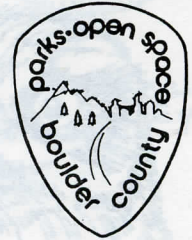




**WINTER  
1987**

# Nature Detectives



*"Who's been here?" "What were they doing and why were they doing it?" "When did it happen?" Nature Detectives try to answer questions like these by looking for clues and evidence of the activities of creatures in the outdoors.*

*Have you ever wondered about teeth marks on the trunk of a tree, or strange footprints in the snow or mud? If you have, then you are already a nature detective.*

## THEME:



## Vision

How does the world look to an earthworm? The earthworm does not have eyes. It cannot see images or pictures of things in its world. Earthworms do have skin cells which tell its brain when it is moving into light or darkness. Vision takes both eyes and brain. People and many animals have eyes which gather light energy from outside and focus it on special cells in the eye. These cells send a message to the brain which forms a picture of the surroundings.

Vision helps animals stay out of danger, find food, mates and shelter, and care for their young. There are interesting differences in vision. Hawks have very good vision. They see well from high in the air. Moles and shrews have small eyes and depend on keen noses to find food. Night animals, like owls, may have huge eyes and good hearing. Or, like bats, they may not depend much on vision but almost entirely on hearing.

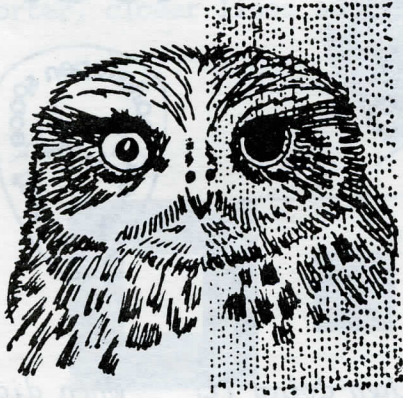
People, birds, fish, some reptiles, and many insects see in color. Other animals see the world like black-and-white TV. No rainbows? Bees and butterflies see flowers in color, but the colors are a little different than the colors we see. Bees can see from the purple light waves into ultraviolet waves but can't see red colors. We see reds, but can't see ultraviolet waves without using special lights or film. Wouldn't it be fun to see like a bee? But we wouldn't want to miss stop signs and fire engines!





## Night Vision

Because light is needed for vision, animals active at night have special problems. What improvements to vision, or adaptations, help these animals see at night?



- \*large eyes for body size
- \*pupils which open wide
- \*many rods--cells sensitive to light and dark, and outline shapes
- \*pigment--a chemical which forms in darkness and improves night vision
- \*third eyelid--protects sensitive eyes of some animals from bright daylight
- \*eyeshine--reflective lining on the inside of the eye

## Eyeshine

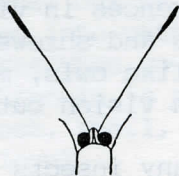


Eyes glowing in the night--what kind of animals are those? Some animals which move around at night have a silvery layer of cells lining the eye. This lining works like a mirror. Light which enters the eye strikes this layer and is reflected back through the light sensing cells a second time and out of the eye. You see the shine. Deer, alligators, cats, coyotes, raccoons, and even wolf spiders are some of the animals you may see with eyeshine.

## Eye Pairs

Can you match the eyes with the animal they belong to? Put the animal's letter next to its eyes. (Answers are on the last page.)

- a. butterfly
- b. frog
- c. cat
- d. owl
- e. hawk



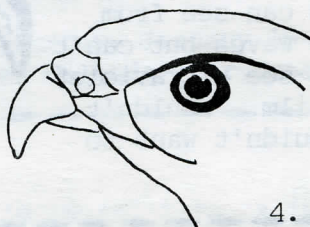
1. \_\_\_\_\_



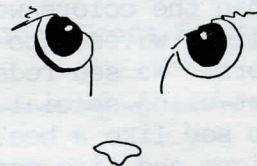
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3. \_\_\_\_\_



4. \_\_\_\_\_



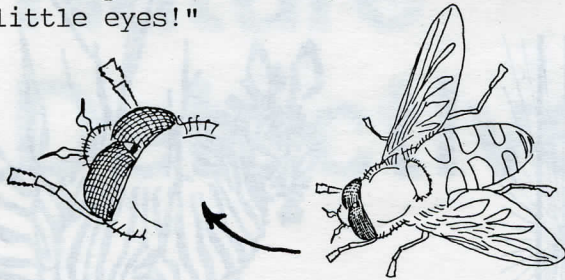
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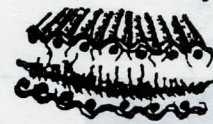
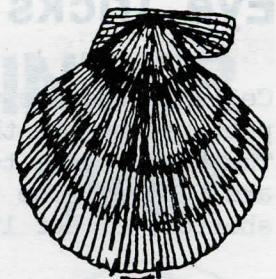
# Amazing Eyes

Did you know that:

1. Ostriches have the biggest eyes of any land animal--each one is about the size of a tennis ball!
2. A scallop has 50 eyes!
3. Hawks and eagles have better vision than humans!
4. Insect eyes are made up of hundreds or thousands of "little eyes!"



