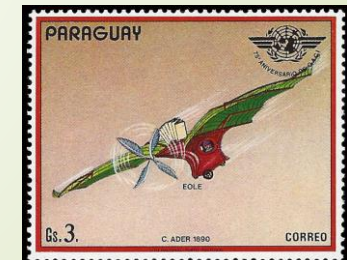


# Clement Ader - Bat Plane

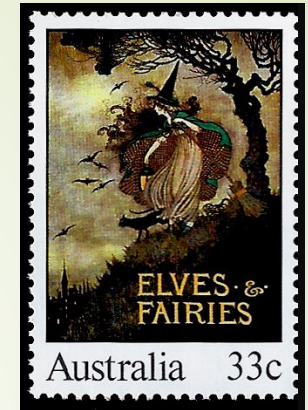
- Around 1890, Clement Ader (1841 – 1926) became fascinated with Leonardo da Vinci's, circa 1500 drawing of an airplane, described as “l'aile, inspiree de celle de la chauvre-souris” (the wing of the flying apparatus was inspired on that of a bat).



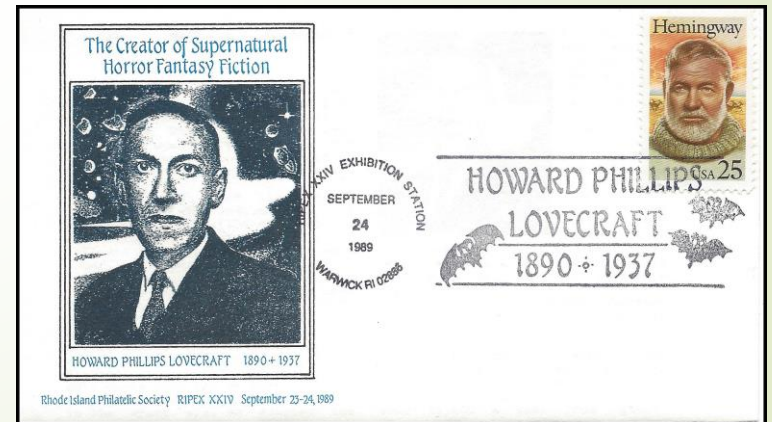
- Using da Vinci's concept, Clement Ader became the first man in history to lift off the ground in a single steam engine-powered aircraft with wings that flapped similar to those of a bat. The aircraft was called *Éole*, “The Ruler of the Winds.”



# Writers



Sesame Street - **Count Dracula**, Alphonse Daudet - **Lettres de mon Moulin**,  
Ida Rentoul Outhwaite - **Elves and Fairies** (1916)



Walt Disney's **Tom Sawyer** lost in a cave with Becky, The Black Dog "**Moddey Dhoo**"  
haunting Peel Castle, H. P. Lovecraft, writer of horror and supernatural fiction.

