

Glossary of Terms & Pronunciation

(reference for educators)

abdomen - (AB-duh-men)

the elongate hind part of the body, behind the thorax

alleles

Alleles are alternate forms of genes. For example, in a plant there might be a gene that codes for flower color. That gene might have two alleles: one that codes for white flowers and one that codes for purple flowers. In a sexually-reproducing species (such as humans or monarchs), an individual has two alleles for each gene, which may be the same or different. One allele comes from its mother and one from its father. Sometimes one allele is dominant, which means that it masks the other allele. If the allele that codes for purple flowers were dominant, for example, and an individual had one purple allele and one white allele, the flowers would be purple. To get white flowers, the individual would have to have two alleles that coded for white flowers. In this example, the white allele is called a recessive allele. In notation, biologists often name dominant alleles with capital letters (A) and recessive alleles with lowercase letters (a). If an individual has two copies of the same allele (e.g., AA or aa), it is called **homozygous** and that individual is a homozygote. If it has different alleles (e.g., Aa), the individual is called **heterozygous** and it is a heterozygote. Sometimes neither allele is dominant or recessive; this is called incomplete dominance. When incomplete dominance occurs, heterozygote traits are in between each homozygous alternative. In the example above, the heterozygote would have lavender flowers while homozygotes would be white or purple. Genes often have more than two alleles.

antenna - plural, antennae

sense organ on the head of an insect. In Monarch larvae, these are often confused with the tentacles or filaments. Larval antennae are very small while adult ones are much longer.

aposematic coloration

Aposematic coloration is conspicuous, bright coloration that protects an organism, whether or not the organism contains poisons or other noxious chemicals. This term is often used in the context of mimicry to describe the bright colors of both poisonous species and their palatable mimics. See **warning coloration** and **mimicry**.

camouflage

Camouflage is concealment by coloration, pattern, or shape that makes something hard to pick out of the background or makes it appear to be something else. In the animal world, camouflage often involves looking like a plant (a leaf, stem, twig, etc.), an inanimate object (a stone, bird droppings, dirt), or a larger animal (e.g., eyespots on wings). Many butterfly species are camouflaged at various stages in their life cycle. Adults from the genera *Anaea*, *Nymphalis*, *Polygonia*, and *Libytheana*, for example, have undersides that look like dead leaves. They often sit on twigs, which adds to their brown leaf disguise. The pupae of *Polygonia* and *Limenitis* also look like dead, curled leaves hanging from a twig. *Limenitis* caterpillars look like bird droppings, while many other larvae are green and match the foliage they eat. Hairstreak eggs, which overwinter on woody plants, look like bark. What other camouflaged animals and butterflies have you heard about?

chorion - (KOR-ee-ahn)

the hard outer shell of insect eggs. (In general, the chorion is the outermost membrane enclosing the developing embryo. In reptiles, this layer lies just inside the shell, and in mammals the chorion becomes the placenta.)

chrysalis - (KRIS-uh-lis); plural, chrysalides (KRIS-uh-lids)

another name for a butterfly pupa.

clasper

appendages on the last segment of the male abdomen; they grasp the female tightly during mating.

cocoon - (kuh- KOON)

a silk web that encloses the pupae of many moths, but not butterflies.

conspecific

A conspecific is a member of the same species as the organism in question. Two humans, for example, are conspecifics as are two elm trees, two lake trout, two bluebirds, or two monarchs.

cremaster - (kree-MAS-ter)

the black stem-like appendage that a larva pokes into the silk pad it spins, from which it will hang during the pupa stage.

crochets - (kro-SHAYS)

rows of tiny hooks on the end of each caterpillar's proleg that are used for traction.

cuticle

the hard part of the butterfly's outside skin that is no longer living.

Danaus plexippus - (duh-NAY-us PLEX-ip-us)

the scientific (Latin) name for the Monarch butterfly. Worldwide, there are only ten other species in the genus *Danaus*, but there are hundreds of species in Danainae, the insect group that contains them, known as the "milkweed butterflies."

