

Animal Coverings with Scope-On-A-Rope

By: Adrienne Lopez, LSU SOAR Coordinator

Every living thing has some kind of covering (skin) to protect it from its environment. This covering can aid in defense, camouflage, locomotion, sensory perception, and is instrumental in keeping an animal from drying out. An animal's skin may produce structures such as hair, nails, feathers, scales, horns, etc. What else can an animal's skin reveal about its habitat?

VOCABULARY

Magnify: to make an image appear larger than it really is.

Skin: the outer covering of an animal that protects it from its environment.

Keratin: a type of protein that forms many of the epidermal structures in vertebrates, such as hair, nails, claws, feather, and some kinds of scales.

Hair: a non-living structure (made of keratin) found in mammals that grows from a follicle in the skin; it aids in insulation and tactile functions (e.g. cat whiskers)

Scales: overlapping structures forming a shield over the skin. Different types of scales are found on many animals, such as reptiles, fish, butterfly wings, and bird legs. Reptile scales are made of keratin and are part of a single layer of skin that is shed periodically. Fish have individual bony scales that grow with the animal.

Feathers: a structure found in birds that insulates and helps them fly. The anatomy of a feather consists of a main shaft with branches, called barbs. Each barb has smaller, interlocking projections called barbules. This configuration allows for a strong, yet flexible structure.



Vertebrate: an animal with a backbone and a nerve column (spinal cord).

Invertebrate: an animal lacking a skeleton. Some are soft-bodied or have external shells.

Polyp: an individual coral. It has a soft, cylindrical body with a mouth surrounded by stinging tentacles. Corals usually live in groups (colonial) with many other individuals.

Websites for additional information:

<http://www.charfac.umn.edu/MMS/ProjectMicro/Explorations/Apr1998.html> (hair info)

<http://www.earthlife.net/birds/feathers.html> (feather facts and diagrams)

<http://www.szgdocent.org/cc/c-slimy.htm> (about snake scales)

<http://www.zoomschool.com/coloring> (animal printouts)

<http://www.amonline.net.au/fishes/students/scales> (Australian Museum fish site-great info!)

GRADE LEVEL EXPECTATIONS

Science As Inquiry

Pre-K: 3, 8

Grade K: 4, 10

Grade 1: 5, 11

Grade 2: 6, 12

Grade 3: 6, 8, 15

Grade 4: 7, 9, 17

Grade 5: 29

Life Science

Pre-K: 20

Grade K: 24, 25

Grade 1: 32

Grade 2: 30

Grade 3: 35

Grade 4: 41

Grade 5: 29

SOAR ACTIVITIES

We will examine at the outer covering of the animals included in the Biofacts kit. Key features to look for with the SOAR are denoted by the “🔍”.

Mammals

Mammals, including humans, have **hair** for insulation and sensory purposes. A person has between 100,000 and 150,000 hairs on his/her head, and we lose 50-100 hairs every day! But we also have many different types of hair. Tiny hairs inside your ear aid in a person’s sense of balance, while hairs inside your nose act as filters to help prevent dust from entering your lungs. Mammals with fur can have two types of hair in their coat: guard hairs (long and thick) and downy hairs (short and soft). What other kinds of mammal coverings can you think of? (ex: armadillo “armor”, porcupine quills)

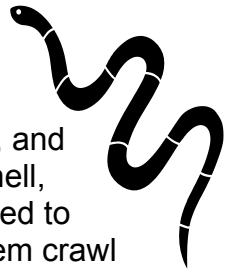
- 🔍 Examine the hair on your head with 30x and 200x lenses. Can you see air bubbles inside the hairs? How is the hair on your head different from the hair on your arm or in your ear?
- 🔍 Look at the pelt with the 30x lens. How is the animal’s hair alike/different from our own? Can you see different types of hair?

Mammal skin has two structures to keep it from drying out: sweat glands and sebaceous (oil) glands. 🔍 Can you find the sweat glands on your fingertip? (if not, try pressing the ON button)

- 🔍 What does your skin look like up close? Did you know that the outer layer of your skin is made of dead cells that shed continuously? Scratch your skin, then examine it with the 30x lens.
- 🔍 Your nails are also made of **keratin**, like hair. Take a closer look if you dare!

Reptiles

Reptiles have a tough, dry, scaly skin that protects them from predators and allows them to live in dry places. Reptilian **scales** are made of **keratin**, like hair, and some have bony plates underneath their scales for extra protection (ex: turtle shell, alligator osteoderms). Their scales are not separate like a fish’s; they are attached to the skin in one large sheet. Snakes have special scales on their belly to help them crawl and climb and they shed their skin periodically in one single piece.



- 🔍 Examine the snake shed with the 30x lens. Can you see how the scales are all connected by skin? How much do you think a snake’s skin can stretch when swallowing large prey?
- 🔍 What does the alligator’s skin look like? Can you see its scales?

Bony Fish

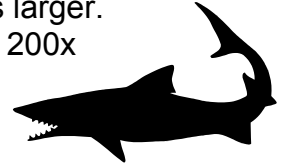
Fish **scales** are smooth to help them glide through the water, and some reflect light to help camouflage them underwater. Unlike reptiles, the scales of bony fish are made of enamel and dentine (like teeth) and are separate and detachable. The scales protect the fish and are overlapping for greater flexibility. In most fish, the scales grow as the fish grows, creating a ring pattern similar to that of a tree (ctenoid and cycloid scales). Garfish have a different type of scale (ganoid) that is made up of thick bony layers that lack growth rings.