# Artists



Josef Lada  
The Water Sprite

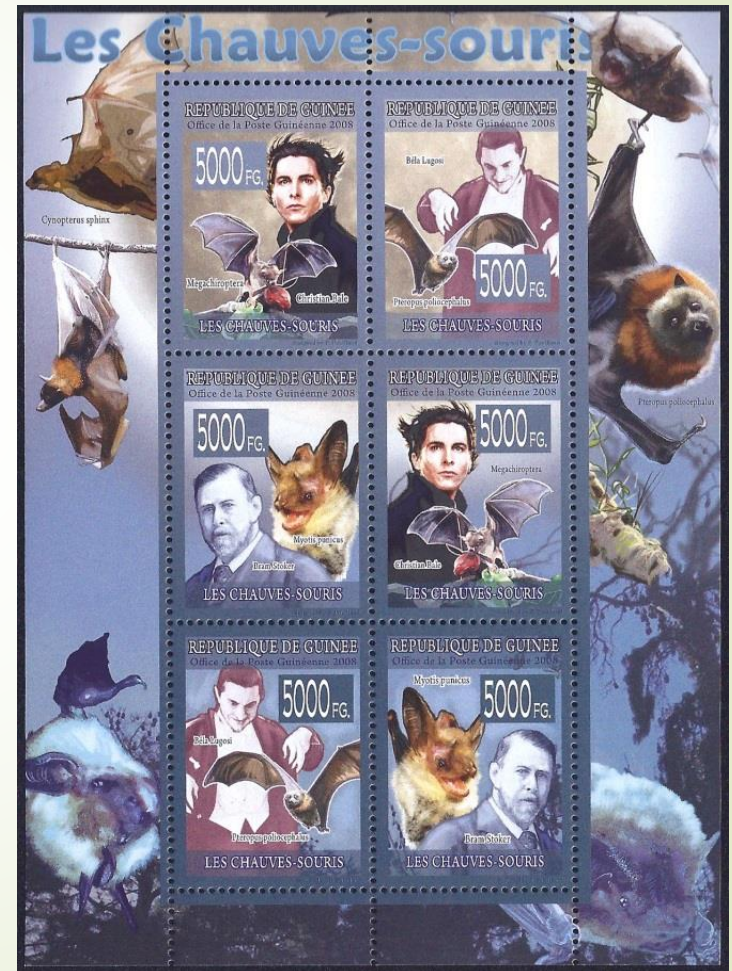


Goya's **The Dream of Reason Brings Forth Monsters**

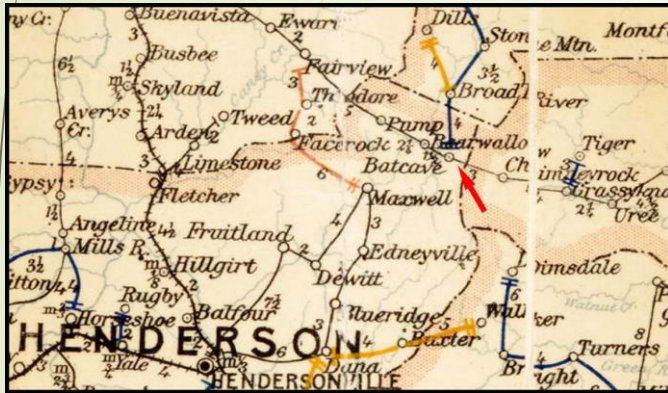


John of Kastav, Church of the Holy Trinity, Hrastovlje, 1490,  
**Dance Macabre**

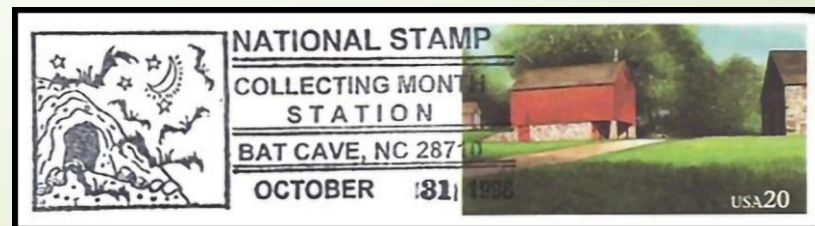
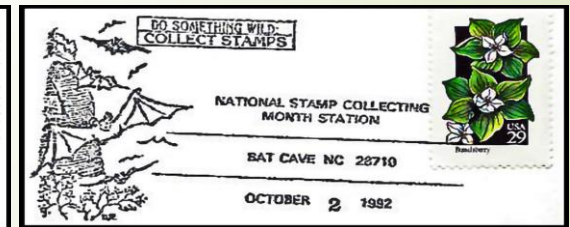
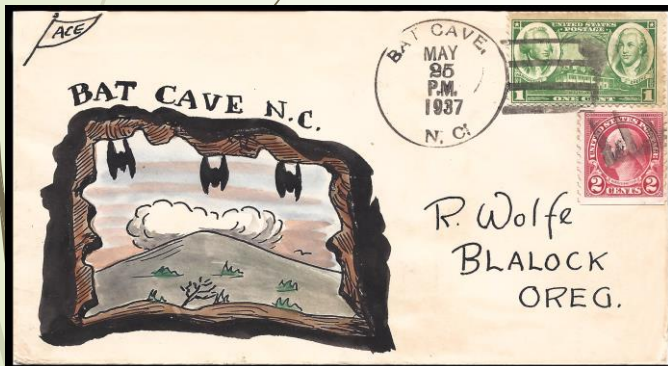
# Bram Stoker's *Dracula*



