When You're Ready to Do
Research

by Carol Blackburn, PhD

You've done science labs in school and in summer programs. You've gotten hands-on experience in extracurricular activities like robotics or environmental club. Maybe you've even toured a lab or shadowed a researcher. Now, you want to try doing some research yourself. What are your options?

~~Don't Try This at Home~~

For many kinds of research, you can do a project using your own resources or ones you can buy or borrow from school. This is especially true of computer science projects and those that use data available online.

High school junior Catherine Wong had an idea for an inexpensive medical tool for the developing world: use simplified medical sensors to send real-time medical data via cellphone. But she didn't stop with an idea: with help from her high school physics teacher, she built a working prototype of an EKG that transmits data via cellphone. Catherine just won NPR's Big Idea contest for her work.

Meredith Lehmann was interested in the spread of epidemics and the idea of "six degrees of separation." Using data available on the Internet, she developed a simulation to model how epidemics spread in large population centers. Meredith became a 2012 Intel Science Talent Search (STS) finalist.

Sometimes, a project begun at home can lead to an internship. Sophomore David Liu was trying to organize his family's photo collection and developed an AI image-characterization software program to help with the task. At the local science fair, one of the judges was so impressed that he invited David to continue working on the project with him—at NASA. So David went from sorting family photos to analyzing NASA images of Earth! In 2010, David won second place in the Intel STS.

If you think of a project that you can pursue on your own, go for it. But if you need expert guidance (or lab facilities) to pursue your interests, or if you don't have an idea you'd like to pursue on your own, you have two basic choices: apply for a formal internship program, or arrange one of your own.
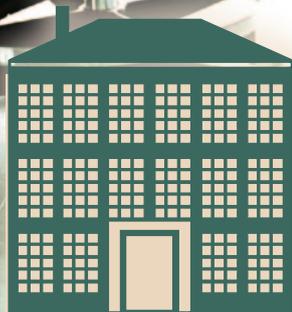
Internship Programs

Many institutions, from universities and hospitals to government and private labs, have set up formal summer research internship programs for high school students. Such programs typically run for six to eight weeks and vary widely with respect to eligibility, research options, and cost. Some are just for local students, others are not. Some are commuter, others are residential. Some are very specific—focusing, for example, on pediatric oncology or particle physics—while others offer placements in a range of labs. Some offer a stipend, some are free, and some cost money. All have competitive admissions, with application deadlines ranging from December to March.

One advantage of a formal program is that it offers a structured experience designed by someone who knows what gifted high school students can do in a summer. The research mentors have experience working with teen scientists and designing projects appropriate for six- to eight-week stints.

In most programs, interns do not have to come up with their own ideas for research; the mentors suggest projects. But sometimes, interns come up with ideas that they may be able to pursue in that lab. 2012 Intel STS finalist Sayoni Saha began an internship at a nearby medical school working on an existing project, but came up with an idea of her own, which the lab directors helped her pursue instead.

Most internship programs do not allow students to choose which lab they will work in. The few that do are for more advanced/experienced students. In these programs, applicants read descriptions of the available labs and specify which ones they would like. Individual scientists then select their own summer interns from the self-selected applicant pool. The largest such program is the National Institutes of Health (NIH) Summer Internship Program for high school and college students, which places about 1,000 interns each summer from more than 7,000 applicants.

Many programs also provide a cohort of fellow interns, and getting to know them and sharing the summer with them can be one of the most rewarding parts of the internship. It's pretty easy to tell how powerful the peer component is by reading testimonials of past participants on the program's website.

The major limitation of formal programs is that there just are not enough of them! A second limitation is that, even if you get into one, it can be difficult to continue to work with a mentor after the program ends.

Create Your Own Research Internship

The majority of high school students who do research—including those who make it to the highest levels in science fair competitions—do *not* do their research in formal programs. They do their projects on their own, or they arrange their own research internships. Unfortunately, there's no simple recipe for creating your own.

A big advantage of arranging your own internship is that you will have much more say in the research topic and the technology you'll use to pursue that topic. And if you arrange an internship near home, you may be able to extend it beyond the initial commitment, continuing your work during the school year or over multiple years.

You don't have to have a specific research question in mind when you contact labs, but you should know enough to be able to tell the lab director why you'd like to spend your summer in their lab.

How do you know what research a lab is doing? It's easy to find out about the research interests of faculty; their web pages outline their general interests and current projects, and their publications will tell you much more. So you may want to start with universities. But you can also look for other research facilities in your area, such as hospitals, government labs, and industrial research labs. It can be harder to learn what's going on in hospital and government research labs, as those scientists may not have public web pages. Industrial research labs typically do not publicize ongoing research. To find out what's going on in these labs, you need to know someone who works there.

Knowing someone is the best way to get in any door. If you are lucky enough to have a parent, relative, neighbor, or friend who works in a lab, you have a huge head start finding a sympathetic scientist. Even if the person you know can't offer you a spot, they can help you network and look for someone who does.

If you must make "cold calls" (or emails), expect a lot of rejections. A lot. 2012 Intel Science Talent Search winner Nithin Tumma contacted over 100 labs, and only three said maybe. And 2012 Intel ISEF winner Jack Andraka contacted 200 labs, only one of which said maybe. But in each case, one was enough.

There are many ways to do research, and many kinds of experiences. Think about what you're interested in and how you'd like to explore it, then find a way to make it happen! i

For lots more ideas and assistance in all stages of doing research, visit Science Buddies at www.sciencebuddies.org.