HOW TO USE THIS RESOURCE
Show the figure below to your students along with the caption and background information. The “Interpreting the Graph” and “Discussion Questions” sections provide additional information and suggested questions that you can use to guide a class discussion about the characteristics of the graph and what it shows.

Caption: Proportion of prey captured by three predators (skink, Lampona sp., and Servaea sp.) for each of six species of arthropod prey (along x-axis). The five species on the left are mimics with gold coloration on their abdomens to warn predators of their defenses. The nonmimic group (Badumna insignis, a spider) does not display such coloring. The prey species are listed in order of palatability (based on a combination of all defenses, such as spines and chemicals), with the least palatable on the left and most palatable on the right. The first three groups on the left are ants; Daerlac sp. are “true bugs” (order Hemiptera); and Myrmarachne sp. are spiders. Daerlac sp. and Myrmarachne sp. are also ant mimics in terms of their body shape. The three predator species vary in their prey preferences: skinks are lizards that are visual hunters with no feeding preferences among arthropod groups, Lampona sp. are spiders and are nonvisual predators that avoid ants, and Servaea sp. are spiders that are specialized ant predators.

BACKGROUND INFORMATION
Some animals are vividly colored to advertise to potential predators that they have defenses that may include stings, noxious chemicals, spines, and biting. Predators then learn to avoid such brightly colored prey. The vivid colors evolve via natural selection because individuals with more striking and noticeable color have a survival advantage. In many regions, many different species have evolved similar warning colors, seeming to mimic each other’s appearance. These are called “mimetic complexes,” in which species appear to be similar physically but do not always possess the same defense mechanisms (such as foul-tasting chemicals, spines, or biting mandibles). In this study, researchers in Australia examined a group of more than 140 members of a mimetic complex, including...
ants, wasps, spiders, and true bugs, that all possess a similar black body with a gold patch on their abdomen to ward off predators. The nonant species in this group mimicked the body shape of ants. In general, the level of unpalatability, measured by a combination of their defenses, was found to correspond with the size of the golden patch on their abdomen; as unpalatability increased among species so did the amount of gold, after controlling for body size. Would the golden patch ward off predators regardless of the prey’s palatability? How effective is mimicry when confronted with different predators’ prey preferences? To answer these questions, the researchers exposed five mimic species with different levels of palatability, and one nonmimic species without defenses, to three predator species with different prey preferences.

**INTERPRETING THE GRAPH**

The bar graph shows the proportion of prey captured by a predator. For example, a relative frequency of 0.9 would mean that the predator captured 90% of the prey it was offered of that prey type.

*Lampona* sp. and *Servaea* sp. strongly preferred to attack the nonmimic over the mimics, while the skink showed a slight preference. This suggests that the predators may have picked up on visual cues of golden color to detect prey species that carried antipredator defenses. This makes sense for the skink and *Servaea* sp., as both are visual predators. But *Lampona* sp. is not a visual predator, so the question remains how it knew to avoid the mimic species. It may be recognizing mimics through means other than visual sense, such as scent or movement vibrations. These prey species may have evolved additional traits in response to predation by nonvisual predators. *Lampona* sp. also preferred the less-defended of the nonant species, *Myrmarachne* sp., providing additional evidence that they can detect the degree of prey defense without using vision. *Lampona* sp. avoided the three ant species, which could be due to their higher degree of defense, but may also be due to its aversion to eating ants.

*Servaea* sp., which strongly prefers to hunt ants, tended not to attack *Polyrhachis ammon*, the most strongly defended arthropod in the complex. Thus, *Servaea* sp. might be able to visually recognize the degree of a potential prey species’ golden coloration and use it as an indicator of that species’ strength of defenses.

Do members of a mimetic complex enjoy greater protection from predation than nonmimics? The varying degrees of overall defensive strength keep the predators guessing as to what defenses they’ll encounter in a mimetic prey species with golden coloring. As a result, the predators generally avoid mimics and prefer to attack nonmimics. Mimicry thus evolves via natural selection, because prey species with weaker defenses that have characteristics that make them look or smell like more unpalatable species are more likely to survive and pass traits on to the next generation. This research supports the idea that mimicry offers members of the complex a greater degree of protection than they would enjoy on their own.

**Teacher Tip: Prompt your students to explain the parts of the graph as applicable:**

- **Graph Type:** Bar chart
- **X-axis:** Prey type in which the degree of unpalatability and golden coloration decreases from left to right
- **Y-axis:** Proportion of prey captured based on the number of prey offered
- **Bars:** Predator species in which blue bars represent the skink, orange bars represent *Lampona* spiders, and gray bars represent *Servaea* spiders.

**DISCUSSION QUESTIONS**

- What were the differences in predators’ responses to mimic versus nonmimic species?
• What trends do you observe in predation by the three different predators? How might these trends be influenced by differences in their prey preferences?
• *Lampona* sp. avoids ants while *Servaea* sp. prefers ants. Did these preferences impact how the predators responded to the prey species’ golden warning coloration?
• How might *Lampona* sp., a nonvisual predator, determine that a potential prey species is well-defended?
• Why was it important to include a nonmimic organism in the experiment?
• According to the data, which predator’s hunting approach was affected the least by mimicry? Which was affected the most? Explain using evidence from the graph.
• The graph supports the claim that *Lampona* spiders prefer mimics that are not ants. How would you design an experiment to test whether it is lack of interest in ants and not the amount of golden coloration that caused this result?
• Why might it be beneficial for members of the mimetic complex to have defenses that differ from those of other members?
• The mimetic complex of more than 140 species contains many more ant species than other (nonant) insects and spiders. Several of the spider and nonant insect species in the complex also mimic ants in terms of body shape. What might this tell you about the evolutionary origin of the golden warning color?

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