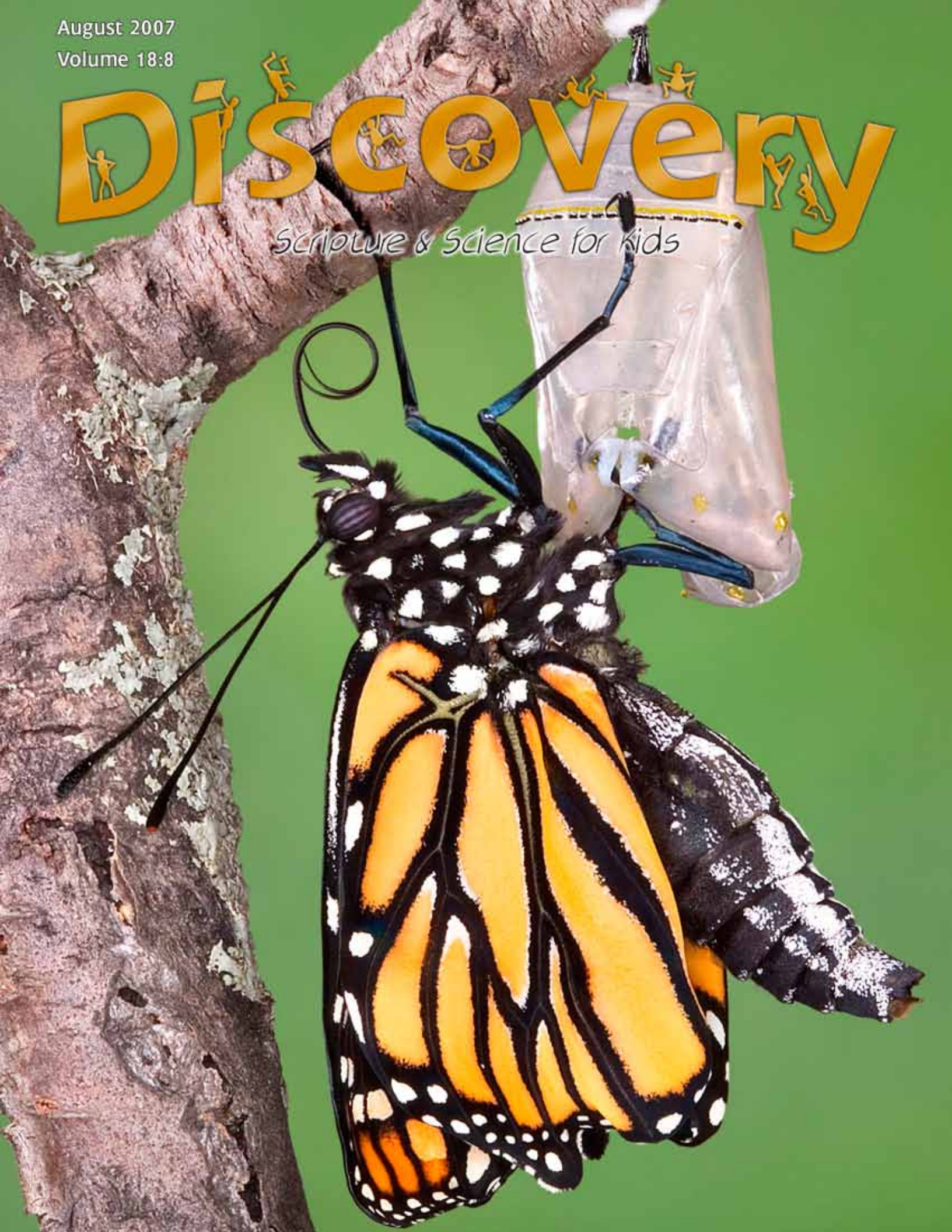


August 2007

Volume 18:8

Discovery

Scripture & Science for Kids



METAMORPHOSIS

ERIC LYONS

Robots that can change into cars, trucks, planes, or motorcycles have entertained children for more than 20 years. Young people have played with Transformers®, read stories about them in magazines, and even watched them come to life on TV and in the movies. Truth be told, even as an adult, I enjoy helping my kids convert their Transformers® from one thing to another.

As exciting as converting toy Transformers® is, a more amazing transformation process can be seen in the animal world. God designed various animals, like certain insects and amphibians, so that throughout their lives they go through major changes. They do not evolve into other kinds of creatures, but undergo a process of major changes that allow them to develop properly. We call this process **metamorphosis** (me-tuh-MOR-fuh-sis).

