Symbiotic Relationships

1. Red Cedar and Pasture In areas where red cedar is not controlled, the grass frequently disappears, erosion starts and gullies begin to form. Red cedar survives drought conditions by drawing water away from grass. Is this a symbiotic relationship? If so, is it parasitic, mutualistic or commensalist?	2. Cows and Egrets The cattle egret is often seen in the company of cattle, horses and other grazing animals. The grazers stir up insects, which the egret then eats. Is this a symbiotic relationship? If so, is it parasitic, mutualistic or commensalist?
3. Cattle and Grass When cattle are properly grazed they aerate the soil with their hooves, allowing more oxygen to enter the soil and helping grasses and plants grow better. If soil isn't aerated, it develops a hard crust, which decreases the amount of water and nutrients it can absorb. Grazing cattle also press grass seed into the soil and provide natural fertilizer in the form of manure. When cattle graze they reduce the length of the grass. This helps reduce the spread of wildfires. Is this a symbiotic relationship? If so, is it parasitic, mutualistic commensalist?	4. Mycorrhizal Fungi and Plants Plants photosynthesize and provide carbon to mycorrhizal fungi in return for nutrients that the fungi take up from the soil. Mycorrhizal fungi help plants get nutrients by extending plant root systems beyond low nutrient zones into places where more nutrients are available. Fungal hyphae are often much smaller in diameter than roots, which allows them to access nutrients and water in smaller soil pores. Finally, fungi have higher surface-to-volume ratios than roots, which increases the rate at which nutrients are absorbed. Is this a symbiotic relationship? If so, is it parasitic, mutualistic or commensalist?
5. Southern Green Stink Bug and Cotton The southern green stink bug feeds on cotton with its piercing-sucking mouth parts. Salivary fluid is pumped down the salivary duct and liquefied food is pumped up the food canal. The stink bug feeds on all plant parts but prefers growing shoots and developing fruit. Attached shoots usually wither and may die. Young fruit growth is retarded, and the fruit often withers and drops from the plant. Is this a symbiotic relationship? If so, is it parasitic, mutualistic or commensalist?	6. Wasp and Stink Bug Stink bugs lay their eggs in masses. There are several species of very small wasps that take advantage of this by searching for stink bug egg masses and laying their own eggs inside the individual stink bug eggs. The larvae complete their development inside the eggs. Is this a symbiotic relationship? If so, is it parasitic, mutualistic or commensalist?

Symbiosis: A Flower and a Moth

In late May, after the rains fall, a plant with clusters of waxy, bell-shaped flowers emerges from the desert. As bats catch insects by the millions and owls search for mice, which search for seeds, the yucca flowers open.

A small silver-white yucca moth enters the yucca flower petal, folds her wings and rests. A male moth mates with the female and flies away.

The female moth recovers the golden pollen from each of the six stamens that circle the broad pistil in the center of the flower. She works the pollen into a ball approximately the size of her head. She carries this ball under her neck and flies into the night.

The moth is guided by the fragrance and whiteness of the waxy flowers. She must visit hundreds of flowers and plants while eluding the bats, which are also busy at night. She inserts her proboscis deep into young blossoms and lays eggs at the base of the pistil.

She packs a hunk of pollen into the tip of the pistil. As she moves up and down the pistil, she repeats her egg-laying, pollen-packing action. She must work quickly, because she lives for less than a week.

From each minute grain of pollen, a tube grows to reach an ovule in the chamber, which will house the moth's eggs until they hatch. Only yucca moths bring the pollen that the yucca plant needs for the ovules to become seeds that will grow into young yuccas. The yucca seeds are the only food that the moth's young will eat.

During the day, others will visit the yucca plant. Aphids suck juice from new blooms, while ants milk the aphids for droplets of sugary honeydew. As the sun heats the desert, and the yucca petals droop, the yucca's pistils swell with growing seeds. If the aphids, weather, or mule deer don't destroy the blossoms, the moth's eggs will hatch in about a week.

The moth's young eat some yucca seeds, but hundreds more of the seeds survive. In four to eight weeks, the full-grown larvae bore through their seed-pod caves, lower themselves to the ground on silk threads and burrow down to weave sticky cocoons.

Through the fall, the open yucca pods are shared with mice and ants. In the winter these same empty pods are capped with snow.

If no rain has fallen by May, the yucca moth will not appear. The yucca plant will not bloom. Instead, it will wait until the following spring, when the rains return. The stiff yucca leaves funnel water to its roots and also shade the wet roots when the sun returns. Soon the yucca plant will bloom, and during the night, a yucca moth will find it.

(Text adapted from *Night Life of the Yucca, The Story of a Flower and a Moth*, by Katherine B. Hauth.)

List the three kinds of symbiosis.

Which of the three kinds of symbiosis are represented in the story above?

Explain the symbiotic relationships.

Symbiosis Description	**Symbol Summary** + = benefits - = harm N = neutral	**Symbiosis Term** Parasitism Mutualism commensalism
1. Mycorrhizae are associations between fungi and the roots of plants. The fungi provide minerals to the plant, and the plant provides food the fungi.		
2. Egrets are beautiful white birds that roost on the back of cows. The cows are not affected.		
3. Tapeworms inhabit the intestines of dogs. They feed on food the dog is digesting. While the do not usually kill the dog, they can weaken the dog, making it susceptible to other illnesses.		
4. The stinging tentacles of the sea anemone do not affect the clownfish. Instead, the fish are protected from predators and feed on the sea anemone's leftovers as they swim among its tentacles. The anemone is not harmed by the fish.		
5. Athlete's foot is caused by a fungus that grows on the warm moist skin of the people, often around the toes of the feet. It my cause severe itching and cracking of the skin.		
6. The ramora is a small fish with a sucker on its head that attaches to the underside of a shark. It feeds on the sharks' leftovers. The shark is unaffected by the ramora.		
7. Lichens are a combination of an alga and a fungus. The alga produces food for the fungus; the fungus provides protection for the alga and supplies needed nutrients.		
8. A robin builds a nest in a tree. The tree provides protection for the nest, but is not harmed by the presence of the nest.		
9. A tick lands on a dog. It feeds on the dog's blood. Large infestations may weaken the dog and make it susceptible to other illnesses.		
10. In Africa there exists an unusual relationship between ants and the Acacia tree. The tree sap provides food for the ants, and the ants protect the tree from predators.		
11. There is a white bird that feeds on the particles of food left between the Hippopotamus' teeth. The hippo does not harm the bird and benefits from the teeth cleaning.		
12. Mosquitoes carry the larva of the heartworm. Their bite may infect a dog. The heartworm larvas infect the dogs' heart, where they may live for some time before killing the dog.		
13. Barnacles have no means of location and may reside on the skin of the whale. The whale is unaware that the barnacles are there, but the barnacles get a free ride from place to place.		
14. Ringworm is really a type of fungus that causes a ring shaped itchy place on the skin of humans. The fungus obtains food from human skin, and the human can become quite miserable.		
15. Bromeliads grow in the canopy of the tropical rainforest. They live in the tops of trees to obtain sunlight. They do not obtain nourishment from the tree or harm the tree.		