

the TROPICAL GARDEN



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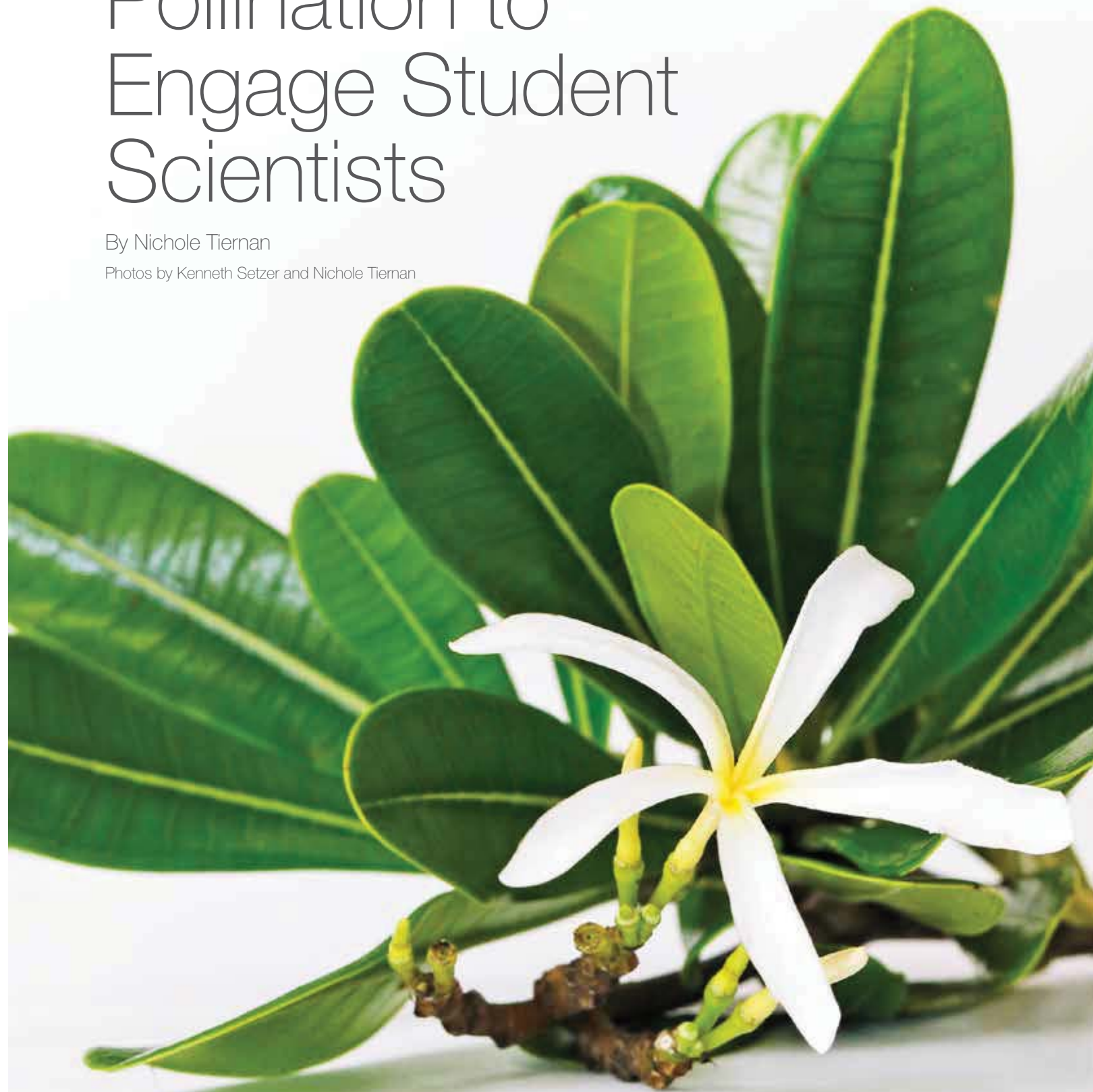
■ Fall Classes



Using *Plumeria* Pollination to Engage Student Scientists

By Nichole Tiernan

Photos by Kenneth Setzer and Nichole Tiernan



PREVIOUS PAGE
Plumeria cubensis,
native to Cuba.

RIGHT
Sofia Ocampo and Mario
Escoriza Gonzalez monitor
Plumeria in the Nursery.