# Bat Cave, North Carolina



- The cave system consists of ten passable, and several impassible, entrances leading into a complex underground network.
- The main chamber is more than 300 feet long, 85 feet high. A 1984 survey measured the total length of all passages at 5,560 feet, making Bat Cave the longest granite cave in North America, and second longest known granite fissure cave in the world.
- The cave itself is closed to the public, however, the preserve is open mid-April through September. It is closed October to mid-April to allow the Indiana Bats to hibernate undisturbed.





# Museums Around the World with Bat Exhibits



# Monteverde Costa Rica

Magnificent bat museum with many interactive live exhibits.

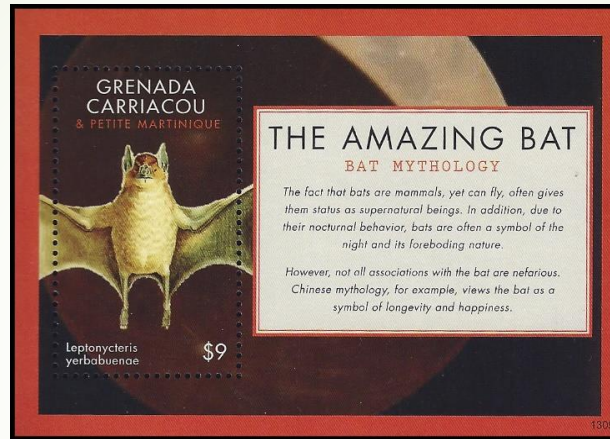


# Some of My Interesting Photos

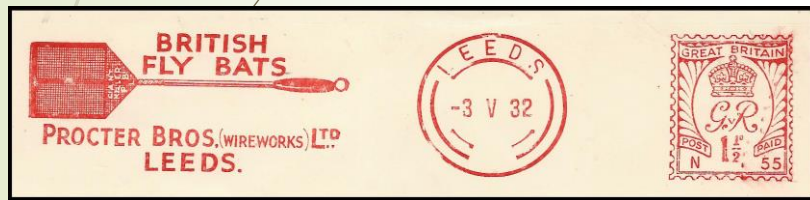
- Bat flights at Carlsbad Caverns and Bracken Bat Cave
- Cave Gate allows bats to fly freely in and out
- Maternity colony at Bracken Bat Cave



