

## Outreach – Fur, Feathers Scales and Slime

**Objectives:** Using their exterior coverings as a starting point, compare and contrast characteristics of arthropods (insects, spiders, millipedes), fish, amphibians, reptiles, birds and mammals. Students should be able to differentiate each of these animal groups by their unique identifying characteristics. Include conversations regarding basic life stages for most of the animals (i.e. egg, larva, pupa, adult for insects, comparison of egg types for fish, amphibians, reptiles & birds). Make sure that your audience has a good understanding of cold-blooded and warm-blooded. Provide some basic understanding of heredity –that animals get the characteristics of their type of animal from their parents.

**Key terms:** cold-blooded, warm-blooded, invertebrate, vertebrate, arthropod, exoskeleton, arachnid, internal skeleton, symbiosis, mutualism, heredity, traits, reproduction, environment

### What to take:

**Education Animals:** Take a selection of all the various types of animals (if available – insect, spider, arthropod, reptile, bird, mammal. For reptiles and mammals, try to bring examples of different coverings (turtle vs. snake, fox snake vs. milk snake, ferret vs. tenrec/armadillo)

**Biofacts:** Bring along preserved fish (piranha), preserved sea turtle, turtle shell with attached vertebrae, snake shed, assortment of feathers, assortment of mammal pelts to show types of camouflage, some bones.

**Getting Started:** Engage them by asking questions that pertain to animal coverings or differences between types of animals –for example, how do we tell them apart? Some of the terms they will be learning may be difficult for them to pronounce or remember. One technique for helping them assimilate and remember is to repeat new words several times as a group and to continue referring back to them –you make a game out of it by challenging them to remember and coming back to “quiz” them several times. For lower elementary, heredity can be kept very simple: animals get certain traits (features that we can see) from their parents –an example may be if a black dog and a brown dog mate and have puppies, the puppies will usually be black, brown or black and brown.

**INVERTEBRATES** are any animals without a backbone. **Invertebrates** make up more than 97 percent of all known animal species, outnumbering all other species combined. Some are soft-bodied (sponges, jellyfish and worms), while **arthropods** have an **exoskeleton**, an all-over body case made of a hard, plates (made up of a tough substance called **chitin**) that meet at flexible joints. The exoskeleton protects both from attack and from drying out. The word “arthropod” means “jointed foot”. Arthropods have jointed limbs as well as very obvious segments, or divisions, of body parts. They include insects, spiders, scorpions, ticks, mites, crustaceans, millipedes, centipedes, etc.

**VERTEBRATES** are animals with a backbone and **internal skeleton**. Compared to most other animals, vertebrates are intelligent with well-developed nervous systems and larger brains. Unlike a shell or exoskeleton, this internal skeleton can grow to a large size without becoming too heavy or clumsy to move. Fish, amphibians, reptiles, birds and mammals are included in the vertebrate category.

Madagascar hissing cockroach: **arthropod, insect, invertebrate**, has **exoskeleton** and is **cold-blooded**. Has 6 (3 pairs) legs, and three main body parts: head, thorax (chest), and abdomen. Most insects have compound eyes. Life cycle varies quite a bit, but the standard is egg, larva, pupa, and adult. Cockroach is a scavenger, feeding on decaying vegetation in the tropical rainforest floor. Has an interesting behavior to defend itself –it expels air and this makes a hissing sound. Also, explain **sybiosis** with mites –this is an example of **mutualism** --they both benefit.

Chilean rosy-haired tarantula: **arthropod, arachnid, invertebrate**, has **exoskeleton** and is **cold-blooded**. **Spiders**, along with ticks, mites and scorpions, are **arachnids**. They have 8 legs (4 pairs), and two main body parts: cephalothorax (head and thorax together) and abdomen. They have simple eyes, usually 8 (rarely 6) and usually on the dorsal side of the head. All spiders are carnivores, all can spin silk. Tarantulas, like many spiders do not spin webs to catch their prey. The “hair” on a tarantula is not true hair –only mammals have hair. True hair is made of keratin, the hair-like material on a tarantula are actually bristles made up of chitin (the same material that makes up the exoskeleton). Explain the defensive use of this tarantula “hair.”

Fish: Use the preserved specimen. They are **vertebrates, cold-blooded**, are covered with scales, breathe with gills and lay soft, jelly-like eggs. Fish have a layer of slime over their scales. This serves two functions: 1) it lubricates their bodies and allows them to pass through the water more easily; 2) the slime also protects the fish from bacterial and fungal infections.

Amphibians: They are **vertebrates, reptiles, cold-blooded**, are covered with scales, breathe with gills or lungs (depending on the life stage and species) and lay soft, jelly-like eggs. The two most recognizable groups are the frogs/toads and salamanders. Amphibians have thin relatively tender skin that usually plays a role in respiration. Water nearby or very humid microclimate is living requirement for most species. For many they have a life cycle of egg, tadpole and adult. All are carnivorous.

Turtles/tortoises: Choose which ever ones you like. They are **vertebrates, reptiles, cold-blooded**, are covered with scales and lay soft-shelled leathery eggs. Discuss the shell as the distinguishing feature of turtles. The shell is an integral part of the turtle’s body –if you have it, this is the perfect time to show the preserved carapace with the attached spine and vertebrae. Most turtle species cannot completely protect every part of their body with their shell.

Lizards: Choose which ever ones you like. They are **vertebrates, reptiles, cold-blooded** and are covered with scales. Point out lizard characteristics: they have no shell, have eyelids, have ears, have hinged jaws like birds and mammals, have fairly long tails, lay soft, leathery eggs. Explain their use of the tongue as a sense organ. Bringing the sheltopusik helps emphasize that presence/absence of limbs is *not* a distinguishing characteristic between lizards and snakes.

Snakes: Choose which ever ones you like. They are **vertebrates, reptiles, cold-blooded**, are covered with scales and lay soft-shelled, leathery eggs. Point out snake characteristics: they have no eyelids, have no ears, lack functional limbs, have relatively short tails and have very flexible jaws that open as wide in the back as they do the front. Explain their use of the tongue as a sense organ. If using the milk snake explain mimicry.

Birds: Choose which ever ones you like. They are **vertebrates, warm-blooded**, have an **internal skeleton**, lay hard-shelled eggs, are the only animals which have feathers. Talk about the various types and functions of feathers. Include coloration and use of colors. Most see color very well. Most have a body designed for flight –discuss hollow bones, etc.

Mammals: Choose which ever ones you like. They are **vertebrates, warm-blooded**, have an **internal skeleton**, give live birth, are the only animals which have hair/fur and feed their young milk. Differentiate between the more traditional hair of ferret, rabbit with specially modified coverings of tenrec (stiff, spiky hair), porcupine (quills which are released if they stick into a predator) and/or the modified skin and bone that makes up the “armor” of the armadillo.

For upper elementary you can include a discussion on how the features of the various animal types help determine in which environments those animals are found. You can also (if you have them with you) show and contrast mammal bones and bird bones --fused bones of bird's central body essential for attachment of flight muscles, bird bones (in flighted birds) are hollow, etc. If time allows, you may even decide to have a little more detailed discussion on heredity and inherited characteristics –animals that inherit characteristics that allow them to survive better, pass those traits to their offspring... this process is called **natural selection**.

**Middle/High School**: This program is seldom requested by middle or high school teachers. If we do get a request for this program with older students, see the education curator for some specific suggestions on how to present.