The first stage of metamorphosis is the egg stage. Insects (like the housefly) lay eggs, where embryos form. The

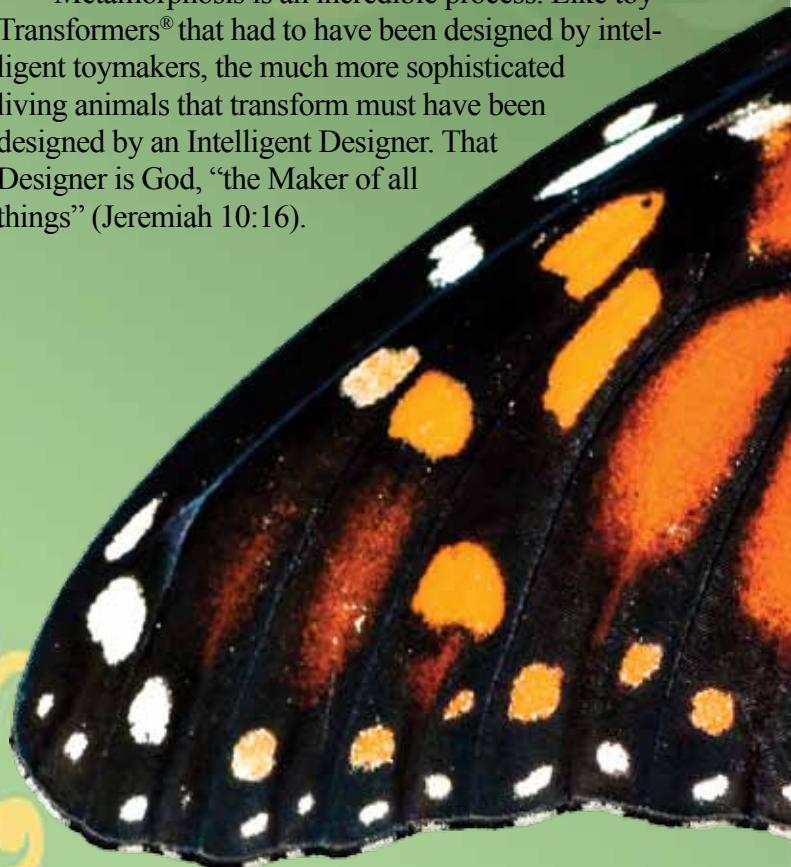
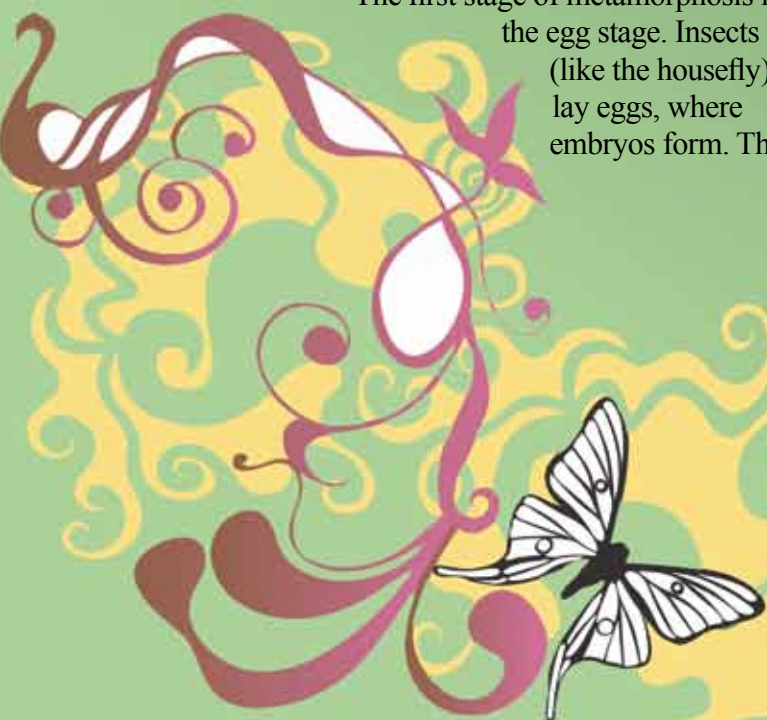
embryos remain in the eggs for anywhere from one day to one month.

