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Out of College and Into a Rewarding Biotech Career

Just finished college and contemplating graduate school because you think you can't get a science job without more education? Think again. Many bachelor's-level scientists are beginning rewarding careers in what is now a growth area: pharmaceutical and biotech manufacturing.

Take Hank Stern, currently a manager of cell culture production operations at Genentech in South San Francisco. While attending the University of California, Davis, Stern worked as a research assistant for the Robert Mondavi Winery. Following his graduation in 1983, he got a job with Contadina, then at Xoma Corp., before joining Genentech. Stern says the diversity of his background was an asset. "A lot of the principles and equipment are the same. You will find large tanks and large control systems in many different industries," he adds. Recruiter David Jensen puts it this way: "A manufacturing scientist is a scientist who has gone from working with problems on the bench to working on those at a much larger scale—for example, the microbiologist who moves from shake flasks to three-story-high fermentors."

This is one of a series of pages in *Science* linked to features on *Science*'s Next Wave, the AAAS/*Science* Web site for young scientists (www.nextwave.org). This story highlights an alternative career feature on "Careers in Manufacturing" in the "New Niches" section of the Next Wave beginning 5 December and running until 6 February 1998.

Beginning on 5 December, *Science*'s Next Wave will run a special feature on careers in manufacturing. The package, part of the "New Niche" section, presents inside information on careers in manufacturing as well as what companies are looking for in new hires.

Jobs for manufacturing scientists exist in many different industries, including food, biotech, and pharmaceuticals. Once they get into the manufacturing arena, many scientists find it easy to move between industries. Manufacturing scientists must bridge many different worlds. In addition to mixing solutions, they are intimately involved with the computer control systems in the manufacturing plant. "It's a neat mix between the mechanical works, computer process control, and technical knowledge," says Stern. Manufacturing scientists must be able to troubleshoot the automated processes as well as understand the processes involved in cell growth, making use of the abstract knowledge they have obtained in school.

Manufacturing scientists operate under a series of guidelines referred to as good manufacturing practices or GMPs. As with any area that requires strict adherence to regulatory guidelines, working in manufacturing involves a lot of documentation and verification. Entry-level manufacturing scientists, usually referred to as manufacturing technicians, may spend their days cleaning tanks, preparing buffer or media solutions, or operating large fermentors and other equipment.

What do hiring managers look for in entry-level employees? "We look for a variety of backgrounds," says Stern, "but when I interview I look for four main things." First on Stern's list is a technical background with basic math and science skills. Then there's evidence of mechanical ability, whether it's fixing cars or working on plumbing. "We're looking for people who aren't afraid of working with their hands," says Stern.

The third facet of an ideal applicant is the ability to communicate well. Because manufacturing scientists must work closely within a team, communication is critical. "The [manufacturing] process from beginning to end can take 3 months," says Stern, "and anything that goes wrong in between can mean failure of an entire [manufacturing] lot," at a cost that can top $1 million. "It's a lot of responsibility," adds Stern, "and mistakes can be very expensive."

The last thing Stern looks for is previous work experience. "It could be anything," says Stern. Holding a part-time job in school such as waiting or bussing tables in a restaurant shows that applicants are willing to work hard. "Most students coming straight out of school usually don't feel that their work in the deli or as a maintenance mechanic is appropriate for their résumé," says Stern, "because it doesn't have anything to do with their next job. But it really does, and we certainly look for that as employers."

In making the transition from college to working in a manufacturing environment, previous work experience and a good attitude can be the keys to success. Stern's colleague, Rebecca Graulich, manager of logistics and cell culture production at Genentech, worked as a summer intern at Hughes Aircraft during college and learned what it was like to be in a corporate setting. "It's not like being in college," says Graulich, "where what you do only affects you." In business, "being successful requires applicants to be good group contributors. If you're willing to learn and don't let your pride get in the way," she adds, "there's really nothing you can't do."

When most students think of going to work in industry, they think of going into research. "However," says Stern, "most [career] opportunities are not in research but in quality control, quality assurance, and manufacturing. And "manufacturing," says Jensen, "is a good career choice because it's a growing [area]." Another bonus of beginning your biotech career in manufacturing is that manufacturing scientists can move easily into other areas such as quality control, quality assurance, regulatory affairs, or process development, say Stern and others.

All in all, young scientists who think they might want to postpone graduate school for a while may find that an entry-level job in manufacturing is the way to go. It's an excellent way to make use of the basic science learned in college, providing a way for new college graduates to apply their skills. In addition, it's an ideal entry point into many other areas of the industry. And as more companies get their products ready to bring to market, it also promises to be an area of significant growth.

–Nicole Ruediger

For more information on careers in manufacturing, please go to *Science*'s Next Wave, on the World Wide Web at www.nextwave.org, and look under the "New Niches" heading on the home page. There you will find essays by the people mentioned in this story, along with resources that will help you get started.