# Many Countries Educate Us About Bats



# Saving Bats From Predators



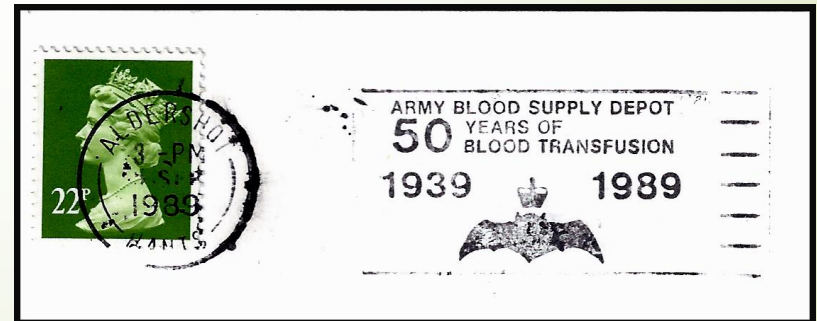
Various Predators of Bats



Gray-headed bat, *Pteropus poliocephalus*

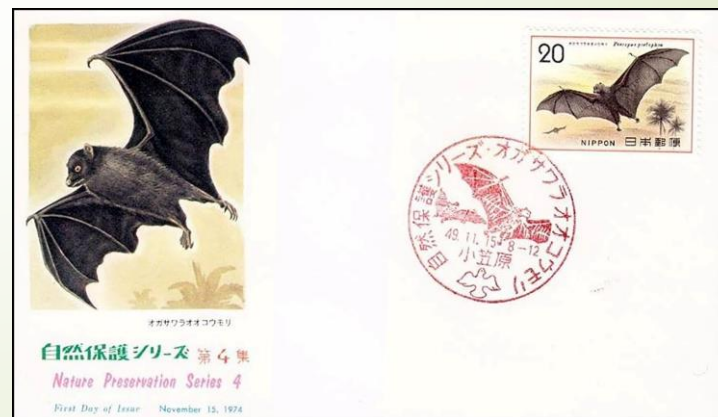
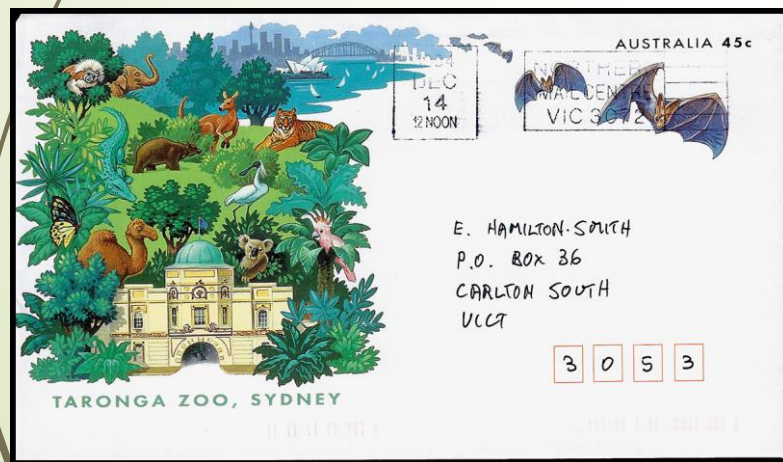
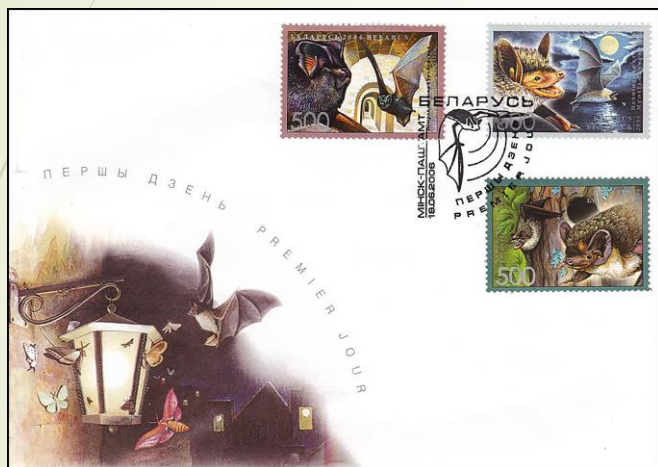
# Corporate Symbols

A logo is a distinctive and easily recognizable graphic symbol designed to make a brand or individual product to be quickly identifiable.



# Preservation of Bats

- Many organizations worldwide protect bats.



# White-Nose Syndrome

- ▶ North American bats are threatened by the fungal disease *Geomyces destructan*, known as called “white-nose syndrome.” The fungus, which grows best in cold, humid conditions typical of many bat hibernacula, has devastated eastern North American bat populations since 2007.
- ▶ The fungus grows on, and, in some cases, invades the bodies of, hibernating bats. This appears to result in hibernation disturbance, causing a debilitating loss of important metabolic resources and mass deaths.
- ▶ Mortality rates at some hibernation sites have been as high as 90%.





