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Jungle fever: Brazil nuts, bees and orchids

The winning article in the latest Young Science Communicators' Competition

Every Brazil nut you've ever eaten has been collected from the Amazon jungle. Forget about wine and cheese; Brazil nuts represent the ultimate in *terroir*. Without intact rain forest, the very landscape surrounding the tree, there would be no nuts at all.



Brazil nut trees in a soybean field. (Photo by Pat Joseph; reproduced with kind permission)



Euglossine bee on a Stanhopea orchid. (Photo by Daniel Jimenez; reproduced with kind permission)

The Brazil nut tree (*Bertholletia excelsa*) can live to be more than five centuries old, reaching more than 40 m into the sky to become what's known as an emergent, a true forest giant standing head and shoulders above the forest canopy below.

The nuts (which are really just delicious, oily seeds) are encased in an enormous woody capsule that takes more than a year to mature on the tree. Imagine about 20 nuts arranged like the segments of a Terry's chocolate orange, but wrapped in a cannonball. It's downright dangerous to be under the tree when these palatable projectiles (which can weigh 2 kg) start falling to the forest floor.

Around 20 000 tons of nuts are harvested each year. In the past, people who tried to farm the trees in large scale orchards were disappointed to find that the trees almost never set seed. Something was missing. Those who tended trees within or right next to undisturbed forest had much more success. This practice is called forest gardening, an example of which is shown in the accompanying image, with nut trees growing in a soybean field overhung by jungle.

Amorous bees and bizarre orchids

It was clear that the trees need the forest like the forest needs the trees. This is because an intact ecosystem is required in order for the flowers of the Brazil nut tree to be pollinated. And that ecosystem includes amorous bees and bizarre orchids.

When the short-lived flowers of certain orchids open up in the shadows of the forest canopy, it's the equivalent of a holiday sale for the males of several species of metallic-looking insects known as euglossine bees. The bees have not come to score a good deal on a meal, for the orchids produce no nectar. Instead, the male bees crawl all over the flowers, enticed by otherworldly fragrances produced by special scent glands hidden within. The male bees actively collect the scent molecules onto specialised hairs that cover their legs to form a sexy bee cologne which they'll use to attract females at display sites elsewhere in the stifling forest. In their mad scramble, they'll also pick up and deposit some orchid pollen, thereby intertwining the reproductive fate of the orchid with their own.

Master perfumiers

Outdoing the talented perfumiers of Guerlain and Givenchy, the scent glands of different orchid species produce unique mixes of volatile chemicals. In turn, female euglossine bees are as particular as the *mademoiselles* of Paris: scent preferences are often highly species-specific. The result is that pollination only occurs between orchid plants of the same species, as males of a particular bee species typically only visit one species of orchid.

Some bee species play perfumier themselves and collect scent from different orchid species, mixing their custom cologne on-the-go. In these cases, the orchids attach their pollen on different parts of the bees' bodies in order to prevent cross-pollination.

And what role does the female euglossine bee play in all of this? Well, she's the one who pollinates the flowers of the Brazil nut tree. Without intact rain forest, there can be no orchids. And without orchids, no bees. And without bees, no Brazil nuts.

So think about all that jungle lust when you're snacking on your roasted nut mix this festive season, and thank those horny bees and bizarre orchids every time you pop a precious Brazil nut in your mouth.

By Leon van Eck, Department of Genetics, University of Stellenbosch