

POSITIONS AVAILABLE: NO Ph.D. REQUIRED?

Not sure a Ph.D. is the best route? Take heart: There are plenty of opportunities in science for those who have a B.S. or M.S. degree. **By Jacqueline Ruttimann**

Upon completing college, many science undergraduates who don't want to go on to medical school think only one other option exists: pursuing a Ph.D.

A Ph.D. however, is not one-size-fits-all. While personally and financially rewarding in the end, those who choose this path should do so upon serious introspection. Long hours with low pay and dry spells in data are often the norm. Add to this the varied completion time which, depending on the program, ranges from four to eight years.

For those not sure of the life-style or time commitment involved, other fast-track options such as obtaining a Master's degree or entering a company exist. Many of these choices lie in not commonly considered industries or up-and-coming fields of study.

Food for Thought

A possible career may lie in the cereal you crunch or the soda you sip. Careers in the food industry are plentiful and in high demand, especially for budding scientists with either a Bachelor's or Master's degree.

"When most people think food science they think McDonald's and flipping burgers. Part of it is working on new types of beer, better packaging, and products that are environmentally friendly," explains **Martin Wiedmann**, director of graduate studies for the Department of Food Science at Cornell University, Ithaca, New York.

In technical terms, food science is the application of biological and physical sciences as well as engineering to the processing and manufacturing of foods in order to ensure their nutritive value, safety, and quality. To study the interactions of foods and food components, the field comprises several disciplines including chemistry, animal and plant biology, biochemistry, biotechnology, nutrition, physiology, microbiology, and engineering.

Professional food scientists also have the tall order of trying to increase the food supply to meet the demands of a rapidly growing population without straining the environment. "It's a great opportunity for people who like the application aspect of science and are looking to have a tremendous impact," says Wiedmann.

Cornell's Food Science Program offers two types of Master's degree: a one and a half to two-year Master of Science (M.S.), for those relatively new to research, and a one-year Master of Professional Studies (M.P.S.), for those already in a professional career but wanting to upgrade their core set of skills and knowledge. While both degree programs require classes and research with department faculty members, only the M.S. students must submit a research-based thesis. Each program is tailored around the individual student, in which the class schedule is worked out in collaboration with an adviser. Students have a choice of classes such as general and international food science, food microbiology and engineering, enology, dairy science, sensory science, and food safety.

The students are in such high demand, says Wiedmann, that "most of our students have two to three job offers by the time they end their senior year." These offers range from governmental institutions such as the U.S. Food and Drug Administration and the U.S. Department of Agriculture to various food industries such as breweries and chocolatiers.

"The program is a great stepping stone between academia and industry," says current M.P.S. student **Yankai Liu**. "It provides the skills and expertise that are essential for a future career."

On scholarship from his native country Singapore, Liu plans to return there and serve in the Civil Service. Before then, however, he is working on a project with food process engineering professor **Syed Rizvi** on methods to improve mineral fortification of rice. The rewards of his efforts are plenty: if perfected, the rice could aid those suffering from malnourishment. **continued »**



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Alexandra Doronkin



Tony Yuan



Sam Alcaine

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“The global demand for grain and record commodity prices are driving up demand for faster delivery of new products with better technologies.”
—Dave Bubeck



Recipes for Success

“Lab work for the sake of lab work wasn’t really interesting, and I didn’t want to be in grad school that long,” says **Sarah Kirk** who, after getting her biology degree from Hiram College, spent a couple of years as a lab tech in a microbiology lab at Case Western University, Cleveland, Ohio.

Cornell’s program was a perfect fit. Kirk worked with food science professor Kathryn Boor on why flavored milk spoils faster than unflavored milk, and was hooked. Upon graduating, Kirk landed a job at M&M/Mars, where she specialized in confections and worked for five years on Starburst and helped launch mint Skittles. She is now at Kashi, where she works on whole grain and naturally healthy products ranging from cereals to snack bars. Although the food products differ, the extensive technical background from Cornell’s program enabled her to easily make the switch.