Darwin, Charles

Charles Darwin was born in 1809 in England. In 1831, at the age of 22, he joined the crew of the ship *Beagle*, which sailed around the world and charted poorly known sections of the South American coastline. Darwin was the ship's naturalist, collecting all sorts of animals, plants, rocks, fossils, and other samples from the places they visited. As he collected, Darwin noticed a lot about the flora and fauna that led him to new questions. He observed similarities between South American fossils and living animals, which were quite different from animals in Europe, and he wondered if the living animals were more closely related to the South American fossils than to creatures on other continents. He also observed species in the Galapagos Island that existed nowhere else on earth, and he wondered how they came to be. By the time he returned to England in 1836, Darwin believed that the world was very old and constantly changing. This voyage became the foundation of his theories and books on evolution.

Even though he had these ideas pretty well formed by the 1840s, Darwin hesitated to publish them because it was against the teachings of the church and the beliefs of the time. Within a decade, however, another scientist named Alfred Wallace came up with similar ideas and Darwin rushed to present his theories before Wallace beat him. Both naturalists had papers presented in 1858, and Darwin published his book *On the Origin of Species by Means of Natural Selection*, in 1859. This book and Darwin's theory of natural selection to explain how evolution happens are the main reasons people today still think of Darwin as the father of evolution. Darwin, who published a second book called *The Descent of Man*, continued to refine his ideas until his death in 1882.

diapause - (DI-uh-pawz)

a period of dormancy between periods of activity.

Diptera

All dipterans are flies. The approximately 80,000 species include fruitflies, houseflies, gnats, and mosquitoes. Flies have one pair of wings; club-shaped organs called halteres replace their hind wings. Halteres help them maintain balance during flight.

eclosion

An entomological term; the emergence of an adult insect from its pupal case -or- the hatching of a larva from its egg.

electrophoresis

Electrophoresis uses an electrical current to separate different molecules or particles. Based on their size, shape, and chemical composition, particles move through a substance at different rates. In genetic analyses, biologists put the molecules (such as proteins or DNA) from several individuals into a substrate called a gel, apply electricity, and then see how far the molecules move. After applying the electrical current, the scientists add chemicals that stain the molecules to show where they are. They can then compare "maps" of the gels that show the location of molecules from different individuals. If two maps are the same, it suggests that the individuals have the same alleles, while if they are different, the individuals have different alleles. By comparing many individuals, a researcher can begin to see the variation that exists in the population.

environmental conditions

Events in nature often play an important role in structuring and limiting butterfly populations. Weather is one of the most important of these. Unexpected cold snaps, either in normally warm climates or in colder climates after spring has already arrived, can kill larvae and adults because butterflies cannot generate their own heat internally. Severe weather (storms, high wind, heavy rain) can also kill butterflies. For example, Hurricane Andrew in Florida wiped out almost all of the Schaus' Swallowtail butterflies, which lived on islands hard-hit by the storm. (Luckily, a researcher had 100

eggs to breed in Gainesville as part of an experiment, and the descendants of those butterflies now populate the islands again.) Similarly, big snowstorms killed huge numbers of monarch butterflies in the Mexican overwintering sites in 1991-92 and 1995-96. Cold wet springs and summers have also reduced monarch populations in previous years. Drought may lead to butterfly deaths if the plants they eat as larvae or visit as adults die back or don't flower.

Butterfly populations may also be limited by food. If the population of a plant that serves as a food source for either adults or larvae is reduced, butterflies may not find enough food to reproduce, or even to live. Sometimes plant populations decrease for natural reasons, such as drought, herbivory, or weather. Human actions can also reduce plant populations, especially when people develop land into houses, roads, offices, or highly maintained parks.

Habitat destruction may also decrease the amount of space available for butterflies to live in. Butterflies require plants, water, and refuge from the elements and predators. These resources may disappear when people build on once-natural land.

exoskeleton

a hard skeleton located on the outside of an invertebrate's body (in contrast to the internal skeleton of vertebrates) that protects it and serves as a point for muscle attachment. Arthropods and mollusks have exoskeletons. Arthropod exoskeletons are made of a substance called chitin, similar to fingernails, while mollusk exoskeletons are made of the mineral calcium carbonate.

frass

the waste product of the larvae, called caterpillar poop by most students. Monarch larvae produce a lot of this, especially in their later instars.