As a Ph.D. graduate student in the joint Florida International University-Fairchild program, I understand the value of mentorship and outreach in botany. Working with my university, I have found a unique opportunity to engage undergraduate students in plant sciences through the extraordinary Garden collections and my own graduate research. In this article I will introduce my topic followed by details of the great experience I have had mentoring eight undergraduate students from FIU in topics pertinent to pollination and breeding systems of plants.

The genus *Plumeria*, commonly known as frangipani, was described by Linnaeus in 1753 and named after Charles Plumier, the botanist of King Louis XIV of France. Although these milkweed relatives originated in the Caribbean and adjacent Central and South America, *Plumeria* has become a ubiquitous member of tropical gardens throughout the world, including at Fairchild.

You may be familiar with some of the nearly 300 cultivars of *Plumeria*, namely from the species *P. rubra* which are easily recognized as the pink flowers used in Hawaiian leis. Yet despite their popularity, little is known about other members of the genus.

There are more than 50 names described for the group. The goal of my graduate research is to uncover the true diversity within the genus, particularly in the Caribbean islands. My work in systematics utilizes Fairchild's living collection of *Plumeria* plants, as well as herbarium and DNA samples I have collected from wild-growing *Plumeria* across their natural range in these islands. Much of my time after returning from fieldwork is spent at the bench analyzing DNA or herbarium specimens that I collected.

The extensive collecting I have done in Hispaniola, Jamaica, and Cuba suggests there are approximately 25 *Plumeria* species endemic to the Caribbean islands and many of these occur on only one island. The flowers of wild-growing *Plumeria* are perhaps more striking than their cultivated relatives because of the way their large white masses of flowers contrast with their surrounding unkempt landscape or complement the turquoise waters of the Caribbean.

While flowers are important components of plant taxonomy and systematics, so too are fruits. However, when finding fruits became a rare treat, I found myself questioning how the wild endemic species reproduce. The absence of fruits in wild plumerias is a potential concern for conservation, especially given the destruction of habitat in the Caribbean.

Sarah Gonzalez, Jennay Bailey, and Stephanie Espaillat placing mesh bags around flowers and fruit.



This sparks several questions: Can flowers self-pollinate and set fruit without a pollinator? Is the lack of fruits due to a lack of pollinators? If they don't require pollinators, why are there so few fruits in the wild?

To answer these questions, I stepped away from the lab bench and ventured into the Garden collections.

If you took a walk through Fairchild's Caribbean Jewels plots this past summer, you may have seen purple mesh bags around the *Plumeria* flowers and fruits. With the help of eight FIU undergraduates, I am using Fairchild's collections to study the breeding system of *Plumeria*.

Many undergraduate students pursuing biological training are eager to get their hands dirty with research, so it wasn't hard to find students willing to brave the steamy summer at Fairchild. We selected eight different species growing either on the grounds of Fairchild or at the nursery. These included the hairy-leaved *P. tuberculata* from Haiti, named for its tuberculate (i.e. bumpy) stem; *P. cubensis* with dark glossy leaves from Cuba; the common *P. obtusa* from the Bahamas; and the long, skinny-petaled *P. stenopetala* from the Dominican Republic.

Though leaves and petals among *Plumeria* species can vary in size and shape, all have the characteristic deep-throated white flower with the pollen-bearing anthers deep in the

base where the nectar is produced. This type of flower design is consistently associated with hummingbird hawk moths that use their long proboscises to access nectar deep within the flower tubes. The mesh bags allowed us to manipulate the flowers, keeping any unwanted visitors out. Using a method designed by FIU Professor Dr. Suzanne Koptur, we mimicked hawk moths—the suspected pollinators—by using fishing line to probe deep into the flower's throat to move pollen around inside the flower. The busy summer intern pollinators tagged more than 7,000 *Plumeria* flowers and are currently monitoring the fruits that were produced.

With so many unique and special species of *Plumeria* in the Caribbean, the consequences are grave if the habitat becomes unable to sustain species diversity. If *Plumeria* are pollinator-dependent for reproduction then this puts incredible pressure on the pollinators to maintain the balance of the ecosystem.

While this study is still in progress, it will provide us with important information about the reproductive strategies of this widely recognized but poorly understood genus.

Through integrating Fairchild's education mission, the vast *Plumeria* collection has engaged students and given them a greater understanding about conserving the world's plants. 