

DECEMBER 2008

# Careers

GRAD STUDENT / FELLOW	PHIL A.	KAREN S.	GREGG M.
1. HYPOTHESIS / BIG PICTURE:	Physiological Basis of C. elegans and Parkinson	Genetics of C. elegans and Parkinson	Behavioral effects of C. elegans and Parkinson
2. EXPERIMENTS TO PERFORM:	Nicotinic Abolition	Microarray Studies	Microdeposition
3. RESULTS: (FAILED + SUCCESSFUL)	Failed - Parkinson is likely	Good - identified a subset of genes	Good - identified a subset of genes
4. QUESTIONS RAISED:	What other known people have done a similar thing?	Genetic analysis	Good - identified a subset of genes
5. FURTHER EXPERIMENTS:	Look for known		

## Mentoring Magic

How to be an effective mentor: tips from two highly successful principal investigators.

By Jennifer Evans

**W**hen Christine Jacobs-Wagner made her first stop in Lucy Shapiro's Stanford lab 12 years ago, it was the first of five interviews she had scheduled for postdoc positions across the country. After one day with Shapiro, Jacobs-Wagner's mind was made up. "I was so excited by her research I cancelled the rest of my interviews and joined the lab."

Two factors were most convincing for Jacobs-Wagner: "[Shapiro's] energy and the quality of people she could attract," which Jacobs-Wagner immediately appreciated when talking to lab members. It's a decision that served her well: the work Jacobs-Wagner did in Shapiro's lab appeared in such top-tier journals as *Cell* and *Proceedings of the National Academy of Science*.

"The most fundamental thing a mentor can do for a lab is to help to maximize a lab's productivity," Shapiro says. "That's based on creating an environment of collaboration and respect." It's a tone that is set by the principal investigator (PI).

"Everyone tries to emulate [Shapiro's] enthusiasm," says Mike Laub, an assistant professor of biology at MIT and former graduate student in Shapiro's lab. "It's very motivating."

"People are not born knowing how to run a lab," Shapiro says. Yet, she and Carlos Castillo-Chavez at Arizona State University, who won last year's AAAS award for excellence in mentoring, are clearly doing something right. Here are tips from the labs of two notably successful mentors on how to push students and fellows to be successful and productive scientists.



## Lucy Shapiro

When Shapiro began studying *Caulobacter crescentus* over 35 years ago, she was one of the first scientists to work with the model in an attempt to answer fundamental questions about developmental biology. Since then, Shapiro has not only pushed the field forward, she has also mentored more than 31 PhD students and 50 postdocs. Her graduates since 2000 have won such prestigious awards as the NIH New Innovator Award (Zemer Gitai), Beckman Young Investigator Award (Sean Crosson), and an HHMI investigator appointment (Christine Jacobs-Wagner). Today, 12 of Shapiro's trainees have a collective publication record of more than 340 articles.

### Screen carefully

Being a good mentor starts with a thorough screen of whomever you welcome into the lab. Shapiro doesn't use a set menu of questions, but asks them to share stories of favorite college courses, family, and career aspirations. She shares her own stories too. "I try to get them to relax enough that I can ask them to ponder something they've never pondered before ... like what they would do if an experiment failed 17 times," she says. When choosing an applicant, Shapiro says the opinion of the other lab members is as important as her own. "Dissonance in lab affects everyone," she says.

The ideal candidate doesn't have to be an expert in her field, says former postdoc Sean Crosson, whose work in structural biology may not have seemed like an ideal fit for the lab. "She takes on people who are asking good questions. As a mentor, [she knows] she can bring people up to speed."

### Require intellectual playtime

Laub, who went straight from Shapiro's lab to a tenure-track position at MIT, says he was thrilled by the freedom he received as a new graduate student in Shapiro's lab. "Early on, [Shapiro] lets people explore," says Laub. Once newcomers to the lab can prove they know the literature of the field well, she encourages them to "play" with experiments that most excite them, even if she suspects the experiment could fail. "I think it's a mistake to channel [students] too tightly. They have to learn how to make mistakes," says Shapiro. "In our business, to be the best, you have to be intellectually playful... I try to instill that in all people I train."

### Use their talents

"I may have one vision, but instead of forcing them into a mold, I try to figure out what it is they're good at," says Shapiro, and capitalize on that in their project. Tapping into their own expertise lets students feel ownership over their research.

### Provide fast feedback

Shapiro "doesn't let things sit," says Crosson. According to Shapiro, the last thing a student wants is to see their manuscript on a desk for months at a time. "This is my responsibility ... even if it means staying up late several nights in a row." Her quick turnaround on manuscripts "forces you to get things back to her," he says.

While Shapiro's work typically appears in *Science* and *Nature*, Crosson says Shapiro knows how to recognize data that tell a "cool story" and are ready for publication, even if it's not a *Nature* paper. This is critical for a young scientist trying to build a solid publication record of first authorships.