fungi

Fungi are a kingdom of eukaryotic organisms (see **bacteria** for a definition of eukaryotic cells) that digest their food outside their bodies and then absorb the nutrients. The most familiar fungal structure is the mushroom. Typically, fungi have a net-like mass of strands or filaments, called hyphae, that look like tiny hairs without a microscope. Hyphae grow into whatever the fungus is eating, excrete digestive fluids, and absorb the nutrients. Fungi can grow incredibly fast; they can add up to a kilometer of hyphae in a single day! Mushrooms are dense collections of hyphae that serve as the reproductive structure of a fungus. Mushrooms are connected to a much-larger network of hyphae below the surface of whatever they grow on. Fungi can grow in soil, in dead organic material such as tree stumps, or in combination with living organisms. Sometimes fungi live in other organisms in a mutually beneficial way, including when algae and fungi live together in the structure called lichen. Other times, fungi are parasitic. About one-third of known fungi are parasitic, mostly in or on plants. Examples of fungal diseases include Dutch elm disease, smuts, rusts, and ergots on grains, and athlete's foot in humans.

genetic drift

Genetic drift is the change in a population's gene pool that is due to chance. This is especially important in small populations. Any accidents that prevent an individual in a small population from reproducing will have a dramatic effect on the gene frequency of the whole group. Say, for example, an endangered plant has only 10 individuals left and only two of those individuals have a copy of the allele *r* (the rest of the plants are *RR*). If a rabbit eats those two plants, there will be no copies of *r* remaining in the population; chance removed that allele. Genetic drift is most important in populations of 100 or less, although it cannot be ruled out unless a population is very large.

habituation - (huh-BIT-u-A-shun)

a learned response in which an animal stops responding to a repeated stimulus (such as sound or touch) that normally evokes a reaction.

hemolymph - (HEE-muh-lim(p)f)

the name for the blood of insects.

Hardy-Weinberg Equilibrium

The Hardy-Weinberg equilibrium is named for the two scientists who derived it in 1908. It states that the shuffling of genes that happens during sexual reproduction does not change the overall frequency of genes in a population. If you are interested in the details of how to apply this principle to genes in populations, look in a biology textbook, such as the one listed below. These books will lay out examples and go through the math that proves the principle.

Campbell, N.A., L.G. Mitchell, and J.B. Reece. 1994. Biology: Concepts and Connections. The Benjamin/Cummings Publishing Company, Inc.: Redwood City, Calif.

Hymenoptera

There are about 90,000 species of this order of insects, including ants, bees, and wasps. Hymenoptera have two pairs of translucent wings. The hindwings are hooked to the forewings, making the two act as one wing, which improves flight efficiency. Members of this order generally have a narrow waist.

instar

a period between larval molts. There are five of these periods in the growth of a Monarch larva.

larva - (LAR-vuh), plural, larvae (LAR-vee)

the second stage, after the egg, in metamorphosis. Also known as caterpillar. Monarchs molt five times in their larval state, which lasts about 9-14 days.

Lepidoptera - (lep-uh-DOP-ter-uh)

the group or order of insects that is made up of butterflies and moths. This word should be capitalized, but the adjective lepidopteran should not.

lepidopterist

Lepidopterists are scientists who study butterflies. Some famous lepidopterists include Vladimir Nabakov and Sir Walter Rothschild. Well-known monarch scientists are Fred Urquhart and Lincoln Brower. Dr. Urquhart led the team that discovered the winter roosts in Mexico during the 1970s, and has been studying monarchs for over 50 years. Dr. Brower did early work on cardenolides and bird predators. He still works on many aspects of monarch biology.

mandibles

strong "jaws" on the larval head.

maxillary palp

small sensory organs on the larval head, below the mandibles, that may help direct food into the larva's jaws.

meconium - (mi-KO-nee-um)

the fluid Monarchs excrete shortly after they emerge from the chrysalis.

metamorphosis - (met-uh-MOR-fuh-sis)

the series of developmental stages through which insects go to become adults. Through metamorphosis a butterfly is transformed from an egg, to a larva, to a pupa, to a butterfly.

micropyle - (MY-kro-pile)

a funnel-shaped opening in an egg shell through which sperm enter the unfertilized egg.

mimicry

Mimicry is the close resemblance of one organism (the mimic) to another (the model). In many cases, predators learn to avoid certain prey items after having a bad experience with them (such as throwing up, being stung, or harmed in another way). Mimics can take advantage of this learning; even if they are not harmful, a predator will avoid them if they look enough like a harmful model. Mimicry is common in butterflies in moths, which may mimic distasteful butterflies and moths, or even unrelated species such as wasps and spiders.

