results come back quickly, making it less risky to take research in a new direction. When a computer is the only equipment needed, one does not always have to work in one's office. Bergman often writes software or runs programs at home in the evenings. "That's what sustains my interest in the science," he says.

Dry-lab researchers can apply their skills to many problems. "It really expands what you can do," says Saunders. "If your speciality is analysing data, then the nature of the data is sort of secondary." Saunders has analysed the genes of Antarctic microbes, modelled protein structures to study how enzymes find the right substrates and searched for biomarkers to improve early detection of colorectal cancer. And dry-lab scientists have plenty of options outside academia: career opportunities are opening up at institutions such as museums, which need staff with computational skills to help to organize and share their data, such as biodiversity information, and at DNA-sequencing facilities. Bergman and Saunders know of dry-lab researchers who have gone on to work at genomics and online education start-ups in California's San Francisco Bay Area, or to develop mobile-phone apps or land data-analysis jobs at consulting companies.

Dry-lab scientists must ensure, however, that wet-lab collaborators do not view them only as technicians — they must make it clear that they are "actually a research scientist", says Saunders. "You're not just the computer guy with the magical program." Even when one is the principal investigator of a lab, it is easy to be perceived as just "providing a service", he says. So it is important that, when starting a collaboration, computational researchers discuss whether they will help to set the project's scientific direction. Saunders adds that it is fine to participate in some projects that are steered by wet-lab scientists, but dry-lab scientists should develop their own projects as well, such as developing computational tools.

Researchers who make the transition to the dry lab need not worry that their wet-lab experience is wasted. Dry-lab scientists still need to think like biologists and consider the complexities of the system being studied. Programmers tend to oversimplify complex problems, but biologists know that there are often exceptions to the rules, says Cranston. And some researchers combine wet-lab and dry-lab work rather than giving up the former entirely. "I don't really like to look at it like a switch. I look at it more like adding more tools to your toolkit," says Bergman. "It's not an either/or." ■

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COLUMN

A faulty hypothesis

Carolyn Beans says that some of the most interesting results are negative ones — but it still hurts to be wrong.

MELANIE TAYLOR/SHUTTERSTOCK

I hold a strip of tinfoil above a bowl of water and ask the four children seated around me to make a hypothesis. "What do you think? Will it sink or will it float?" They have all sorts of ideas. "Float! It's too light to sink." "Sink! It's made of metal!" "Float! It's flat!"

I ask the students to circle their guesses next to the picture of the tinfoil in the hypothesis column of their worksheets. Then I drop the foil. The two students who circled 'float' begin flailing their arms in a wild dance of joy. The two who circled 'sink' erase their choice.

"Don't erase!" I beg them. "Just circle 'float' in the results column. Some of the most interesting scientific discoveries come when a hypothesis is wrong." They do not buy it. As we test more objects, the children continue to modify their hypotheses to match the results. One refuses to make a hypothesis until the results are known. Apparently, children do not like to be wrong, even in the name of science.

I thought of this elementary-school visit as I sat in my office last autumn, looking over the results of my summer research. I had tested whether three different plant species could reduce seed production in a jewelweed native to the United States, *Impatiens capensis*, by competing for pollinators.

One of the contenders was an introduced jewelweed from India, *Impatiens glandulifera*, with bright-magenta, nectar-rich flowers. I thought that surely this species would win over the local pollinators and reduce seed production in the native plant.

But it turns out that none of the competitors, either individually or as a group, had any influence on seed production in the native jewelweed. When I first saw these results, I thought how nice it would be to erase the past four months of work and start again.

As a graduate student, I find it hard not to feel like a failure when a hypothesis is incorrect. It was especially disheartening when I had committed an entire summer to an experiment, and there was no hope of restarting until the next growing season. Throughout the autumn and winter, I pondered. Was my sample size too small? Were my plots too close together? Should I have run the experiment for longer?

I came to the conclusion that my hypothesis was just wrong. Although this realization did not leave me dancing for joy like the children who circled 'float' (and I certainly would have danced had my hypothesis been correct), it did allow me to start identifying the positive aspects of my results.

First, I feel grateful that the experiment happened at all. Fieldwork is unpredictable and sample sizes are often demolished when study sites succumb to disease, unusual weather patterns or a stray lawnmower. Getting 700 potted plants of 4 species to flower all at the same time was no trivial task. For my success I thank good field assistants, decent weather and an influx of ladybirds that appeared just when it seemed that aphids would eat every last plant.

Second, I appreciate that my experiment was designed well enough to disprove my hypothesis definitively. I did not get what I expected, but I discovered something real. Now I can develop new experiments instead of wasting time redoing the same one.

Finally, I feel hopeful that the negative results mean that the story will turn out to be more nuanced and interesting than I initially expected. For example, this and other experiments suggest that even without influencing seed production, competitors may alter natural selection on the native jewelweed by causing pollinators to favour different-sized flowers.

As for the kids, they still want to be right. But what they want most is to do another experiment, and then another. They never tire of dropping objects into the water and thinking up reasons that one will float and another will not. They may not own up to their incorrect hypotheses. But they are learning that there is more to science than confirming one's expectations. ■

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