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## The Greenhouse Effect

### Life Sciences Facility Is Vital Research, Teaching Resource for Campus

Displayed prominently in the main corridor of Stony Brook University's Life Sciences Greenhouse is one of curator Mike Axelrod's favorite plants. To label *Amorphophallus titanum*, or corpse flower as it is commonly known, a botanical curiosity is an understatement. Resembling a pale green, mottled cucumber when it is in leaf stage, the plant is capable of producing a towering 8- to 10-foot-tall flower and emitting a stomach-wrenching odor that's best described as the stench of rotten meat.

A blooming corpse flower always makes headlines because it is a rare occurrence, and Axelrod is proud that Stony Brook has a specimen in its collection. Like an expectant father eagerly looking forward to the birth of a child, Axelrod has been waiting for this "baby" to bloom ever since he received it as a gift from a



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colleague at the University of California, Davis, in 2008.

Few people know about Stony Brook's corpse flower — or that there is a greenhouse in the Life Sciences Building, for that matter. Built in 1974 and located on the lower level at the end of a series of windowless, winding corridors, the greenhouse is what Axelrod calls “one of the hidden great places on campus.”



**Curator Mike Axelrod addresses a group of community college students touring the greenhouse.**

Despite the fact that the greenhouse is situated on a quarter acre and houses approximately 4,000 plants from 65 families, it is easy to see why the facility is so hard to find. Access is via a work area adjacent to a loading dock, through a door, and up a flight of metal stairs, which empties into a central corridor with bays on either side. Immediately to the left is a space called the atrium, which is crammed with an assortment of exotic tropical plants, such as bird of paradise, bougainvillea, Japanese sago palm — an ancient species that dates back to the time of the dinosaurs — several varieties of citrus trees, and an oversized, barely contained banana tree, which stretches its massive, paddle-shaped foliage toward the top of the glass ceiling.

#### **A Resource for Research**

For all its relative anonymity, the greenhouse serves a vital function on campus as a living plant laboratory, research facility and teaching resource.

Jessica Gurevitch, PhD, a professor in the Department of Ecology and Evolution, College of Arts and Sciences, is at home here. As a plant ecologist, she has used the facility for many years for a wide range of research projects with her students. Currently she is studying spotted knapweed, a plant that is invasive in the western United States that has begun to proliferate in New York State, particularly in certain areas of Long Island and the Adirondack Mountains. Gurevitch and her team start spotted knapweed seedlings in growth chambers and the greenhouse and carry out experiments on them to learn more about what makes them thrive.

By Gurevitch's account her research, funded by the National Science Foundation, would not be possible without Axelrod and John Klumpp, assistant greenhouse curator, who provide much more than space for Gurevitch's studies — they offer a high level of expertise and support to student and faculty researchers.

She describes her work with the greenhouse crew as collaborative. “When I'm running experiments, I keep in close touch with Mike,” she said. “I ask him about what size pots and plant mix to use, where we are going to set them up that has the right amount of sunlight, and what to do if we have any kind of pest outbreaks — all nuts-and-bolts practical matters,” she said.

*Mai Fahmy '15, an ecosystems and human impact major, talks about Stony Brook's greenhouse.*

Gurevitch isn't the only researcher who depends on the greenhouse. Sharon Pochron, PhD, a lecturer in the Sustainability Studies Program, is working on several projects involving earthworms and the effects that products such as Roundup® and lawn fertilizer have on the creatures. Pochron's research began in September 2012 with a team of seven students, which has since grown to more than 40.

"One of the things that makes my research so popular with the students is that it is very intellectually accessible, and the greenhouse is a beautiful place to work," Pochron said. "This kind of science doesn't require mathematical modeling, computer programming or knowing how to do genetic analysis, so students can bring their critical thinking skills. And when you have an intelligent, willing student who doesn't have specialized skills, the greenhouse is a good place for them."

Mai Fahmy '15, an ecosystems and human impact major, is one of the students working on Pochron's research team. She spends many hours in Bay 5, a warm, sun-drenched space filled with rows of glass terrariums that appear to contain only soil, but are brimming with colonies of earthworms beneath the surface.

"Having a greenhouse on campus makes this research possible — we couldn't have done the experiments we're running without it," said Fahmy.

**New Growth Chambers**

Enhancing the greenhouse experience for many of the researchers are eight recently acquired, state-of-the-art plant growth chambers, which house different experiments being conducted at the facility.

“We rely on our growth chambers for more precise controls for most of the research done here,” said Axelrod. “Each chamber is basically a box that is outfitted with a small computer that allows us to manipulate variables, such as photoperiod, light intensity, temperature, etc. These features of the new growth chambers offer tremendous advantages for conducting plant research.”

