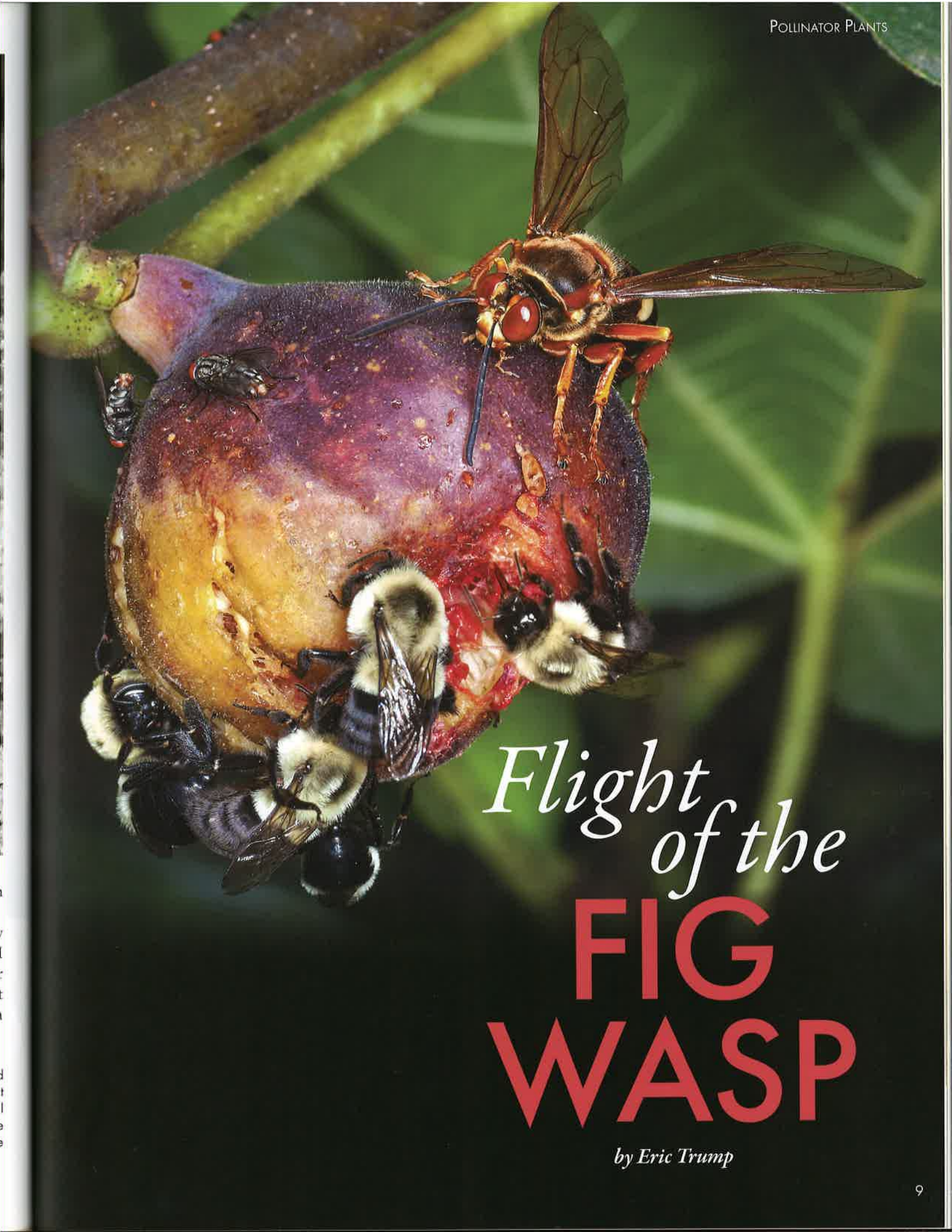

Flight of the FIG WASP

by Eric Trump

Above left: A fig tree in the Sydney Botanical Gardens. © *Michael Evans* **Above right:** A fig wasp using her ovipositor to inject eggs. © *Alandmanson, Wikimedia commons* **Opposite:** Figs ripening on a tree.

Humans have grown up with figs. In 2006, in ruins near the Palestinian city of Jericho, scientists found the charred remains of nine figs that were 11,400 years old, the earliest known cultivated fruit. This find situates figs at the beginning of agriculture in the Middle East, even before we domesticated wheat and barley.