mitochondrial DNA

Mitochondrial DNA (mtDNA) is the genetic material of tiny organelles inside each cell that are called mitochondria. Mitochondria are the powerhouses of the body; they convert energy stored in chemicals into energy the body can use. Biologists think that

mitochondria were once free-living bacteria that joined with another cell to work together for their mutual benefit (the mitochondria got food and safety, while the cell got an internal efficient mechanism to convert stored energy to usable energy). Mitochondria still have aspects of their free-living life, including their own DNA. mtDNA is especially useful for evolutionary biologists for several reasons:

- mtDNA evolves rapidly because it lacks efficient repair mechanisms. In cellular DNA, these repair mechanisms would change back many alterations since such alterations could be harmful to the cell. The lack of repairs in mtDNA means all mistakes stay in place, which allows scientists to observe them and use them as markers for evolutionary change.
- The way mtDNA changes is through base substitutions in the DNA sequence (the genetic code on DNA is made up of the four bases adenine, guanine, thymine, and cytosine). Unlike cellular DNA, mtDNA does not rearrange during replication, so the overall DNA sequence stays the same over time. Mutation and base substitutions are the only sources of changes in mtDNA's sequence.
- Scientists know a great deal about mtDNA because of the research that has been done. This thorough understanding makes mtDNA a useful tool to study other questions.
- It is easy to isolate mtDNA from the rest of the cellular material. This is critical, since researchers must be able to examine mtDNA alone to use it in studies.
- An organism inherits all its mtDNA from its mother. In sexual reproduction, the egg and sperm combine to form the new individual. The sperm cell is small and contains almost exclusively DNA inside it. The egg brings all the resources to the new individual, including mitochondria and their DNA. Maternal inheritance means that all the genetic information in mtDNA comes from one source, so any similarities between mtDNA of different individuals indicates a common ancestor or shared history.

Researchers have found that the degree of divergence between the mtDNA of individuals from two populations correlates with the length of time the two populations have been isolated. Two populations that had lived in different places for 100 years would have fewer differences in their mtDNA than two populations that had lived apart for 1000 years.

molting

the shedding of skin. A monarch larva molts as it grows and becomes too large for its former skin.

mutation

A mutation is a change to an organism's DNA, or genetic material. Mutations are usually rare, and often have a negative effect on the organism's fitness. Mutation is the only source of new alleles, though, and is therefore very important in evolution. Many events can cause mutation. Sometimes mistakes are made during DNA replication. Some chemicals and energies can change DNA, including ultraviolet radiation. These are called mutagens. Mutations will only be important to evolution if they happen in the sperm or eggs, since that is the only way the change will pass on to the next generation.

natural selection

Three main ideas underlie this pivotal aspect of Darwin's theory of evolution:

- all species produce more offspring than the environment can support, and only a fraction of offspring survive to adulthood;
- individuals of a species vary in their traits or characteristics; and
- offspring can inherit many of these variable traits from their parents.

From these three ideas, Darwin came to the theory of natural selection. He saw that when only a portion of the population will survive due to environmental limits, those individuals who have inherited traits that best adapt them to their environment are more likely to survive and reproduce. These individuals are more likely to have more offspring in the next generation, and those offspring that inherit the beneficial traits will also have better survivorship and reproduction. Natural selection is simply the unequal or differential reproduction of individuals in a population.

In nature, the environment determines which variations allow for higher reproduction in those individuals that have them. Over time, the population will change as more individuals have the traits natural selection favors. Eventually, this could lead to new species. Darwin used artificial selection, or selective breeding of plants and animals, as evidence for his theory of natural selection. In artificial selection, humans choose which individuals breed. For example, a farmer may select a plant with high yields over ones that have long lives but lower yields. Or dog owner may choose to breed individuals with long noses and short ears. Over time, breeding can create new varieties of plants and animals that have very different traits than their wild ancestors. For example, broccoli, cauliflower, cabbage, brussels sprouts, and kale are all varieties of the same species derived from a wild mustard.

ocellus - (o-SEL-us), plural, ocelli

simple eyes of some insects. Monarch larvae have 12 ocelli.

ommatidium - (oh-mah-TI-dee-um) plural, ommatidia

the units which make up compound eyes in insects. Each ommatidium has two parts. One part gathers light through a lens, while the other senses it through nerves.