“Only one or two companies prefer Ph.D.s,” says Kirk. “A Master’s degree was enough to get my foot in the door.”

Alum **Sam Alcaine** has a job that most scientists who homebrew would crave: He works as a product developer at MillerCoors. While a senior majoring in cellular and molecular biology and genetics at the University of Maryland, College Park, brewing became a hobby to Alcaine. Wiedmann called and offered him an opportunity to combine his loves of genetics and yeast fermentation. “That basically sold me,” he says. He worked on his M.S. in Wiedmann’s lab on the transmission of antibiotic resistance genes among different *Salmonella* strains, and through the department’s social network, landed his current job. “When looking for a Master’s program, it doesn’t always have to be your angle, but it does have to give you the tools,” he advises.

Field of Dreams

Those not looking to go to graduate school right away and who would rather move straight into the work force could consider the agricultural biology industry. A not-too-distant cousin to food science, agrobio entails research and development of seed crops.

“The global demand for grain and record commodity prices are driving up demand for faster delivery of new products with better technologies,” explains **Dave Bubeck**, North American research director at Pioneer Hi-Bred International, a leading global source of customized solutions for farmers, livestock producers, and grain and oilseed processors.

Plant breeding is a multidisciplinary field. Those who have entered it have had backgrounds in agronomy, agricultural engineering, plant sciences, entomology, botany, general biology, molecular biology, and genetics. As the field has become more computer based, it is not surprising to find even those with a mathematics

or statistics degree. “There are excellent growth opportunities for those with a Bachelor’s or Master’s degree. The ratio in research and development groups in the seed industry of Ph.D.s to undergrads/Master’s students is approximately 1:5,” says Bubeck.

The timing for Bachelor’s and Master’s students, according to Bubeck, has never been better. Pioneer operates more than 90 worldwide research centers and has undergone a significant expansion in its R&D department. Nearly 300 new positions in this department were added in 2007, and the company plans to offer more than 300 additional positions this year—most of which will be non-Ph.D.

Similarly, over 70 percent of research associate positions at Monsanto are filled by those who have either a Bachelor’s or Master’s, says **Alexandra Doronkin**, the company’s technology recruiting lead. Many who continue to work at Monsanto quickly climb the corporate ladder. “We go by contributions people make,” she says. “We have many examples of people with Bachelor’s or Master’s degrees leading scientific project teams and managing key functions.”

Bubeck offers the following piece of advice to future college graduates: “If you’re not certain of pursuing a graduate degree after your Bachelor’s, it may be more beneficial to get out into the work world first. If it leads you back to grad school, you are more committed to it.”

Best of Both Worlds

Contemplating a career in either medicine or science? You may be able to find the best of both worlds in genetic counseling.

With the advent of next generation sequencing technologies, even more is being learned about our genetic makeup. However, there is a great need for this information to be translated to patients or relatives who are at risk of an inherited disorder. These people need to understand the disorder and its consequences, the probability of developing or transmitting disease, and the prevention options needed for personal health choices or family planning.

“It’s part science, part counseling,” explains **Angela Trepanier**, certified genetic counselor and president of the National Society of Genetic Counselors. “For somebody who really likes science but is not interested in becoming a physician or working on the bench as a Ph.D.—but is interested in working with people—this is a great profession to choose.” **continued »**

Featured Participants

American Board of Genetic Counseling
www.abgc.net

Pfizer
www.pfizer.com

Cornell University
www.cornell.edu

Pioneer Hi-Bred International Inc.
www.pioneer.com

Monsanto
www.monsanto.com

University of Alabama-Birmingham
www.uab.edu

National Society of Genetic Counselors
www.nsgc.org

Wayne State University
wayne.edu

Northwestern University
www.northwestern.edu

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Careers and Graduate Programs for B.S./M.S. Scientists



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The profession is small but growing. Currently there are around 3,000 genetic counselors in the United States and numbers are growing worldwide. Those who enter the field go through Master’s programs, of which there are 29 in the United States and three in Canada that are accredited by the American Board of Genetic Counseling. Typically those who enter have some sort of biology or psychology undergraduate degree. However, those in nursing, public health, and social work also apply.