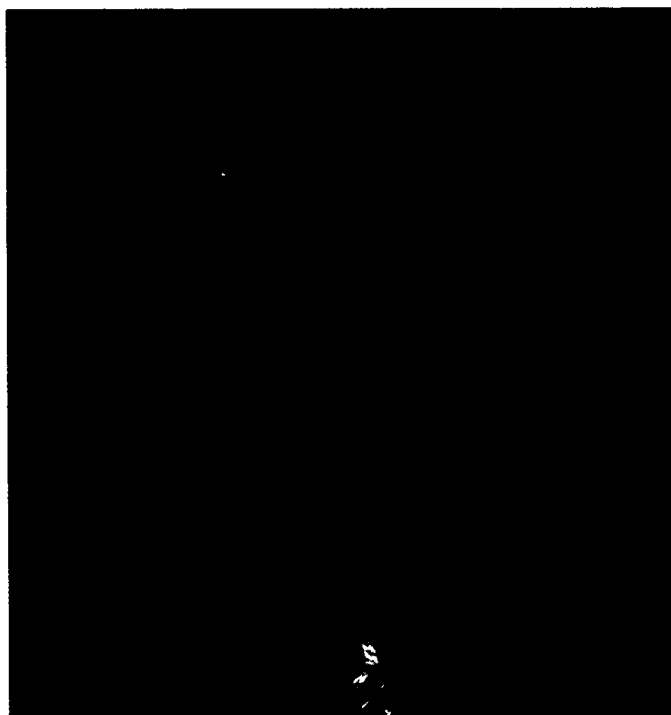
### Let early success drive students

Graduate students joining the Shapiro lab often begin with two projects; one geared toward generating immediate, publishable data, and one that has the potential to tell a fascinating story but where the data may be difficult to get. "Nothing brings success like success," says Shapiro. "Once they have success... they feel empowered. They've done something good," then students can move to the more difficult studies with confidence.

### Get a mega whiteboard

Zemer Gitai, a former Shapiro postdoc, says he still has a mental image of the mega whiteboard hanging in her office that tracked the progress of her 15 or so postdocs and graduate students. "On her board, there was a list of goals with columns of every person in the lab, papers being worked on, bullet points of key results already ... what's the big picture, what did we learn, what questions are still left to ask?"

"I know every week, what every person's progress is in each project," Shapiro says. The whiteboard not only helps organize but demonstrates Shapiro's vested interest in the work of every member of the lab, Gitai says. He now tracks his own students with a similar board in his Princeton University office. ►



## Carlos Castillo-Chavez

As a graduate student, Carlos Castillo-Chavez dropped-out after his advisor made a derogatory statement suggesting Latinos were unfit to make it through graduate school on their own. When he eventually returned to school to complete his PhD in mathematics, he was surrounded by mathematicians who he says embraced diversity and drove him to excellence. In order to recreate this atmosphere for underrepresented students throughout the United States, Castillo-Chavez created the Mathematical and Theoretical Biology Institute, a summer program that brings together students ranging from the high school to the postdoctoral level to work on research problems over a two-month period. Out of 300 summer program participants, 169 have gone on to graduate school, 120 of whom were minorities. Castillo-Chavez works on mathematical models to help understand the evolution of pathogens in disease, and estimates he's trained hundreds of undergraduates, 50 PhD students, 20 postdoctoral fellows and 10 junior faculty over the past 30 years.

### Help students network

When Castillo-Chavez's students are at conferences, they had better hope their cell phones are on vibrate, because they invariably get bombarded by text-messaged pointers from Castillo-Chavez on where they need to be to make the most of networking opportunities.

When former grad student Miriam Nuno was at a mathematics conference, Castillo-Chavez told Nuno where she had to be to introduce herself to a famous biomathematician she was interested in working for. "[Castillo-Chavez] said, 'Make sure she knows your name and face.'" After the meeting, Castillo-Chavez e-mailed the professor on Nino's behalf, helping her secure an interview.

### Be vicious with manuscript reviews

When Sara Del Valle worked with Castillo-Chavez for a year during graduate school, she couldn't believe the number of marks on her manuscript once Castillo-Chavez was done with it. "I'd give the same manuscript to [Castillo-Chavez] and another editor," Del Valle says. While the other reviewers would offer a comment or two, Del Valle says Castillo-Chavez always found many ways to improve the piece. All of his questions trained her to be prepared to respond to reviewers before the paper was even submitted.

### Mentor a person, not just a scientist

When Griselle Torres-Garcia, one of Castillo-Chavez's current PhD students, became pregnant with twins, he helped. Throughout her pregnancy and first year as a mom, Torres Garcia says Castillo-Chavez has kept her research on track. "I meet with Dr. Castillo-Chavez very frequently," she says, and shows him new results every time they meet, which "helps me remain productive." Torres-Garcia says that recognizing Castillo-Chavez's commitment to her, motivates her to keep focused and work hard.

On Fabio Sanchez's first day of graduate school at Cornell University, Castillo-Chavez offered to buy his books for class so he wouldn't have to worry about the expense. Through such "simple gesture[s]," Sanchez says, Castillo-Chavez helps ensure his students stay focused on their work. "The student has to become personal to you," Castillo-Chavez says. "How do I help them to manage other barriers [outside the lab]? This is much more challenging than writing a good thesis."

### Train scientists to be storytellers

When Nuno first heard Castillo-Chavez give a talk about his research, she was blown away by his enthusiasm and the simple language he used to explain complex mathematical concepts. Later, Castillo-Chavez demanded the same of her research presentations. He always urged his students to use presentations to tell an interesting story. "He'd tell us, 'Don't give me big words. Don't get caught up in mathematical detail. Always think big picture,'" Nuno recalls. She believes that this training, which enabled her to communicate the "big picture ideas" of her research in applied mathematics to a group of biostatisticians, helped her secure a postdoc position in the biostatistics department at University of California, Los Angeles.

### Push them out of the nest

Since graduating from Cornell in 2005, Nuno has done postdocs at Harvard School of Public Health and UCLA. In October, she took a position as a senior biostatistician in neurosurgery at Cedars-Sinai Medical Center. She recognizes she may not have the opportunity to collaborate with Castillo-Chavez anymore because of moving into a new area—a shift Castillo-Chavez supports. "Carlos always said to me, 'Once you graduate and get your PhD, you stay as far away from me in research as you can,'" Nuno says. While she'll miss collaborating with her mentor, "you have to cut the umbilical cord of your advisor and dig up your own identity." ■