# Bat Houses



DIY Bat House

Suwannee Music  
Park Bat House



Sugarloaf Key Bat Tower

# University of Florida -Gainesville Bat Community

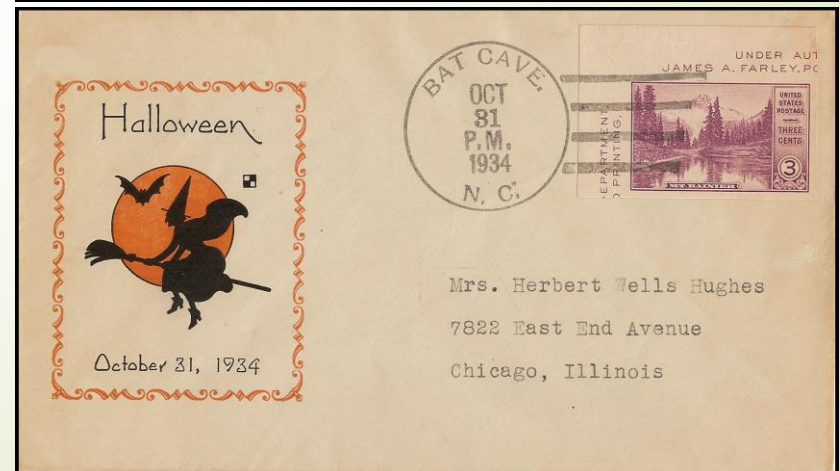


What started out as a colony of 5,000 individuals has since blossomed to an estimated 300,000 **bats!**



# Bats Are Truly the Masters of the Night

- ▶ Highly sophisticated, mainly beneficial allies to man, bats are perhaps the least understood of the world's mammals.
- ▶ I hope after this presentation you have a better understanding of this amazing mammal.



# Bats of Florida

Family: Vespertilionidae

- ▶ Big Brown Bat (*Eptesicus fuscus*)
- ▶ Tri-colored Bat (*Perimyotis subflavus*)
- ▶ Eastern Red Bat (*Lasiurus borealis*)
- ▶ Evening Bat (*Nycticeius humeralis*)
- ▶ Gray Myotis (*Myotis grisescens*) **ENDANGERED**
- ▶ Hoary Bat (*Lasiurus cinereus*)
- ▶ Northern Yellow Bat (*Lasiurus intermedius*)
- ▶ Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*)
- ▶ Seminole Bat (*Lasiurus seminolus*)
- ▶ Southeastern Myotis (*Myotis austroriparius*)

Family: Molossidae

- ▶ Florida bonneted bat (*Eumops floridanus*) **ENDANGERED**
- ▶ Velvety free-tailed bat (*Molossus molossus*)
- ▶ Mexican Free-tailed Bat (*Tadarida brasiliensis*)