Fig trees have played important roles in the stories we tell ourselves, too. Tantalus, the rich but wicked king of Sipylus in Greek mythology, longs for figs he can't reach; Romulus and Remus, the legendary founders of Rome, are saved from drowning by a fig tree's roots. The fig tree is the third and perhaps most practical tree mentioned in Genesis, as Adam and Eve girdle themselves from shame with its leaves.

> "The green and black figs burst with the pressure of their sap, and in the pink splits...the rich, never-ending largesse . . . "
>
> Gerald Durrell, *My Family and Other Animals*

The mythical tree has long been linked to wisdom. Siddharta Gautama receives Bodhi, or enlightenment, under the heart-shaped leaves of the *Ficus religiosa*. Sunk in the tangled shade of a *Ficus benghalis*, the banyan tree, with its roots descending like loggia and flying buttresses, anyone might feel something like awe. Thimmamma Marrimanu, a banyan tree in Anantapur, India, spreads its canopy over five acres and can shelter 20,000 admirers beneath its crown.

We have been observing the genus *Ficus* with passionate attention over millennia. Perhaps its most recognizable symbol is the fig, whether purplish black, honey-gold, or musty green, whether growing from a vine, a tree, or a shrub. What looks like and is commonly called a fruit, is not actually a fruit at all, but a syconium: an inverted inflorescence, an outside-in flower, a hidden garden containing hundreds or thousands of florets. The syconium was celebrated by English writer DH Lawrence in his poem "Figs" as a "ripe womb" and "covert nakedness," where "everything happens invisible, flowering and fertilization." The fig is, he writes, a "very secretive fruit."

And he's right. The fig still holds on to some of its secrets. Despite its many representations in visual and literary culture, for thousands of years we did not really know what we were looking at. The Greek philosopher Theophrastus, who has a fig tree from the Solomon Islands named after him—*Ficus theophrastoides*—examined them too. He noticed something very important, something that had been going on for at least 80 million years prior to his observations: miniscule insects leaving and entering figs. We would be puzzling over the relationship between these bugs and figs until the early 1960s, when their relationship was first teased apart.

What Theophrastus observed were female fig wasps (*Agaonidae*). They are about as big as an ant and have been around a long time: the oldest wasp fossil is 34 million years old. The first fig syconia were open, so the flowers could be pollinated by various insects or wind. Eventually, the flowers evolved and became enclosed in the fig's urn. This protective

Above: The common myna or Indian myna (*Acridotheres tristis*) dines on figs. © *Petr Salinger* Right: A huge ancient banyan tree covered in vines in Bali.

urn safeguards the seeds, and lures in fig wasps.

Once born, a female fig wasp has a short, hectic life. She leaves the fig of her birth and has one to three days to find another fig to drop her eggs. Tree and insect evolved together in a relationship of exquisite obligate mutualism, each the fulcrum of the other's existence. The fig wasp, laden with pollen from the fig where she was born, is attracted to the scent of mature female fig flowers. She enters through a small, bract-lined opening, the ostiole, a passageway so tight that she often loses her wings and antennae. She won't need them anymore, since she has entered her tomb.

Inside the fig, her life almost over, the mother wasp moves around, searching for the calyces of female flowers where she can deposit her eggs. As she scrambles through the dark territory, she spreads pollen from the male flowers of her birth location to the female flowers here. When she lays her eggs, the wasp also injects a fluid that hardens into a structure called a gall. This is the larvae's nursery. The flowers she has pollinated produce seeds.

The opening of the fig's male flowers and the exposure of its pollen is synchronized with the emergence of male wasps from their galls. These are wingless, with reduced eyes and strong jaws. Once they find the embryonic females, still in their respective galls, the wasps insert their telescopic penises into their sisters to fertilize them. The males then use their strong jaws to tunnel out of the fig's flesh, after which they fall to the ground and die.

When pregnant females emerge, they have antennae, wings, and large eyes. They crawl over male flowers toward the tunnel opening, pollen filling their pouches and leg pockets. They crawl through the passage their brothers constructed and leave their womb to repeat the journey of their mother. This constant cycle of pollination ensures that most fig trees bear fruit year round.