When the creature leaves the egg, it is known as a larva. Caterpillars are the larvae of butterflies and moths. Maggots are the larvae of flies. (“Larvae” is the plural of “larva.”) Although with most insects this stage lasts only a few days or weeks, some cicadas (si-KAY-duhs) remain underground in the larval stage for **17 years**.

Next is the pupal stage. Not all creatures that undergo metamorphosis go through this stage (cockroaches, for example, do not). Insects like flies, moths, and butterflies, however, form pupae. (“Pupae” is the plural of “pupa.”) When a moth caterpillar forms a cocoon, it is in the pupal stage. The insect undergoes major changes during this time. For example, this is when caterpillars develop their wings and become moths or butterflies. The pupal stage may last for days, weeks, or months.

When an insect at the end of the pupal stage emerges from its case, it is fully developed. It is now an adult and will remain in this stage until it dies, which for many insects is not very long.

Metamorphosis is an incredible process. Like toy Transformers® that had to have been designed by intelligent toymakers, the much more sophisticated living animals that transform must have been designed by an Intelligent Designer. That Designer is God, “the Maker of all things” (Jeremiah 10:16).



JUMPING INTO LIFE AS A FROG

WILLIE THE WORD WORM

WWW: Willie the Word Worm here, excited to bring you another interesting interview. Today we will be talking with Frybert the Frog. Frybert, thanks for being with us today.

FF: Oh, thank you Willie. Would you like to talk about how far I can jump? God gave me these two strong back legs so I can jump really far. Do you want to see?

WWW: Well, Frybert, I see you do have very strong legs, but that’s not what I wanted to ask you about. I want to talk about your metamorphosis.

FF: Right, you mean the part of my life when I changed from a tadpole to a frog. Well, that is very fascinating. You see, I started out inside a little egg. I was clumped together with thousands of my brothers and sisters in their eggs.

WWW: I see. Please continue.

FF: When we all hatched, we didn’t look like frogs. In fact, we had long tails and gills, and we kind of looked like fish with big heads.

WWW: That is remarkable. How did you ever change so much to look like you do now?

FF: Good question, Willie. God designed us frogs to grow from a tadpole to a frog over several weeks.

At about five weeks, I started growing tiny back legs. Those legs got bigger and bigger. Also, as I grew, I started losing my gills, and my lungs started working. That meant I needed to go to the top of the water and start breathing air.

WWW: Wow! So, when you were little, you could breathe in water like a fish. But as you grew, you had to use lungs and breathe air?

FF: Exactly. After several more weeks, my front legs began to grow. My tail started to disappear and fit into my body. I hopped out on land, and was a frog.

WWW: Amazing! Could you tell us, Frybert, where did you learn to change from a tadpole to a frog?

FF: Willie, I didn’t “learn” to change. God designed me like that. It is something that we frogs do because God has programmed us to do it.

WWW: Well, kids, there you have it—the scoop on the life cycle of a frog. What an amazing story, and what an awesome God!



CATERPILLAR...CHRYSALIS... BUTTERFLY!

CALEB COLLEY

Because God designed butterflies in such a perfect way, these little creatures have many interesting features. For example, butterflies have two front wings and two back wings that are designed perfectly for flight. A network of veins, filled mostly with air, runs through the wings and supports them. Also, some butterflies blend in with their surroundings in order to escape harm. Other butterflies, such as the Monarch, are distasteful or poisonous to animals that eat insects. Some butterflies hibernate during cold winters, while others migrate to warmer climates.

Among all of the butterflies' intriguing qualities, the most mysterious feature is the

dramatic change from a caterpillar into a beautiful, flying, adult, winged insect. Prior to making this transition, the caterpillar sheds its skin five times.

Resting high on a twig or leaf, the butterfly caterpillar deposits a sticky liquid, which hardens within an hour. Hanging from the twig or leaf, the caterpillar forms its hard shell (called a chrysalis—pronounced chris-ALL-is). The chrysalis, only about an inch long, protects the caterpillar from the winter's cold. While in the chrysalis, the caterpillar undergoes the wonderful change called metamorphosis. The outlines of adult features, including wings, eyes, tongue, antennae, and body segments, can be seen on the surface of the chrysalis. When the warmth of spring arrives, the chrysalis suddenly cracks, and a beautiful butterfly emerges.

Butterflies help us in several ways. They pollinate important plants, allowing them to make seeds. Butterflies are pretty, adding to the loveliness of nature. Also, the fascinating design of the butterflies, and particularly of their metamorphosis, prompt us to glorify God for His amazing creation. Sometimes, small creatures such as caterpillars and butterflies provide **big** reasons to believe in the Creator.