order

(Biol) the usual major subdivision of a class or subclass in the classification of organisms, consisting of several families

overwintering colonies

The two populations of monarch butterflies (west of the Rocky Mountains and east of them) overwinter in California and Mexico respectively. In California, monarchs overwinter in sheltered bays and inland areas along the coast, roosting in eucalyptus trees, Monterey pines, and Monterey cypresses. The eastern population, which constituted 95% of the North American monarch population, migrates to central Mexico. They roost in trees in the mountain ranges. The sites they choose must have trees and underbrush for resting on; cool temperatures but protection from snow and wind; water from clouds and fog; and nearby streams for additional water sources. These roosts were discovered by the scientific community in 1975 (although local villagers had known about them before that) after several years of following tagged butterflies.

palp - plural, palpi

paired appendages on an insect head used to sense, and test the quality of, food.

panmictic

Panmictic populations are ones that have complete mixing of individuals. This means that every female has an equal chance of mating with any male in the population and vice versa. In a panmictic population, gene flow is unobstructed within the group.

parasites

organisms that live in or on a host's body and depend on the host for nutrients and resources necessary to complete their life cycle. Parasites are usually smaller than their hosts (e.g., tapeworms that live in animal intestines) and usually do not kill the host directly, although they may weaken it and make it more susceptible to disease or predation.

parasitoids

insects that lay their eggs on or inside another insect species (called their host). The eggs hatch and feed on the host from the inside, eventually killing the host.

pathogens

disease-causing organisms. Bacteria, viruses, fungi, and parasites may all be pathogens.

pheromones - (FAIR-uh-mohns)

special chemicals released by some animals to communicate with other members of their species. They may be sensed over long distances and help mates find each other. They may also encourage mating at closer distances and help ensure that mating only occurs with other members of the same species.

proboscis - (pro-BAHS-kiss)

the adult Monarch's feeding tube, for sucking nectar, which is coiled under the head when not in use.

prolegs

the "false" legs on the abdominal segments of the Monarch larva. Only the three pairs on the thorax will become legs in the adult Monarch.

protozoan

Protozoans (from the Greek *protos*, first, and *zoion*, animal) belong to the kingdom Protista. Protozoans are eukaryotic (see **bacteria** for a definition of eukaryotic), single-celled organisms that eat food like animals rather than make their own food like plants. Protozoans can eat bacteria, other protists, or organic material suspended in fluid. Some are parasites on animals, including those that cause harmful human diseases, such as sleeping sickness and malaria.

pupa - (PU-puh) plural, pupae (PU-pee)

the third stage in metamorphosis, after the larval stage. In Monarchs this stage lasts 8-13 days.

pupate

to change from a larva (caterpillar) to a pupa (chrysalis).

pyrrolizidine alkaloids

Alkaloids are a class of organic chemicals that contain nitrogen. They are physiologically active in vertebrates, and examples of alkaloids include nicotine and caffeine. Many plants contain specific alkaloids in their tissues, which may ward off animals or help make the plant taste bad to potential herbivores. Pyrrolizidine alkaloids are a specific type of alkaloids that have two 5-member rings linked along the side that contains the nitrogen.

restriction enzymes

Restriction enzymes are bacterial enzymes. They cut up foreign DNA by recognizing a sequence of base pairs, attaching the DNA strands, and breaking them at a specific point in the sequence. This protects bacteria against intruding DNA from viruses, phages, and other organisms. Biologists use restriction enzymes to study genetic differences in many organisms, since the restriction enzymes will cut all DNA. In these studies, scientists put restriction enzymes in with the DNA from two different individuals. The enzymes cut the two sets of DNA into pieces called restriction fragments. Different DNA in the two individuals means that the pieces will be different sizes, since the enzymes will cut in different places. By separating the fragments by **electrophoresis**, scientists can quantify the difference between the two individuals' DNA.

scales

overlapping pieces of chitin (the same material of which exoskeletons are made) that insulate butterflies' bodies and wings, improve their aerodynamics, and give them color and markings. Many people think the scales look like fine dust on butterfly wings.

sequester

to separate or segregate something from the general whole without changing it. When Monarchs sequester cardenolides, for example, they do not metabolize, or break down, the chemicals but rather shunt them into specific locations in their bodies.

spinneret

the organ on the bottom of the larva head from which silk is spun. This is the only silk-producing organ in the larvae.

spiracles - (SPEER-uh-kulls)

openings on the thorax and abdomen of insects through which gases are exchanged with the outside air. These lead to long air tubes, or tracheae, that run throughout the body.