Fig wasps are not the only inhabitants of the fig, though certainly the most beneficial ones. Larvae of other creatures have been found inside the fruit, creatures that play no role in the fig's development. For example, flies of the genus *Lissocephala* lay eggs in the ostiole precisely when the female wasp enters the fig. The fly larvae then use her tunnel to move inside, where they feed on the yeast and bacteria she brings in with her. To escape, they crawl out the tunnel the male wasps have made. Certain moths and butterflies devastate the fig, laying eggs directly into the fig wall. Their larvae munch their way inside and feed on everything: pulp, wasps, and seeds. Once sated, they crawl out of the destroyed fig to build cocoons on the tree.

The fig tree is not a helpless victim to its tormentors. It can be stern with the insects it hosts, especially fig wasps. Every fig tree has a specific fragrance, and this plays an important role in its delicate relationship with the female pollinator wasp. The wasp locates her host fig through species-specific volatile organic compounds that the fig releases when its stigmas are ready for pollination. Every species of fig tree, over 750 of them, relies on its own species of pollinating fig wasp.

About half of fig trees are monoecious, meaning their syconia have both male and female flowers, producing both seeds and wasps. About half of the remaining species are dioecious: male trees produce pollen and wasps, while female trees produce only seeds.

Female wasps have a tricky time dealing with dioecy. While the wasp can still deposit her eggs in a dioecious fig, it can only do so in the male flowers. The female flower stalks are so long her ovipositor cannot reach all the way in. Despite the inability to reproduce in female flowers, wasps sometimes head for female fig trees. Inside, they pollinate the blossoms without reproducing, even though the male flowers in another tree are receptive. Why would a fig wasp choose a dead-end? Because she's been tricked; dioecious female fig trees mimic the heady scent of male flowers, luring in female wasps.

Fig trees are hard on wasps another way. Some wasps passively pollinate, which means they don't need to spend

energy collecting pollen in the pollen baskets that are a feature of their bodies. Others pollinate actively, which means they need to look for and collect the pollen for delivery to the new fig. If an active pollinator betrays the mutual relationship by laying her eggs and not dropping off a load of pollen for the fig, the tree gets revenge by dropping the entire syconium to the ground, destroying everything, vespine progeny included.

In the end, obligate mutualism with wasps is just one phase in a fig's life. It is displaced by dispersive mutalism, when the fig—the "glittering, rosy, moist, honied" fig (Lawrence, again . . . is a fig ever just a fig?)— is eaten by a larger animal, who carries the precious seed to new locations in the forest. Fig trees provide more mammal and bird species with food than any other tree: over 1,200 species dine on figs.

These magnificent trees are a keystone provider, supporting entire ecosystems. Still, if it weren't for the flight of the tiny fig wasp, and a delicate system of checks and balances to which the tree and the insect have agreed over millennia, the whole edifice would crumble.

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PAN DE HIGO

Figs are not just for Newtons. They are great for all kinds of baking. They hold in moisture and can be used as a substitute for fat. The below recipe is for pan de higo, or fig loaf (though flour is not one of the ingredients). It is a Spanish dish and was originally a food eaten by farmers, who valued it as a source of energy and nutrition. It is still sometimes called "el turrón de los pobres," or the "nougat of the poor." Figs are an excellent source of calcium and potassium and are packed with fiber and antioxidants. Today, fig bread is enjoyed all around Europe. In Spain, it is usually eaten during the Christmas and New Year holidays. Try it with Manchego cheese.

1 pound dried Mission figs
½ cup sliced almonds
½ teaspoon cinnamon
1 teaspoon anise seeds
2 tablespoons rum
1-2 tablespoons honey

Pour figs and almonds into food processor and mix together until well chopped.

Add cinnamon, anise, rum, and 1 tablespoon honey, and mix until ingredients start to come together.

Stir in final tablespoon of honey, if needed. The mixture should be sticky and hold together well.

Press mixture into baking pans lined with wax paper, or wrap into a cylinder. If using pans, put waxed paper or parchment on top and weigh down, using canned tomatoes or other heavy objects.

Let rest for three days before eating. Will keep at room temperature for at least a few months.