As I slid down the steep slope, trying to use roots, trunks, and small stones to slow my passage and steer my course, I saw it. The sight brought me up short despite gravity’s insistence that I should tumble down the hillside.

It was not imposing like the *Ceiba*s, which can tower at an astonishing 70 meters tall (as much as a 13 story building), nor was it miraculously beautiful like the matapalo’s twisting, vine-like trunk. It was ordinary and would be easily overlooked by untrained eyes. However, this was my first glimpse of *Theobroma cacao,* of a truly wild variety in a natural setting, and for that, I was stunned into silence.

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*Theobroma cacao*, or the chocolate tree, is native to the western part of the Amazon Basin. Short of stature, with a maximum height of about 14 meters, it is relegated to live forever shaded by the canopy of giants rising up around it. However, despite its seeming insignificance in this cathedral of life, cacao has attracted the interest and even the worship, of humans, for hundreds of years. Its Latin name, *Theobroma*, means “food of the gods,” and it is well deserved. Not only does the fruit provide a succulent, tangy pulp commonly eaten as a snack during harvest, but the fermented and roasted beans also make a rich, distinctive butter — two flavors mimicked nowhere else in nature.

Though cacao originated in the Amazon Basin, it was brought to Central America by trade, where the Mayans began to cultivate it for its beans, not just its fleshy fruit. Now, cacao is grown around the world and is a commodity on which millions of small farmers depend. Like many other agricultural crops, there is a plethora of research on this species. For example, intensive breeding programs strive to produce the next popular variety that is productive, pest-resistant, disease-resistant, and/or sun-tolerant while still retaining the fine aroma and notes in the bean, and researchers in the Atlantic Forest of Brazil study how traditional growing systems that are based on cacao, known as *cabrucas*, can support native flora and fauna. Despite the quantity of research on cacao, there are still many aspects of this tree that remain a mystery to researchers, growers, and even the chocolate industry.

One such mystery is why this tree has such low fruit set in agricultural systems. Fruit set refers to the transition from flower to fruit and is the first step in determining the yield of an agricultural product such as cacao. It is estimated that between 1 and 50 percent of all flowers produced transition to fruit, with most growers experiencing levels in the teens. Cacao is a hard plant to please. It is self-incompatible, meaning that it requires pollen from another tree for successful fruit production, while the flowers themselves have an architecture that seems to barricade insects from transferring pollen effectively. Flowers have hoods over the anthers (the pollen-producing organs) that restrict access to only the tiniest insects, and the stigma (the receptor for the pollen) has a crown around it that only opens for 24 hours. So, *T. cacao* relies on tiny flies (<1mm long), colloquially called no-see-ums, to pollinate its dime-sized flowers. To make matters worse, these insects are weak fliers and have a limited capacity to actually transmit the necessary amounts of pollen from flower to flower.

From the 1950s to the 1980s, cacao pollination was a popular topic in scientific literature, but funding dried up as the industry decided that breeding varieties that could self-pollinate would be more useful than investing in years of research on increasing no-see-um visits to flowers. Currently, there are several self-pollinating varieties, but they have lost the fine aroma required to produce high quality chocolate. As such, research on how to increase pollination of *T. cacao* is still important for small holders hoping to produce chocolate for premium markets. Further, research into the pollination biology of cacao has only focused on cultivated varieties and never explored the pollination of this tree in a natural setting. So I set out this summer to study the dynamics of chocolate pollination in both cultivated and natural systems.

It is relatively easy to find cacao in Ecuador. There are several artisanal chocolate makers in Quito, where you can buy beans if you know how to sweet talk the owners. Leaving the capital city, as soon as you are lower than 500 m in altitude on either side of the Andes, you will start to see cacao growing in sunny fields. Ecuadoreans are intensely proud of their cacao and the resulting chocolate. *Cacao nacional* is a variety native to Ecuador, distinctive for the purple color of the beans at harvest and with the hardiness of *forestero* but the fine flavor of *criollo*. My hosts in Rio Blanco were only too eager to open up a cacao pod my first day in the field. They had me taste the pulp and roasted up a small batch of cacao in order to serve me artisanal chocolate.

Finding wild cacao, however, is a bit harder.