## Florida Bat Conservancy

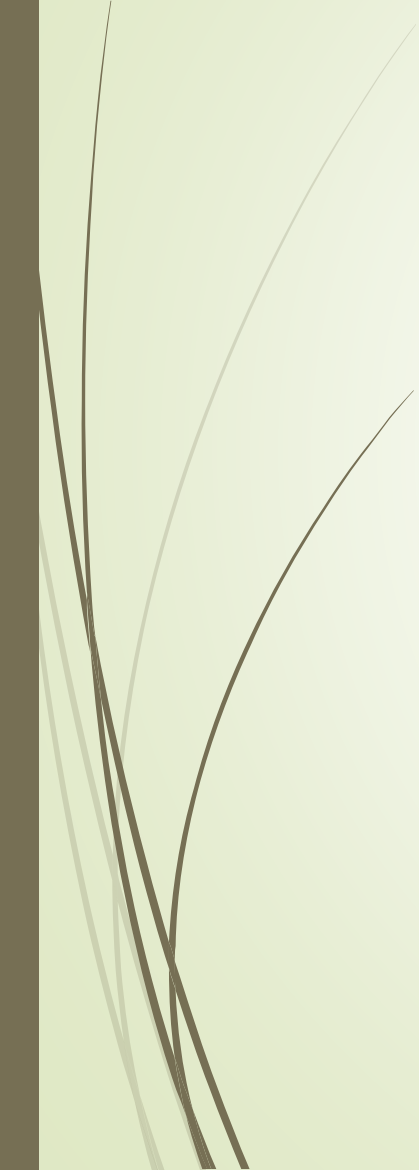
1690 Pine Island Road  
Merritt Island, FL 32953 USA

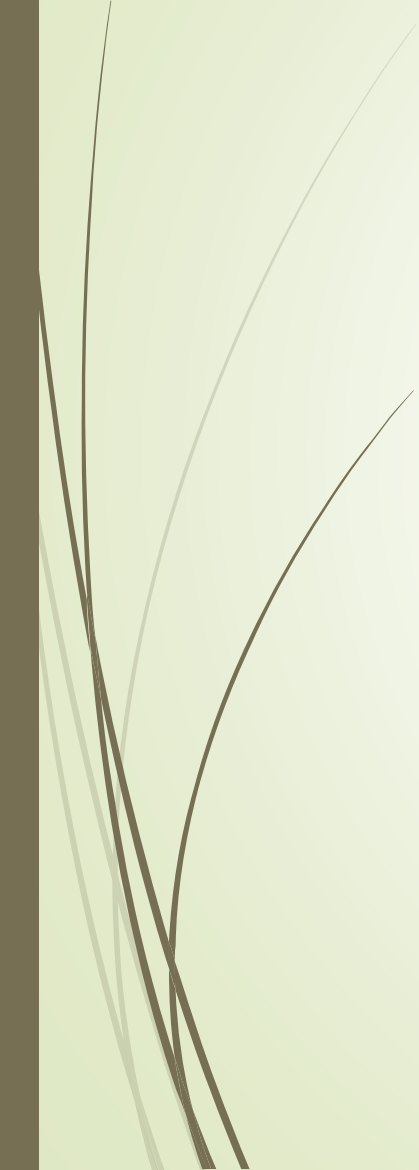
**Remember at night - look up**

**you may see a bat.**



**The End**





# Bats of North Carolina

- ▶ Big Brown Bat (*Eptesicus fuscus*)
- ▶ Tri-colored Bat (*Perimyotis subflavus*)
- ▶ Eastern Red Bat (*Lasiurus borealis*)
- ▶ Eastern Small-footed Myotis (*Myotis leibii*)
- ▶ Evening Bat (*Nycticeius humeralis*)
- ▶ Gray Myotis (*Myotis grisescens*)
- ▶ Hoary Bat (*Lasiurus cinereus*)
- ▶ Indiana Myotis (*Myotis sodalis*)
- ▶ Little Brown Myotis (*Myotis lucifugus*)
- ▶ Mexican Free-tailed Bat (*Tadarida brasiliensis*)
- ▶ Northern Long-eared Myotis (*Myotis septentrionalis*)
- ▶ Northern Yellow Bat (*Lasiurus intermedius*)
- ▶ Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*)
- ▶ Seminole Bat (*Lasiurus seminolus*)
- ▶ Silver-haired Bat (*Lasionycteris noctivagans*)
- ▶ Southeastern Myotis (*Myotis austroriparius*)
- ▶ Virginia Big-eared Bat (*Corynorhinus townsendii*)
- ▶ All are Vespertilionidae except Mexican Free Tailed Bat – Molossidae. Three are federally endangered Gray, Indiana, and Virginia Big-eared.