spore

a resistant stage of an organism's life cycle that can survive unfavorable environmental conditions (e.g., low moisture, high or low temperature, no host present, etc.).

stridulation

Over 150 species of butterflies and moths stridulate as pupae. A tiny rasp and file exist on the margins of abdominal segments, and the pupae rub these segments together to creating chirping, creaking, clicking, and humming noises. Some people think this noise is primarily for defense against predators, while other think it has more to do with announcing its emergence to potential mates or attracting ants that will protect them from predation in exchange for honeydew secretions. It is still unclear exactly what purpose stridulation serves for each species.

synthesize

Synthesis involves combining two or more parts to make a whole. Biochemically, synthesis occurs when a new product is formed either by joining chemical elements, groups, or simpler compounds, or by breaking apart a complex compound into simpler pieces. Every organism synthesizes biochemicals as part of life. For example,

plants use the energy provided by the sun to make sugars ($C_2H_6O_2$) out of oxygen (O_2), carbon dioxide (CO_2), and water (H_2O).

The four main categories of compounds organisms often synthesize include proteins, nucleic acids, carbohydrates, and fats. Each of these molecules is made up of many smaller parts, called monomers (Greek, *mono*, one, and *meros*, part). Organisms can store energy in the bonds that hold together monomers in many of these molecules. When it needs more energy, it breaks the big molecule into its parts and uses the stored energy for other functions.

Some of the chemicals plants and animals synthesize are toxins (in plants, these toxins are often called secondary compounds). These chemicals are expensive, in terms of the energy required to make them. Many ecologists believe organisms invest energy in toxins because the toxins serve as a defense against predation, including herbivory. There are still many unanswered questions, however, about the trade-offs involved in investing in toxin production vs. investing in growth and reproduction.

tachinid flies - (tah-KIN-id)

a fly family with about 1300 species in North America. Many tachinid flies are large and bristly, and resemble bees or wasps. The parasitic tachinids usually attach eggs to the outside of the host's body. The eggs hatch, the tachinid larvae burrow into the host, and they begin feeding inside. The host is almost always killed. The species that live in Monarchs are gray and smaller than houseflies.

tactile setae - (TAK-tile SEE-tay)

hairs through which butterflies and moths sense touch. They extend through the exoskeleton and connect to nerve cells inside the insect's body.

tarsus - (TAHR-suhs), plural, tarsi

the second-to-last segment of insect legs (analogous to human toes). Butterflies stand and walk on their tarsi.

tentacles

the fleshy black extensions at the front and rear of the Monarch larvae, which function as sense organs. Also called filaments.

territory

A territory is an area that an individual or group defends from others. Conspecifics are usually excluded from a territory, and the individual or group defending the territory has primary access to its resources. Organisms use territories for feeding, mating, and rearing young, and they use behaviors such as pecking, calling, and scent marking to demonstrate their "ownership" to other individuals. A few examples of territorial species include wolves, cheetahs, many songbirds, sea lions, squirrels, and speckled wood butterflies.

thorax

the middle section of an insect's body. The wings (if present) and legs are attached to this segment.

tracheae - (TRAY-kee-uh)

airtubes that run through insects' bodies, delivering oxygen to cells, tissues, and organs.

true legs

jointed appendages located on the thoracic segment of a larva. Contrast with prolegs.

virus

Viruses are pieces of genetic material (RNA or DNA) enclosed in a protein coat. Many people do not classify viruses as living organisms because they cannot reproduce independently. They must inject their DNA into a cell, and then take over the cell's molecular mechanisms to replicate themselves. When they do infect a cell, they usually replicate thousands of viruses until the cell bursts and releases the viruses to infect other cells. Many diseases are caused by viruses, including the common cold, influenza, polio, and AIDS. You cannot cure a viral disease, but must rely on your body's immune system to find and destroy the viruses. Medical researchers have developed vaccines for some viral disease, including polio. A vaccine introduces a harmless version of the virus into your body so your body can learn to recognize and destroy it. If that virus later infects you, your body is already prepared to fight it off. This prevents the "sneak attack" that often allows viruses to cause serious illness.

warning coloration

bright colors that advertise poisons or other harmful defenses to potential predators.

Educators' Note:

The glossary terms will be used in some of the cryptic exercises. You may wish to review them with your child/ren in age appropriate language 😊