

It's Alive! By Cindy Grigg

¹ Look around you. What do you see that is alive? Not alive? Sometimes it's a little hard to tell. Make a mental list of what you see around you that is alive, and make another list of things that are not alive. Now, compare the two lists. What do the things that are alive have in common? How are they different from the things you listed that are not alive? What does it mean to be alive?



² On your list of living things, you might have listed yourself, your pets, and plants. That's a good start, but there are at least two million species of living things that have been identified. "Bio" means life and "logy" means study, so biologists study the science of life. When biologists study the vast variety of over two million species of living things, the question of "What is alive?" becomes a little confusing. Of the three examples above, you and your pets can move, but plants cannot move. Or can they? Have you ever seen a plant growing toward the sunlight? You can talk and respond to others, but your dog or cat can't. Or can they? When your dog gets hot lying in the sun and moves into the shade, he is responding to his environment.

³ It is pretty clear to most people that a desk is not alive. Desks are cold to the touch; they don't move on their own; they don't respond to you. It is also clear that cats, dogs, and humans are alive, especially when you see them run, jump, or respond to you. Those are fairly easy examples, right? What about a cell phone or a stick of firewood? Are these things living or nonliving, and how can you tell?

⁴ You know that a cell phone is nonliving, right? But it makes noise and it responds when you press its buttons. That's more lifelike than a desk! What about firewood? Firewood comes from trees, and trees are living. But if a tree dies and is chopped up for fuel, are the logs from that tree nonliving because they are no longer alive? As you can see, the distinction is not always clear. Some inanimate objects have characteristics of living organisms, while many living organisms, on the face of it, seem utterly lifeless.

⁵ Biologists believe that living organisms are characterized by six "signs of life." They are:

⁶ **1. Organization in Cells:** Living things are composed of one or more cells which are the basic units of life. Your skin, hair, fingernails, blood, bones, nerves, and muscles are all made up of cells. Plant leaves, stems, and roots are also made up of cells. These cells work together to keep the life form alive.

⁷ **2. Respond to their environment:** Living things respond to things happening around them. What do you do when someone yells, "Duck!"? You move out of the way. You move to avoid danger, to eat, play, or run. Many living things can move. Just like you, they move to find food, to avoid danger, and to find shelter. Plants also move. They do not move from place to place as animals do, but they can turn toward the sun, open and close their flowers, and some carnivorous plants even move to trap prey. When you get cold, you put on a sweater. When you get hot, you wear shorts. You respond to your environment. This one single characteristic makes living things very different from non-living things, which do not respond to the environment, but instead just let whatever happens to them happen.

⁹ **3. Take in energy:** All life forms need energy to survive. Energy is the "food" that allows organisms to do things. What kinds of things might an organism do with energy? The answer to this question is as varied as the life forms that use energy. Some, like the African lion, use energy to chase after prey. Other life forms, like many creatures we find in the depths of the Earth's oceans, use energy to create their own light. Living things use energy to grow, to defend themselves, and to move around. Plants are able to make energy from sunlight. To use energy, living things need water. Water in your blood helps transport food and chemicals to your cells. Inside all living things, complex chemical reactions take place to carry out the functions of life. Some of these are breaking down food to use for energy, building new cells, and repairing body parts. It helps remove waste products from your body. Water is used to cool you down, to warm you up, and to carry out the chemical reactions that allow you to move and grow.

¹⁰ **4. Grow and Develop:** Almost all living things start their lives as smaller creatures. Over time, they grow and develop into adults. Some living things live in a different form, such as tadpoles, and then they change dramatically as they grow into frogs. Butterflies hatch out of their eggs as caterpillars, and then they grow into beautiful butterflies.

¹¹ **5. Reproduce:** A very important part of the life of living things is the ability to reproduce, to make more of its species. Reproduction is the process of one or more living things creating another living thing. Your parents created you. By reproducing, living things are able to pass on their characteristics to another generation. This is important because all living things will eventually die. The time that something lives is called its lifespan. Some things have a lifespan of only a few hours or a few days. Some bacteria and insects, for example, begin their lives, mature, reproduce, and then die, all within a few hours. Other living things can live for many years, such as an elephant, which might live for 70 years, and a human, which can live for 100 years. Then there are the living things which seem to live forever. A bristlecone pine tree can live 5,000 years. That means that today there are bristlecone pine trees alive that began their lives before ancient Rome and even before many of the ancient Egyptian pharaohs. Even these long-lived organisms will all eventually die.

¹² **6. Contain DNA:** DNA, or Deoxyribonucleic Acid, is the genetic material that controls what living things do and look like. The DNA is found inside the nucleus of a cell and acts like the "brain" of the cell controlling all cell functions. DNA is made up of chromosomes, which hold genes. Genes are responsible for the different traits that are passed on from parent to offspring. You have brown hair color like your mom and blue eye color like your dad because you inherited it - you received the brown hair genes!

¹³ In addition to these things, most living things on earth need **oxygen**. Living things use oxygen as the main ingredient in many of the chemical reactions needed for life. The availability of oxygen in the Earth's atmosphere is believed by biologists to be a major reason for the advancement of life on Earth. Without it, life would probably still be very small and very slow. Organisms get oxygen from their environment in a variety of ways. Many land animals breathe oxygen directly from the air, while aquatic animals (animals that live in water) like fish often use the oxygen dissolved in the water to survive. No matter how they get it, oxygen is an important need for almost all living things.

¹⁴ Look back at your list again. Have you changed your mind about some of the things you listed? Where would you list a piece of firewood? It was once a tree that was alive, and now the piece of it is dead. But that is one of the characteristics of life - all living things die. So the piece of firewood came from a living thing. Look around you at the vast variety of life on earth and say, "It's alive!"

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<p>1. What do biologists study?</p> <p><input type="radio"/> A The science of biomes</p> <p><input type="radio"/> B The science of classifying organisms</p> <p><input type="radio"/> C The science of the stars</p> <p><input type="radio"/> D The science of life</p>	<p>2. What are the basic units of life?</p> <p><input type="radio"/> A Organization</p> <p><input type="radio"/> B Cells</p> <p><input type="radio"/> C Environment</p> <p><input type="radio"/> D Molecules</p>
<p>3. What is one chemical reaction that takes place in all living things?</p> <p><input type="radio"/> A Photosynthesis</p> <p><input type="radio"/> B Breaking down food to use for energy</p>	<p>4. Why is it important that all living things reproduce?</p> <p><input type="radio"/> A To make more of the species</p> <p><input type="radio"/> B Because things die</p> <p><input type="radio"/> C Both A and B</p>
<p>5. What is the time that something lives called?</p> <p><input type="radio"/> A Mainframe</p> <p><input type="radio"/> B Timeframe</p> <p><input type="radio"/> C Age</p> <p><input type="radio"/> D Lifespan</p>	<p>6. How long can a bristlecone pine tree live?</p> <p><input type="radio"/> A 100 years</p> <p><input type="radio"/> B 5,000 years</p> <p><input type="radio"/> C 70 years</p> <p><input type="radio"/> D 500 years</p>
<p>7. What other things do most living things on earth need to live?</p> <p><input type="radio"/> A Hydrogen</p> <p><input type="radio"/> B Carbon dioxide</p> <p><input type="radio"/> C Oxygen</p> <p><input type="radio"/> D Nitrogen</p>	<p>8. How do fish get the oxygen they need?</p> <p><input type="radio"/> A They get oxygen that is dissolved in the water.</p> <p><input type="radio"/> B They come to the surface to breathe air.</p> <p><input type="radio"/> C They don't need oxygen.</p>