SCIENCE QUEST GAZETTE

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I hope the new year finds you all healthy and happy. This month we will be learning about Texas animals.

Ocelot

Twice the size of the average housecat, the ocelot is a sleek animal with a gorgeous dappled coat. These largely nocturnal cats use keen sight and hearing to hunt rabbits, rodents, iguanas, fish, and frogs. They also take to the trees and stalk monkeys or birds. Unlike many cats, they do not avoid water and can swim well.

Like other cats, ocelots are adapted for eating meat. They have pointed fangs used to deliver a killing bite, and sharp back teeth that can tear food like scissors. Ocelots do not have teeth appropriate for chewing, so they tear their food to pieces and swallow it whole. Their raspy tongues can clean a bone of every last tasty morsel.

Many ocelots live under the leafy canopies of South American rain forests, but they also inhabit brush lands and can be found as far north as Texas. These cats can adapt to human habitats and are sometimes found in the vicinity of villages or other settlements.

Ocelots' fine fur has made them the target of countless hunters, and in many areas they are quite rare, including Texas, where they are endangered. Ocelots are protected in the United States and most other countries where they live.

Female ocelots have litters of two or three darkly colored kittens. In northern locations females den in the autumn, while in tropical climes the breeding season may not be fixed.

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BERNOULLI'S PRINCIPLE

Have you ever said of someone who was talking too much, "He's just an old windbag"? Actually, windbags can be fun (think balloons), and they allow us to learn about an important property of moving air called Bernoulli's Principle.

Daniel Bernoulli was a Swiss physicist who lived from 1700 to 1782 and did pioneering work on the motions of fluids ("hydrodynamics"). A modern application of Bernoulli's Principle is the shape of airplane wings, which in part generate "lift" by making the air on the top of the wing move faster than the air under the wing.

<u>Bouncing Balloon</u>

For this experiment you will need:

- **an electric hair dryer with circular nozzle**
  • a balloon
  • a table tennis ball

- First, blow up the balloon and tie off the end. Hold the balloon out at arm's length and let go of it. Does it stay there, or drop?
- Next, hold the balloon above your head at arm's length, then blow hard at it as you let go. Can you keep the balloon in the air?
- Now hold the hair dryer in one hand, turn it on, and point it up toward the ceiling. Place the balloon in the stream of moving air, and let go. Does the balloon fall to the ground or stay up? Why does this happen?
- Experiment further with the hair dryer. If you tilt the nozzle slowly a little to one side, does the balloon stay in the air stream? Can you bring the nozzle back to vertical and make the balloon follow? How far can you tilt the nozzle before the balloon falls? What causes the balloon to stay in the stream of moving air?
- Finally, try placing a table tennis ball in the air stream created by the hair dryer. Does it float? If your hair dryer is powerful enough, the ball will float in the stream just like the balloon. Can you place both the balloon and the table tennis ball in the air stream at the same time? Which object must be placed on top for them to both remain floating? Why is this the case?

When you first let the balloon go, it sinks because it is denser than the surrounding air. (Why do balloons filled with helium rise?) However, the balloon is just a little denser than air, so you were able to keep it from falling by blowing on the bottom of the balloon, either by mouth or with the hair dryer. The column of moving air pushes on the bottom of the balloon, forcing it to rise. The effect is the same in either case, but the hair dryer doesn't run out of breath.

But what happened when you tilted the nozzle of the hair dryer? If the balloon were simply held up by the column of air, it would have fallen down when you tilted the nozzle. Instead, the balloon followed the column of air when it moved—so something else must be happening.

The reason the balloon stays in the moving stream of air has to do with Bernoulli's Principle. **Bernoulli's Principle says that the pressure <u>decreases</u> inside a stream of flowing air**. When the balloon begins to move out of this low pressure stream, the higher pressure of the air in the room pushes it back into the moving stream. When you tilt the nozzle, the pressure in the room is still high enough to push the balloon back into the air stream, even if the moving air stream is at an angle. Eventually, at a large tilt, the force of gravity will become greater than the force of the air pressure holding the balloon in the stream, and the balloon will fall.

For more examples of applications of Bernoulli's Principle, with good explanations, see

- http://www.nasm.si.edu/exhibitions/gal109/LESSONS/TEXT/TEASERS.HTM