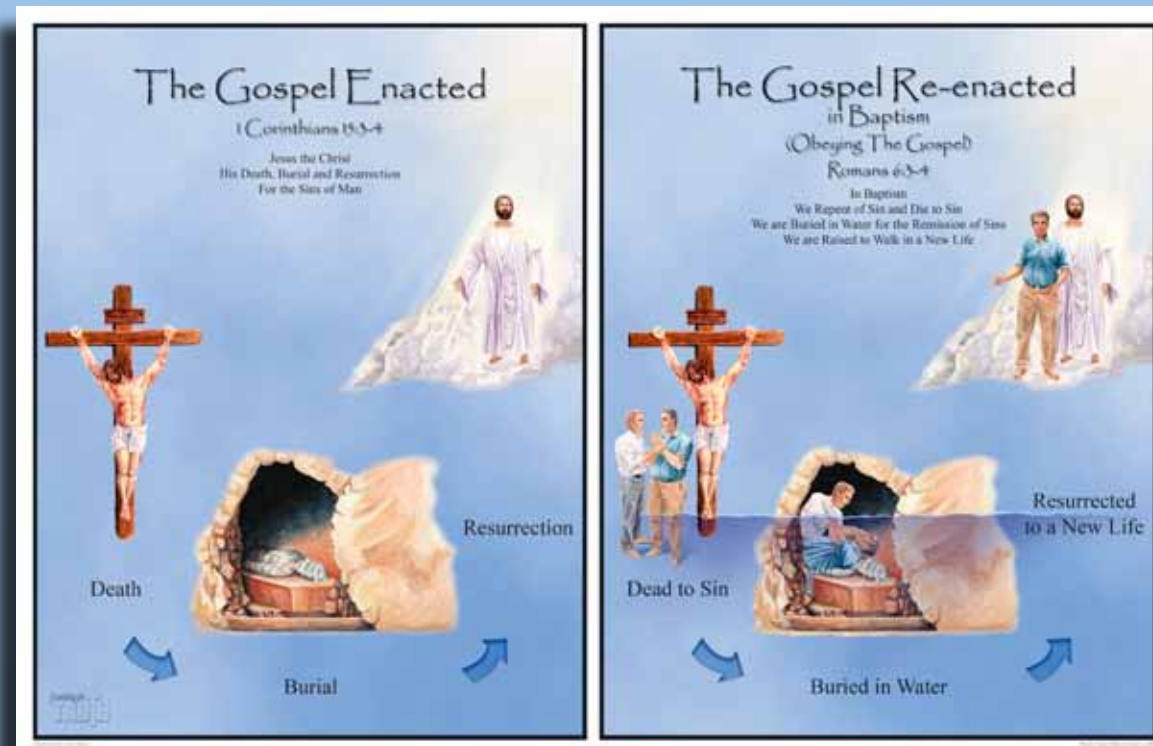
SPIRITUAL METAMORPHOSIS

DAVE MILLER

When a person who has reached the age of accountability sins by breaking God's laws, he or she enters into a sad and tragic condition. The sinner is described in the Bible as being in spiritual darkness (Ephesians 5:8). He is like a pig wallowing in muck and mire, or a sick dog (2 Peter 2:22). He is spiritually blind (Romans 2:19). He is like a lost sheep (Luke 15:4). He is like a captive caught in a trap (2 Timothy 2:26). He is like a slave serving a master (Romans 6:16). He is like a sick person who has a disease (1 Corinthians 11:30). It's as if he is asleep or even dead (1 Thessalonians 5:6; Colossians 2:13).

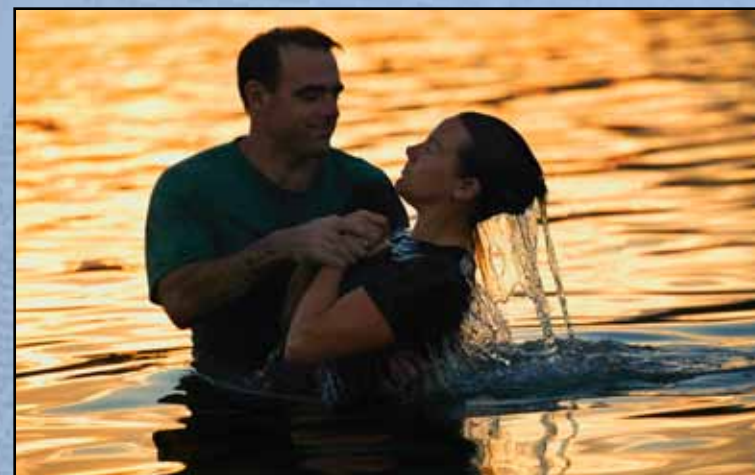
These thoughts of a person under the influence of sin and Satan are not pretty. If a person chooses to live his life doing bad things, and rejects God's will for his life, he will spend the afterlife in torment away from God (Matthew 23:33).