From Quito, I took a six-hour bus ride along barely paved mountain roads cloaked in fog and rain to reach Tena, a provincial capital nestled in tropical rainforest. From there, I still had another day of travel — including an hour-long bus ride, a short jaunt by long boat across the raging Napo River, and another hour and a half in a truck “taxi” — to finally arrive at a small Kichwa community that primarily grows cacao. However, the journey still was not over. There remained a three-hour hike into the rainforest, wading through rivers and balancing precariously on ridge tops, before I finally arrived at a small wood and tin construction that provided me shelter for the next week as I searched for wild cacao. That first day, knowing my time in the field was limited and with three hours left before sundown, I unpacked my field equipment and followed my guide for another 30 minutes of bushwhacking through the forest in order to find myself unsteadily balanced upon that hillside, trying to take in the sight of a wild *T. cacao* without rolling gracelessly down the slope.

That first sighting was both enlightening and disappointing. Within a minute, it was abundantly clear that wild *T. cacao* does not flower all year round like its cultivated sister. Instead, I had arrived right after prime fruiting season, and it would be at least another month before the trees put out a new wave of flowers. While this meant that I would not be setting up my experiments and making new discoveries about the composition of the pollinator communities of wild cacao, all was not lost. I spent the next five days with my guide in the forest reserve, tagging and measuring trees, taking GPS coordinates, and getting an idea of how abundant wild cacao is in the area.

In the process, I also learned much about the medicinal uses of the native plants and even had the opportunity to use some myself, including brewing a tea for a persistent cold and cough and applying an antibacterial sap to a gash on my hand. My guide, Ilicio, had brought his family along, and so we shared stories and laughs in broken Spanish over the cookfire every night. They expressed concern over the oil drilling and hunting problems in the Amazon, while I couldn’t help but ask about how the area had changed in the past 50 years. However, after a week, it was clear that I had exhausted the pool of wild cacao in the area. It was time for me to transition back to my experiments in the cultivated system that I had set-up earlier in the field season. So, I hiked, taxied, boated, and bussed back to Tena and then on to Rio Blanco, the Kichwa community in which I was performing my field experiments.

The chakras are less treacherous terrain than the steep slopes upon which wild cacao tends to cling, but the ancestral biology of the cacao is still readily apparent. Even after hundreds of years of intensive breeding for fruit and seed size, tree shape and height, and the aroma of the fermented, roasted bean, this tree is still considered semi-wild. It needs constant pruning to remove the new trunks that shoot towards the sun, defying the growers’ goal of horizontal branches that will provide support for the heavy pods. Even with improved, distributed saplings and advanced grafting techniques, growers are still noticing that a fourth of their trees are producing more than three-quarters of the final harvest.

I started with a simple observational study in four chakras where I tagged newly opened flowers with thread. By observing the fate of the flowers, whether they drop or fruit, it is possible to determine the rate of pollination in the chakras. Though the final calculations are not yet in, the chakras in Rio Blanco are experiencing very low levels of pollination: less than 10 percent of the flowers transition to fruits. Along with flower observation, I collected ants and flowers to study the dynamics between ant species patrolling the branches and the pollination rates and the insect visitors to the flowers. However, as these collections are still awaiting the green light for exportation to the United States, I will have to be satisfied to limit my current work to just the data points I could bring back in my numerous Rite-in-the-Rain field notebooks.

While I am awaiting the results of my biological study from this summer, I cannot help but comment on the other aspects of my travel through this magnificent country. Ecuador is facing intense pressure to develop, and the people are enjoying both the benefits and living through the negative consequences of new policies. New roads, bridges, and ports have made even the more remote areas of Ecuador accessible when it would have been virtually impossible to travel to them just a year ago. However, this change is monetizing the lifestyles of many native communities and encourages community members to migrate for work. While cacao will not be the magical cure for many communities, for Rio Blanco and Campo Cocha, which produce high quality, organic cacao for Kallari (a farmer-owned, chocolate-producing cooperative), it has provided them with a way to continue to follow a traditional lifestyle while providing futures for their children. I only hope that my research will help them to continue to do this in a world where chocolate prices are fickle and the value of these systems underappreciated by consumers in a global market.