

Insect zombies are the stuff of nightmares

Required Annotations		Student-Created Annotations		Summary / Questions / Reflection	
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Student-created					Required (bold)
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The sting of a wasp can be painful to humans. But for certain caterpillars, spiders and worms, it can mean being turned into a puppet for days or weeks, until they die a grisly death.

Sound like the stuff of Halloween nightmares? It's just an ordinary day in the world of insects, where an estimated 10 percent — about 120,000 species — are **parasitoids** (pronounced pare-uh-si-TOID). That is, they occupy and live off a host insect, eventually killing it.

Parasitoid insects have been around for at least 100 million years, since before there were dinosaurs, says Floyd Shockley. He is collections manager in the department of **entomology** at the Smithsonian National Museum of Natural History.

A lot of them are hymenopterans (hi-me-NAHP-ter-ans). This is the order that includes ants, bees and wasps. Shockley says this makes sense because "they're already equipped with stingers to inject chemicals" to make their victims do their bidding.

They're also all females. That's because there's only one reason parasitoid insects take over other insects: to lay eggs in them. Hatched larvae munch on the insides of their still-alive host. Then, when they've **matured**, they eat their way out.

There are fly parasitoids that decapitate (or take the heads off) fire ants. Hairworm parasitoids make grasshoppers jump into water and drown. And there is even a fungus that pierces the heads of ants to distribute its **spores**.

"But wasps," Shockley says, "do some of the coolest stuff."

Glyptapanteles (glip-tuh-PAN-teh-leez) wasp larvae feed on an inchworm's insides til they're ready to pupate, or live in a cocoon. Then they push their way through its skin and attach to the outside of its body. "Two larvae stay behind inside, manipulating the worm into protecting their brothers and sisters," says Shockley.

Anelosimus eximius (an-eh-LOSS-ih-mus ex-IH-me-us) spiders build webs in groups and kill invaders. So, Zatyptota wasps inject a chemical into a single spider that makes it wander off to spin its web alone while larvae feed on its blood. Shockley says other parasitoids use their hosts' existing behaviors. But Anelosimus eximius doesn't know how to build a web by itself. "The wasp programs a totally new behavior in the spider that it wouldn't do on its own," he says.

Shockley's favorite parasitoid might be the emerald wasp. It stings a much larger, heavier cockroach, making it **docile**. Then it climbs on its head and steers it by its antennae back to its nest "like a dog on a leash," Shockley says. "It's weird."

Scientists only recently developed the tools to study parasitoid wasp DNA. They're researching how hatched larvae avoid triggering immune

responses, reactions that would make their hosts kick them out. They think this is important for understanding human immune responses.

Unfortunately, this research might get harder. Insects are in decline around the world, and Shockley says parasitoid insects are especially vulnerable. They usually have only one or two insects they evolved with, "and don't have alternate **hosts** they can switch to," he says. Experts are not sure what fewer parasitoid wasps will mean to the health of the Earth in the future. But it will have an effect — possibly even on humans.

Questions

1. Which sentence from the article would be MOST important to include in a summary of the article?
 - a) The sting of a wasp can be painful to humans.
 - b) That is, they occupy and live off a host insect, eventually killing it.
 - c) There are fly parasitoids that decapitate (or take the heads off) fire ants.
 - d) Shockley's favorite parasitoid might be the emerald wasp.
2. Read the following sentences from the article.
 - But for certain caterpillars, spiders and worms, it can mean being turned into a puppet for days or weeks, until they die a grisly death.
 - Hairworm parasitoids make grasshoppers jump into water and drown.
 - So, Zatyptota wasps inject a chemical into a single spider that makes it wander off to spin its web alone while larvae feed on its blood.
 - Then it climbs on its head and steers it by its antennae back to its nest "like a dog on a leash," Shockley says.

What central idea do these details support?

- a) Parasitoids make up 10 percent of the world's insects.
 - b) Parasitoids will cause their hosts to die painfully.
 - c) Parasitoids let their larvae eat the inside of its host.
 - d) Parasitoids control the insects that they have poisoned.
3. Read the following paragraph from the article.

Unfortunately, this research might get harder. Insects are in decline around the world, and Shockley says parasitoid insects are especially vulnerable. They usually have only one or two insects they evolved with, "and don't have alternate hosts they can switch to," he says. Experts are not sure what fewer parasitoid wasps will mean to the health of the Earth in the future. But it will have an effect — possibly even on humans.

What does this paragraph explain that other paragraphs do NOT?

- a) what types of problems parasitoids face
 - b) why parasitoids need to use host insects
 - c) how scientists are studying parasitoids
 - d) when parasitoids first started showing up
4. How effective are the first two paragraphs at introducing parasitoid insects?
 - a) The first two paragraphs are effective because they explain how long parasitoids have been around and how many of them exist now.
 - b) The first two paragraphs are effective because they grab the reader's attention while also explaining what parasitoids are.
 - c) The first two paragraphs are not effective because they fail to explain to the reader what parasitoids do and how they affect other insects.
 - d) The first two paragraphs are not effective because they focus on characteristics of parasitoids that are unrelated to the main idea.
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