So what should we do? What can people do to avoid being spiritually sick, lost, enslaved, asleep, or



dead? What must the sinner do to regain a right relationship with God? Answer: A transformation must take place—a **spiritual metamorphosis**. This change begins when the non-Christian hears the Word of God. Hearing of God's great love for every person, the sinner can choose to obey the gospel plan of salvation in order to be transformed by the blood of Christ into a New Testament Christian. To obey the Gospel, one must believe, repent of sin, confess Christ, and be immersed in water for the remission of sins. As Paul explained to the Colossians: "He has delivered us from the power of darkness and conveyed us into the kingdom of the Son of His love, in whom we have redemption through His blood, the forgiveness of sins" (1:13-14).

That spiritual metamorphosis then proceeds as the Christian daily makes the effort to become more like Christ. As Paul reminded the Romans: "And do not be conformed to this world, but be **transformed** (from the Greek word, *metamorphousthe*) by the renewing of your mind, that you may prove what is that good and acceptable and perfect will of God" (12:2). How's **your** spiritual metamorphosis coming?



ACTIVITY PAGES

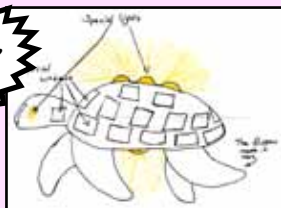


- | | |
|--------------------|-------------|
| A. Proboscis | F. Monarch |
| B. Metamorphosis | G. Cicadas |
| C. Larvae | H. Frogs |
| D. Chrysalis | I. God |
| E. Metamorphousthe | J. Tadpoles |

CONTEST WINNERS

In the April issue of *Discovery*, we asked readers to submit entries for our COPY A CREATURE CONTEST. Participants thought of how the design of a particular animal could be copied to make a new invention, and shared their ideas with me. Here are the winning entries, including artwork and descriptions.

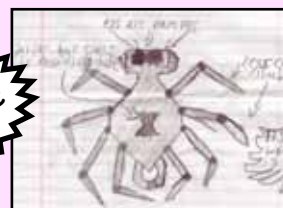
1st Place



This machine is based on a turtle. It is a machine for studying the abyssal (uh bis' uhl) plain, or the deep sea. Not much is known about things this deep in the sea, but this machine would help. It would be able to stand the pressure of the heavy water, it would be able to carry people and lots of food and drinking water.

Katherine Parker
Greentown, IN

2nd Place



I think we should use the design of a jumping spider to create a camera that the military could use to sneak into enemy bases. It should be very small and not easily seen and should be able to crawl into tight places.

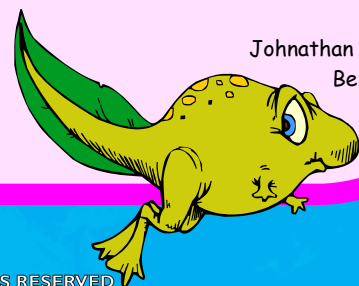
Michael Perkins
Johnson City, TN

3rd Place



The SS-Star Cat is better than a fire plane because it is much faster than most planes, and more accurate. It puts out fires and is used as a scouting plane. A pilot and hydraulics hose help guide the spray of water.

Johnathan Steward
Belden, MS



MATCHING

- The hard shell that butterfly caterpillars form during the pupal stage of metamorphosis
- Can remain underground in the larval stage for 17 years
- The Greek word translated "transformed" in Romans 12:2
- Tadpoles metamorphose into these
- The coil that comes out of the moth's head
- Have long tails and gills
- A type of butterfly
- The Great Designer of the Universe and everything in it
- Plural of larva
- A process of major changes that allows various animals to develop properly

ON A SEPARATE SHEET OF PAPER

- Write down the usual stages of metamorphosis.
- Describe spiritual metamorphosis.



