

Love on six (or eight) legs:

A dance in two acts about the sexual selection theory

Why do peacocks have beautiful tails? Why do dung beetles grow long horns? Why do birds of paradise perform intricate dance movements? Why do crickets and frogs sing? Sexual morphologies and behaviors are nature's most diverse, elaborate and sometimes, plainly bizarre traits. Have you ever wondered where these traits come from?

Like all of us, Charles Darwin was once puzzled by these traits. In his revolutionary book "On the Origin of Species" and later, "The Descent of Man and Selection in Relation to Sex", he proposed that these elaborate morphologies and behaviors have evolved under sexual selection, a process that arises from differences in how successful individuals can obtain mates and produce nature's currency of success—babies.

This dance will take you into the world of Arthropods (the 6-legged insects and the 8-legged arachnids) and demonstrate how sexual selection works in the love lives of these tiny creatures.

Act I: case studies

While human dating may involve Tinder, flowers, movies, and ballroom dancing, arthropods have their own ways to obtain mates.



Crickets use songs to find mates. Only male crickets sing. A female wandering in the field can choose and locate her most preferred male by using the song as a guide. The first three dancers depict

crickets belonging to the genus *Laupala* on the Hawaiian islands. Males of different species sing songs with species-specific chirp rates and females only prefer the songs with the characteristic chirp rate of their own species. Here, the chirp rates of the male songs and the preference of the female are represented by the rate at which dancers jump. Pay attention to their differences. This mechanism ensures that only individuals of the same species mate with each other, which in turn, can promote speciation.



The love life of **water striders**, however, is much less romantic. Because males can make sperm quickly, they almost always want to mate. Females, on the other hand, take much longer to produce the larger and more expensive

eggs and only want to mate once in a while. There is thus a conflict between the sexes over mating rate. This conflict has led to an arms race in water striders. Males have evolved prolonged grasping antennae and genitalia to help overcome female struggle. Females counter-adapted by evolving spines on their abdomen to resist males. The next two dancers enact male grasping and female struggle in the water strider's love life.

Of all arthropods, **praying mantis** love is perhaps the most gruesome. Females commonly eat the males during mating. Through radioactively tracking the proteins in males who get eaten, scientists now understand that most of what the females devour goes into producing baby mantises. By sacrificing their own lives, male mantises help make more and healthier offspring. So who can say that what seems murder on the surface isn't the ultimate form of love?



Many arthropods are incredibly good dancers and the **peacock spiders** of Australia are the champions. During the courtship dance, a male peacock spider will flick his decorated abdomen resembling a peacock's tail up and shake it from side to side while waving his legs with an elaborate choreography. All of these efforts are to impress the female.

When a male peacock spider dances, he is dancing for love but also his life because if the female isn't impressed, she may very well eat him. The next two dancers imitate how a male gingerly courts a female with his intricate dance movements. The female, not so impressed, spooks the male and leaves him frozen in fear.



Besides using sounds and visual cues, insects also use odors known as pheromones to find mates. The last two dancers enact how a female **silkworm moth** produces pheromones from a gland on her abdomen and how male moths can fly to her from up to 30 miles away by using the pheromone trace in the air. For these moths, love is, literally, in the air.

Interlude

Caterpillars feed and pupate at night.

Act II: concepts

In this act, we use the most familiar insects to you, butterflies, to portray the major concepts in sexual selection theory.

In the first part of Act II, a male butterfly emerges from the pupa and forages among the flowers. Upon seeing a female butterfly,

he courts her with his dance movements. The female, being coy, dodges his attention and keeps observing and judging. The male's persistent courtship finally persuades the female, who accepts his courtship. This behavioral series involving **male courtship** and **female choice** is very common in arthropods and other animals. The peacock's tail, the dances of birds of paradise, and the songs of crickets, frogs and birds are all sexual traits males evolved to signal to females how good they are as a partner and a father. Many of these signals, such as feather color, body size, and frequency of the song are related to the genetic quality, health level, or foraging ability of the male. By making a choice based on these male traits, females make sure her young inherit these beneficial traits from their father.

Another important form of sexual selection is **male-male competition**. In the second half of Act II, we can see two males arrive at the same flower patch. They quickly see the female and engage in a fight with the male. Fights in some male-male competitions can involve weapons. For example, the horn of the dung beetle is a weapon they use in fights to flip rivals over. Other insects, such as damselflies, engage in wars of attrition—male competitors fight while flying until one male cannot keep up and drops out of the sky.

In the last part of the dance, while the first male is distracted by his original mate, the two smaller males, who cannot win a fight against the larger male, sneak the female away. This behavior is not uncommon and is termed an **alternative reproductive strategy**. Typically, smaller and weaker males engage in this type of mating behavior. They sometimes even disguise themselves with **female mimicry** (appearing like females) in order to approach females without alarming them.