TOUR: FUR, FEATHERS, SCALES AND SLIME

OBJECTIVES

Using their exterior coverings as a starting point, compare and contrast characteristics of arthropods (insects, spiders), 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 and 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

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

Invertebrates are animals without a backbone. Invertebrates make up more than 99 percent of all known animal species. Most are soft-bodied (sponges, jellyfish, worms, etc.), but the 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." All arthropods are exothermic (cold-blooded) and have jointed limbs and very obvious segments, or divisions, of body parts. Arthropods include insects, spiders, scorpions, ticks, mites, crustaceans, millipedes, centipedes, shrimp, lobsters, etc.

Students are familiar enough with insects and spiders that you can have a discussion of these animals without seeing an actual specimen.

Insects: Have three pairs of legs (six total), 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.

Spiders: spiders, along with ticks, mites and scorpions, are arachnids. They have four pairs of legs (eight total), and two main body parts: cephalothorax (head and thorax together) and abdomen. All spiders are carnivores and most can spin silk, although many do not make webs. 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).

Madagascar hissing cockroach: most insect have wings, although hissing cockroahces do not. Insects also have antennae (arachnids do not). Point out the mites (arachnids) living on the bodies of the cockroaches.

VERTEBRATES

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, sharks, amphibians, reptiles, birds and mammals are all vertebrates

Amphibians: Use the mudpuppies in the Bird & Reptile House. Point out they are unusual in that they are aquatic as adults and retain the gills of the larval stage. Amphibians have moist skin, breathe with gills, lungs or through their skin (depending on the life stage and species) and lay soft, jelly-like eggs. The two most recognizable groups are the frogs/toads and salamanders. Water nearby or very humid microclimate is a living requirement for most species. All are carnivorous.

Terrapins/turtles/tortoises: They are reptiles, which means they're cold-blooded and are covered with scales (even on their shells). All turtles 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.

Lizards: They are reptiles, which means they're cold-blooded and are covered with scales. Point out lizard characteristics: have eyelids, have external ear openings, have hinged jaws like birds and mammals, usually have long tails, and have soft, leathery eggs (oviparous vs. ovoviviparous). Explain their use of the tongue as a sense organ (Jacobson's organ). Point out that presence/absence of limbs is not a distinguishing characteristic between lizards and snakes.

Snakes: They are reptiles, which means they're cold-blooded and are covered with scales. Point out snake characteristics: lack of eyelids, no external ear openings, no functional

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limbs, short tails, have very flexible jaws that open as wide in the back as they do the front, and have soft, leathery eggs (oviparous vs. ovoviviparous). Explain their use of the tongue as a sense organ (Jacobson's organ).

Birds: They are warm-blooded, have an internal skeleton, lay hard-shelled eggs, and are the only animals that have feathers. Talk about the various types and functions of feathers. Include coloration and use of colors. The peafowl/pheasants are great example for this discussion. Most see color very well. Most have a body designed for flight—discuss hollow bones, lack of teeth, etc. Contrast them with the flightless birds (penguins). Birds spend a lot of time on feather maintenance (oil gland, molting, preening).

Mammals: They are warm-blooded, have an internal skeleton, give live birth (except monotremes), are the only animals with true hair and all have mammary glands that provide milk for their offspring. Differentiate between the traditional hair versus modified hair, like porcupine quills or tenrec spines. Discuss the hollow winter hair of cervids (deer family), the extremely dense under fur of the river otters—which prevents water from getting to their skin and traps some air between the fibers to add some insulation.

Keep in mind the various types of camouflage as you survey the various animal types.

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.