TRUE OR FALSE

- Moths help pollinate the flowers that bloom at night.
- The larval stage is the final stage of metamorphosis for most insects.
- Frogs have lungs.
- Tadpoles have lungs.
- God designed the process we call metamorphosis.
- Butterflies form cocoons.
- The pupal and larval stages of metamorphosis are the same thing.
- Moths have more colorful wings than butterflies.
- Non-Christians have no need to metamorphose spiritually.
- Butterflies have two front wings and two back wings.

Dear Digger Doug,

Why and how does a snail change the length of its antenna?
—Hannah, 13 years old

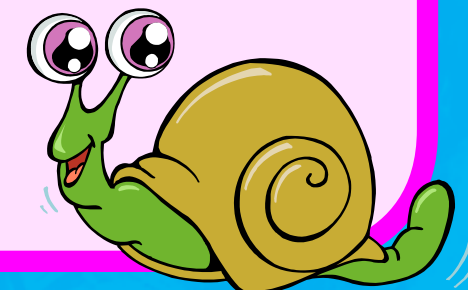


Dear Hannah,

This is a great question. Thanks for taking the time to write it. The snail's two sets of "antennae" are actually tentacles. The upper tentacles, or eye stalks, hold the snail's eyes. The lower pair serve as olfactory (smelling) organs.

Maybe you have seen an antenna for a remote control car or a television. The antenna can be pulled out to be long, but then pushed together and become short again. Things that can be made long and short like antennae are called "retractable." The roofs of some cars are another example of "retractability" (the roof on a convertible slides out of the way). Much like TV antennae and convertible car roofs, the snail's tentacles are retractable. They pull all the way back into the snail's head when they aren't needed. This is important, because the snail's entire head can retract into its shell for protection. When retracted, some snails protect themselves with a door-like structure called operculum.

God has given the snail everything it needs to survive. The design of the snail is a great example of God's wonderful work.





APOLOGETICS PRESS, INC.
 230 Landmark Drive
 Montgomery, AL 36117
 (800) 234-8558 (Orders)
 (334) 272-8558
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Editor: Kyle Butt, M.A.
 Associate Editor: Eric Lyons, M.Min.
 Layout and Design: Rob Baker, M.Ed.

ADDRESS SERVICE REQUESTED



"I Can't Believe It's Not A Butterfly"

Race Hoehdorf

They eat your clothes, surround your porch lights, and can even do serious damage to farmers' crops. Moths can be pests. Yet they can also be very useful creatures. As nocturnal animals (which means they're active at night), moths help pollinate the flowers that bloom at night. Flowers, in turn, provide food for people and wildlife and help to make the Earth look beautiful. Moths also serve an important part of the food chain, providing food for birds and other animals.

There are over 150,000 species of moths. You can find a moth practically anywhere except Polar Regions. Moths eat nectar from the flowers they pollinate, along with other liquids. They suck food up through a tiny, but long, coiled proboscis (pro-BO-sus). A proboscis is a type of coil that comes out of the moth's head, which functions like an elephant trunk.

The way you can tell the difference between moths

and butterflies is by looking at their wings. Butterflies have more colorful wings, but most moths are a bit duller. Moths often rest with their wings open (unlike

butterflies). And contrary to popular belief, if you touch the wings of a moth, it won't die.

God designed the moth to go through four stages of development: (1) Egg; (2) Larva; (3) Pupa; (4) Adult. First, the female moth lays her eggs, usually in summer or fall. A female moth can lay as many as 18,000 eggs in its life! Most moth eggs measure less than one millimeter. A caterpillar then crawls out of the egg, and grows to its full size within a few weeks to a few months, depending on what kind of moth it is.

When the larva grows to its full size, it enters the cocoon, at which time dramatic changes occur. It could take several days to several months for the insect to finish its metamorphosis, depending on the species. When caterpillars hatch, you have...moths!

The next time you see a moth around a light, or on your favorite shirt, remember the amazing transformation process it went through to become what it is. More importantly, praise God for the creation of moths.



ANSWERS

MATCHING: 1. D (Chrysalis); 2. G (Cicadas); 3. E (Metamorphosis); 4. H (Frogs); 5. A (Proboscis); 6. J (Tadpoles); 7. F (Monarch); 8. I (God); 9. C (Larvae); 10. B (Metamorphosis). TRUE OR FALSE: 1-T; 2-F; 3-T; 4-F; 5-T; 6-F; 7-F; 8-F; 9-F; 10-T.

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