- 🔍 Use the 30x and/or 200x lenses of SOAR to try to count the rings of the fish scale. Can you figure out how long the fish lived? How do the garfish scales look in comparison?

Sharks

Cartilaginous fish, like sharks and rays, have a different type of outer covering than bony fish. Their tough skin is covered with placoid scales – small, spiny, irregular-shaped scales called dermal denticles (“skin teeth”). This gives them a sandpaper-like feel. These scales grow like the scales of bony fish – more are simply added as the shark’s skin grows larger.

- 🔍 Examine the placoid scales of the shark skin with the 30x and 200x lenses. Can you see why they are called “skin teeth”?



Birds

Birds have **feathers** covering their bodies and scales on their legs. Their feathers are made of **keratin** and grow from a follicle similar to mammalian hair. Birds have many types of feathers: contour (body) feathers, flight feathers, and down feathers for insulation. Feathers also act as water repellants (like in ducks and penguins) and can be very colorful for display (like the beautiful tail feathers of a peacock). Birds replace worn feathers by moulting (shedding) once a year, and the total weight of a bird’s feathers is three times the weight of its skeleton!

- 🔍 Use the 30x and 200x lenses of SOAR to examine the different bird feathers. [The structure of a feather consists of a main shaft (quill) with barbs attached; tiny barbules are attached to each barb. Some of the barbules have hooks on them to keep the feather rigid, yet flexible.]
- 🔍 Can you tell which feather is from the owl? Owl flight feathers have very long barbules on the edge without hooks to quiet the airflow over its wings, and thus give the owl silent flight.

Coral

Most corals are colonial, meaning that they live in large groups, and are attached to a hard substrate. Coral **polyps** are **invertebrates** that secrete an external skeleton of calcium carbonate. This skeleton is shaped like a cup and gives the soft polyp protection. Over time, individual polyps die, leaving their exoskeleton behind. This serves as an attachment point for more polyps – thus a reef is formed.

- 🔍 Use the 30x lens to see the numerous individual corals that once lived in this colony. Can you find individual openings where the polyps once lived?

Sea Stars and Sand Dollars

These two animals may not seem very much alike, but they are part of the same group – the echinoderms (“spiny skin”). They are pentaradial, which mean that they have five symmetrical parts as opposed to our two halves. Sea stars and sand dollars also have tube feet (fluid-filled tubes) that assist them in locomotion. 🔍 Can you see tube feet on underside of the sea star?

- 🔍 Examine the sand dollar with the 30x lens. Can you find its mouth? (Hint: look underneath in the center.) Can you see why they are said to be “spiny skinned”?

Conchs

Conchs and other gastropods (such as snails) are also **invertebrates** that secrete an outer shell to protect them from predators. Conchs have very thick shells, but they not are not strong enough to withstand a sea turtle’s bite!

- 🔍 Examine the shell with the 30x lens. Is the inside of the shell different from the outside? Can you see any patterns in the shell?



DIVERSITY IN THE ANIMAL KINGDOM

1. Invertebrates – animals that do not have an internal skeleton

Phylum Porifera (sponges)

Phylum Cnidaria (jellyfish, **coral**)

Phylum Nematoda (roundworms - parasitic)

Phylum Annelida (segmented worms - earthworms)

Phylum Mollusca

Class Gastropoda (animals with a single shell: snails, **conchs**)

Class Bivalvia (animals with a halved shell and hinge: oysters, clams)

Class Cephalopoda (squid, octopus)

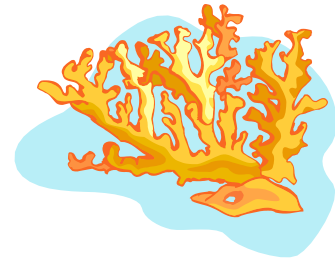
Phylum Arthropoda

Class Crustacea (shrimp, crawfish, crabs)

Class Arachnida (spiders, ticks)

Class Insecta (butterflies, beetles, ants)

Phylum Echinodermata (**sea stars, sand dollars**, sea urchins)



2. Vertebrates – animals with an internal skeleton

Phylum Chordata (Subphylum Vertebrata)

Class Agnatha (jawless fish – lamprey)

Class Chondrichthyes (fish with skeletons made of cartilage - **sharks, rays**)

Class Osteichthyes (bony fish – gars, redfish, catfish, **tarpon**)

Class Amphibia (frogs, salamanders)

Class Reptilia (**snakes, turtles, lizards, alligators**)

Class Aves (birds – parrots, sparrows, **hawks, owls**)

Class Mammalia (**raccoons, elephants, dogs, humans**)

ACTIVITY EXTENSIONS

SCIENCE: Observe animals in the schoolyard or at home. Discuss the features of animals that are beneficial in their environment. Put animals into basic groups: mammal, reptile, bird, etc.

Life Science GLE's = PK: 24, Gr. K: 25; Gr. 1: 34; Gr. 2: 35; Gr. 3: 38-39; Gr. 4: 48 & 52; Gr. 5: 29

ELA: Read a book to your class about rabbits or some other kind of mammal whose fur helps it to be camouflaged from predators. Have students write a story about an animal in its habitat.

Writing GLE's = K: 20, 24-25; Gr. 1: 26, 29; Gr. 2: 21, 24; Gr. 3: 22, 24; Gr. 4: 20, 23; Gr. 5: 18, 21

ART: Have your students create an imaginary animal with a certain type of body covering and explain how this covering helps it to survive. They can draw it, sculpt with clay, or use other methods in the creation process. [VA-CE-E1 & E5]



*Funded by a grant to Louisiana State University in Baton Rouge from the Howard Hughes Medical Institute to support undergraduate bio-medical education.