Behind a gray steel door labeled No. 4 is the growth chamber that houses the research of Vitaly Citovsky, PhD, a SUNY Distinguished Professor in the Department of Biochemistry and Cell Biology, College of Arts and Sciences. The chamber is critical to his program, which is funded by federal agencies such as the National Institutes of Health, National Science Foundation and U.S. Department of Agriculture.

Elena Garcia, a postdoctoral researcher in Citovsky’s group, is studying a soil bacterium called *Agrobacterium*, which causes tumors in plants, infecting them through open wounds. Garcia finds the growth chambers indispensable to her research.

“We have to work in the best conditions to maintain healthy plants for our experiments in a controlled plant growth environment,” she said.

#### **From Seed to Feeding Patients**

But not all the plants grown in the greenhouse are slated for research — some are destined to land on the plates of patients at Stony Brook University Hospital.



*Mike and John trigger interest in science and enthusiasm for the research done here at Stony Brook.*

Since summer 2011, Iman Marghoob has overseen an organic rooftop farm at the Hospital, which grows vegetables that are used to supplement meals for the approximately 600 patients. For the past two years she and her team have used Bay 9 in the greenhouse, which provides the space and materials for vegetable seedlings that Marghoob grows for a fundraiser held annually at the Hospital to support the farm.

Marghoob wears many hats: She is a registered nutritionist and landscape designer, as well as the manager of the farm, which sprouted from a 800-square-foot space on a fourth-floor deck at the Hospital three years ago before relocating to a 2,200-square-foot

space on level 3 by the Galleria. This year repairs to the space have temporarily curtailed plant production, but Marghoob said she looks forward to getting the farm back up and running real soon.

Typically the farm produces tomatoes, eggplants, peppers, zucchini, potatoes, beets and various herbs, to name just a few of the plants grown. “We work with the executive chef to see what he wants,” she said.



Marghoob said she sees the greenhouse as playing a major role not only in providing food for the Hospital, but also in educating students.

“In the greenhouse you can extend the season of teaching,” she said. “It provides opportunities for interns and students to learn about agriculture.”

### **The Mission to Educate**

Having the ability to teach courses year-round is essential, said Marvin O’Neal, PhD, course director for the Introductory Biology Laboratories. The greenhouse serves a support function for the labs by growing plant material used throughout the year, such as spinach for photosynthesis experiments and tradescantia for plant anatomy.

The labs, part of a rigorous two-semester sequence, are a prerequisite for all biology, biochemistry and pharmacology students. Large enrollments are the norm, especially in the fall when during a four-day period as many as 1,200 students are required to visit the greenhouse to study plant adaptation.

To accommodate the influx of students, Axelrod and Klumpp have set up the bays according to plant cultural requirements.

“When students walk into the tropical bay, for example, and I ask them, ‘What characteristics do plants have growing in the tropics?’ they can put their textbooks down and give me the information just by making observations,” said O’Neal. “It’s rare that a greenhouse can provide that level of diversity — most academic greenhouses have numerous bays containing only one type of plant.”

But it’s not only college students who benefit from the greenhouse — hundreds of visitors from various community groups and local elementary, middle and high schools tour the facility every year.

“One of our main missions here is to educate,” said Axelrod, who along with Klumpp, has a background as a biology teacher.

And they do a great job of it, according to Joan Kiely, director of the Biotechnology Teaching Laboratories at Stony Brook, who has brought groups of high school students to the greenhouse during the summer.

“Mike and John engage the participants with discussions of plants on Long Island, food plants, ecology and current research projects,” she said. “They trigger interest in science and enthusiasm for the research done here at Stony Brook.”



**From left: Greenhouse curators Mike Axelrod and John Klumpp**

Tours include a visit to Bay 6, which contains what Axelrod considers “economically important tropical plants.” Here the young visitors can learn about plant evolution and see specimens grown for food, among them, sugar cane, ginger, bay leaf and coffee, as well as a novelty plant, *Synsepalum dulcificum* — the miracle fruit.

“You could suck on a miracle fruit berry and it coats your taste buds with a glycoprotein. Then if you eat something sour like a lemon, it will taste like pure sugar,” said Axelrod.

For all its emphasis on education and research, the greenhouse also serves a practical purpose: Some plants are raised in the greenhouse’s growth chambers and used for special events, such as the President’s State of the University Address, University Commencement ceremonies, award dinners and guest lectures.

“We now have geraniums available all year long,” said Klumpp. “Generally, geraniums don’t like the greenhouse — they prefer bright light and cool temperatures. Ever since we got these new chambers, we’ve been able to produce consistently beautiful plants.”

Having the ability to grow plants year-round likely translates into cost savings for the University, but the real value of having a greenhouse on campus isn’t so much about dollars and cents — it’s about the acquisition of knowledge.

“I would like us to utilize more of our growth chambers for new plant research projects,” Axelrod said. “That and focus on the many interesting aspects of our plants and their role in educating our students, faculty and staff, as well as the community at large.”

—By Susan Tito; video by Jennifer Bond; photos by John Griffin