Insect  
Eyes

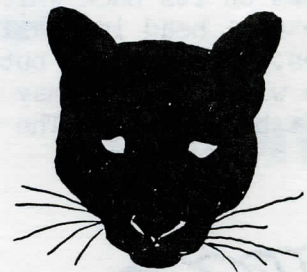


Scallop  
Eyes

## Focusing on Food

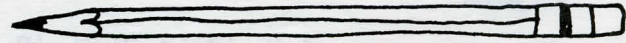
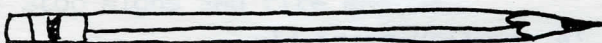
It is early morning on a cold, winter day. A mule deer is munching on a shrub in a frosty meadow. A mountain lion is creeping through the forest that surrounds the meadow. His eyes spot the deer. He knows exactly how far away the deer is browsing. He knows how much further to approach silently before rushing to attack his prey.

The mountain lion is a predator, an animal that eats other animals. The mountain lion has binocular (two-eyed) vision. Both eyes face forward from the front of the head and focus on the same image. The mountain lion can judge distances very well. This is important because the mountain lion's food may run away. If he leaps at a running deer and misses by only one inch, he goes hungry.



The mule deer eats plants. The deer's food does not run away. The mule deer has monocular (one-eyed) vision. Her eyes face out to either side. Each eye sees something different. Although the mule deer is not a good judge of distance, she is able to see in almost a full circle. This allows her to eat and keep watch for predators at the same time.

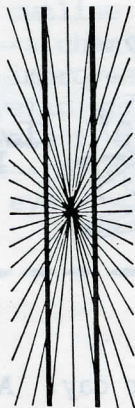
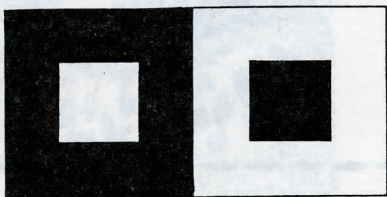
Let's experiment with monocular and binocular vision. Take two pencils with sharp points. Hold them out in front of you, one in each hand, with the points about a foot apart. Now close one eye and bring the pencils together, trying to touch the points. Probably, the two points slid past each other. Try again with both eyes open. It's easier to judge exactly how far away each pencil is when you use both eyes, isn't it?



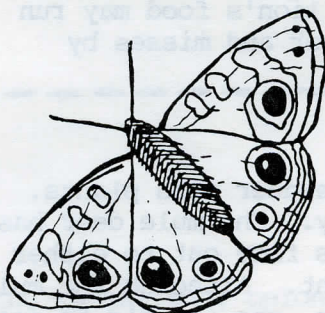
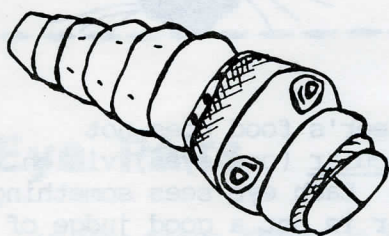


# Eye Tricks

Cells in the eye work in groups. Usually, lighter colors or brighter patterns excite the brain slightly more than darker colors and patterns. The brain tends to "correct" these differences, but sometimes the eyes are fooled. The white squares look larger than the black squares. The shorter, closer lines seem to bend the two long lines.



Animals make use of pattern both to hide and scare. The stripes of the zebra and tiger help the animals blend into the grassland. The swallowtail caterpillar has fearsome spots on its back which look like a huge mouth and eyes. The real head is small and is located away from the fake eyes. The peacock butterfly has several large eyespots on the wings. Birds may strike at the eyespots missing the soft body parts. The butterfly often escapes.



The mind tries to make sense out of what we see. One way is to group shapes into patterns. Have you seen animals or figures when you stare up at clouds? The picture of Lincoln is made of shapes. Can you find a camel, goose, snail, dog, profile of a person, mouse, and a clown?



NATURE DETECTIVES: Saturday, January 16--Meet at Walden Ponds for special activities. See Images Calendar for details.