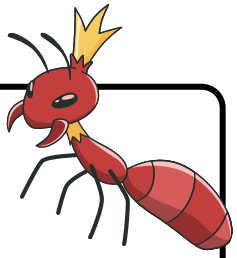
Name: _____ Date: _____

Science Friday Think Big

From “How A Woodpecker Pecks Wood, And How Ants Crown A Queen”

What makes one ant a queen and another a worker?



In most ant colonies, there are different types—or castes—of ants. Researchers have discovered that you can have two ant eggs with the exact same genes, and one can grow up to be a large queen that lives a long life laying eggs, while another becomes a smaller worker that only lives a few months. How is this possible? It turns out that not just nature, but also nurture, determines the future for larvae. Neuroscientist and evolutionary biologist Daniel Kronauer joins Science Friday Host Flora Lichtman to explain what scientists know.

1. What new finding from his study does Dr. Kronauer claim complicates the simple “bigger = queen” idea?

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2. How may a difference in feeding by worker ants lead to different adult outcomes for genetically identical eggs?

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3. What evidence from the ants shows that genes alone do not determine whether an individual becomes a queen or a worker?

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What makes one ant a queen and another a worker?

The audio for this story and the transcript can be found at:
https://www.sciencefriday.com/segments/ant-queen-and-woodpeckers/
The ant story begins at approximately 12 minutes 25 seconds. It is roughly 8 minutes long.

This story aligns with the following NGSS standards:

1. LS1.B: Growth and Development of Organisms
    a. How genetic and environmental factors influence growth
    b. The concept that organisms with the same genes can develop differently based on conditions
    c. Life cycle stages (egg → larva → pupa → adult)
2. LS3.A: Inheritance of Traits
    a. Genes and their expression
    b. The distinction between genotype (genetic information) and phenotype (observable traits)
3. LS3.B: Variation of Traits
    a. Environmental influence on trait expression
    b. Phenotypic plasticity as a biological concept

Expected answers:

1. Dr. Kronauer explains two findings: (a) there are genes that affect body size (which influence caste), and (b) there are genes that affect the relationship between body size and caste — meaning some genotypes can trigger queen development at smaller sizes. Both genetics and size matter together in a more complex way than scientists previously thought.
2. The evidence is that scientists can start with two ant eggs that are genetically identical - they have exactly the same genes - and one can develop into a queen while the other becomes a worker. Dr. Kronauer explains that "depending on how you treat those individuals during the larval stage, when they're growing up and they feed a lot, they can develop into either a queen" or a worker.
3. Workers forage and bring food back, and they decide how much and what type of food larvae get. If a larva is fed a lot, it can grow larger and develop into a queen; if fed less, it becomes a smaller worker.

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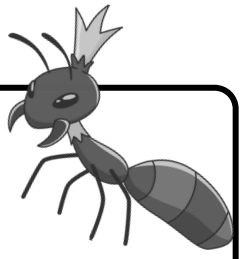

Ants are fascinating creatures that live in large groups called colonies. In every ant colony, there are different types of ants, like workers and queens. Amazingly, you can take two ant eggs with the exact same genes, and one can grow up to be a queen, the other a worker. So what decides which ants become queens? Neuroscientist and evolutionary biologist Daniel Kronauer joins Science Friday Host Flora Lichtman to explain what scientists know.

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