At the Genetic Counseling Graduate program at Wayne State University School of Medicine, Detroit, Michigan, where Trepanier is program co-director, students take basic science, medical genetics, and counseling course work. In addition, they perform internships in a variety of clinical settings in which they first shadow and then perform the duties of a professional genetic counselor. Students also do a clinical research project based on some aspect of the career. Graduates, most of whom sit for a national certification examination, go on to various areas including clinical care, public health, industry, and nonprofit organizations.

Although genetic counseling first started with the detection of birth defects in prenatal and pediatric patients, “the profession has blossomed and grown,” says Trepanier. Cancer genetics became a specialty in the 1990s, and now cardiovascular and psychiatric diseases are up-and-coming focuses.

“People who go into it tend to be into lifelong learning since the field is constantly changing,” she says. Yet, says Trepanier, one can achieve work and life balance. “There’s time to be a genetic counselor and still have a life.”

For those who are interested, she suggests contacting and shadowing a genetic counselor for a day. She also advises getting some advocacy and counseling experience so prospective applicants can see whether they can work with people who are in crisis. Alternatively she advises contacting any of the graduate programs. “We want to talk to potential students. We’re as interested in them as they are in us,” she says.

Before entering the program, **Tiara Johnson** interned at a genetic counseling clinic and found her calling. “I really love the program. I’ve learned so much in such a short amount of time,” says Johnson, now a second-year student. “Just knowing I could get done in another two years and be able to start a career that is highly recognized and respectable has meant a lot to me.”

Like Johnson, recent graduate **Jacqueline Gauthier** feels secure in the future of her profession. “Genetics is very cutting edge and is going to change the face of medicine as we know it,” says Gauthier, who now works at the Genetics Department at the University of Alabama-Birmingham and specializes in cancer and prenatal genetic counseling. “The positions are growing. Ten years from now, I don’t have to make a total career shift.”

A Scientist for All Seasons

Tony Yuan was at a career fork when he graduated from the University of Texas at Dallas with a biology B.S. He didn’t know whether he should go on to medical school or work toward a Ph.D. When he received an e-mail about a Master’s program at Northwestern University, he jumped at the chance. “I didn’t want to spend that much time for a Ph.D. This program gives you a feel if you’re a bench scientist or not.”

The Master of Biotechnology program at Northwestern is a 15-month curriculum that stresses the interdisciplinary nature of the biotechnology industry and cross-trains former biology and engineering majors in each respective field for careers in the biotechnology or pharmaceutical industries. “Upon completion, these students are able to communicate across disciplines and are prepared for a wide variety of positions,” assures program director **William Miller**.

The rigorous program combines coursework in bioprocess engineering and seminar classes in the ethical, legal, regulatory, communication, and business aspects of the biotechnology industry with over a thousand hours of research. In lieu of a thesis, written and oral research reports are required.

While the majority of course graduates go on to biotechnology and pharmaceutical industry companies such as Bristol-Myers Squibb, Amgen, Merck and Company, and Pfizer, about a quarter pursue further graduate education.

“The program gives you a gateway into industry,” says recent alum **Kavi Mehta**, who now works in cell culture process development at Pfizer. “My earning potential went up almost three times and I’m working on more advanced projects.”

Upon completing Northwestern’s program, **Kanika Bhatia** discovered something about herself. “I’m not a sitting-in-the-lab type of person. I like my research a bit faster,” she says. More interested in qualitative and regulatory research, she is now enrolled in the Quality Leadership Program at GE Healthcare, where she does rotations in these respective fields. She suggests that students who are not so sure about research “really think about what they want to do. Your heart has to be 100 percent in it.”

Yuan concurs. “Look at all the options—especially if you’re looking to get a Ph.D. or go on to medical school. There is not just one road you can take.”

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DOI: 10.1126/science.opms.r0800057