

employment outlook

OPPORTUNITIES FOR 2011 AND BEYOND

COURTESY OF CRAIG W. LINDSLEY/VANDERBILT UNIVERSITY

GOAL ORIENTED Brittney Bates, a Vanderbilt University medicinal chemistry graduate student, works in a lab analyzing LCMS tests.



CHANGING THEIR WAYS

As students continue to flock to drug development, **CHEMISTRY DEPARTMENTS ADAPT** their programs

DAVID PITTMAN, C&EN WASHINGTON

AS AN UNDERGRADUATE chemistry student at the University of Michigan, Anthony Emanuele sometimes drove past the abandoned Pfizer campus in Ann Arbor. In 2007, the drug giant had shuttered the grounds—gigantic at 174 acres and more than 2.3 million sq ft of buildings (C&EN, Jan. 29, 2007, page 7). “I actually submitted an internship application to the site about two weeks before they announced they were shutting down,” Emanuele says.

“Needless to say, I didn’t get offered a position.”

The sprawling campus serves as a sobering microcosm of a troubled pharmaceutical industry that has slashed domestic jobs and mothballed facilities across the U.S. in the past few years. C&EN estimated in early 2009 that almost 130,000 pharmaceutical workers had been laid off during the prior three years, and the numbers have only gotten worse since.

Despite the currently bleak employment picture, however, Emanuele and his classmates at Michigan still want to pursue careers in drug discovery. “When I started my undergraduate career five years ago, I knew I wanted to be involved in doing some form of medicinal research,” says Emanuele, a 23-year-old Riverview, Mich., native who enrolled this fall in Michigan’s medicinal chemistry Ph.D. program.

Stunningly, he isn’t alone; students

& MORE ONLINE

To learn more about how some academic programs have taken advantage of drug company woes in their hometowns, click on this story at *C&EN Online*, www.cen-online.org.

across the U.S. continue to turn to similar graduate programs while their peers who have graduated often struggle to find work. In effect, students are disregarding sour economic news of drug companies and pursuing their dreams of developing medicines.

“The number of applications to our program has held steady for a number of years, despite the economic downturn,” says Joseph E. Rice, medicinal chemistry graduate program director at Rutgers, the State University of New Jersey, which enrolls 20 to 22 students in the program. “Every student who has graduated from our program has found employment in the medicinal chemistry field, with the vast majority going into industry,” he states.

In fact, none of the more than half-dozen programs of varying size and prestige contacted by C&EN has seen a drop in applications as a result of the recent downturn in the pharmaceutical industry. All say that interest has remained the same or increased in the past few years.

Nevertheless, academic programs where students like Emanuele train are adjusting their teaching and research methods to create more marketable graduates for the precious jobs that become available in today’s dynamic industry. As certain pharma jobs are outsourced and those that remain are refined, medicinal chemistry graduate programs are moving to a more well-rounded content mix that includes more biology and pharmacology. Medicinal chemistry programs have almost always had some sort of biological component, but recently they have delved deeper into topics such as toxicity, metabolism, and how molecules behave and interact in the body.

SCHOOLS ALSO are emphasizing more integrated teamwork with other disciplines to promote the collaborative style of research that today’s biotechnology companies demand. Small start-up biotechs have risen as big pharma has fallen hard. Chemists in academia and industry say these new companies demand more diversified scientists, researchers who don’t specialize in a single area such as synthetic organic chemistry.

These well-rounded candidates are prized at traditional pharma firms as well. Joel C. Barrish, vice president in discovery chemistry for Bristol-Myers Squibb, says his company tries to hire a few postdocs or recent Ph.D. graduates for drug discovery

each year. Applicants who have broader training and more experience with collaboration fare better in the recruitment process. “The more creative and innovative solutions or approaches they can bring to problem solving” the better, Barrish says.

To help meet this need, the University of Minnesota now offers a course in which medicinal chemistry Ph.D. candidates work with grad students in fields such as biology and engineering to learn to collaborate in interdisciplinary teams. That training

just tremendously uncertain right now.”

To provide a broader background for grad students, the chemistry department at the University of California, Berkeley, offers a graduate-level course in chemical biology that serves as a jumping-off point for more detailed courses in chemistry and biology. “We are trying to teach people who are very good chemists to really understand biology” and, maybe sometimes for the first time, to teach those who are very good biologists a deeper level of chemistry,

says Michael A. Marletta, a chemistry professor at Berkeley.

For its part, Michigan just graduated its first cohort from the chemical biology graduate program the school started six years ago. “The idea is to train students to be flexible, creative thinkers who can solve problems from a variety of different perspectives,” says Anna K. Mapp, director of the program. “Certainly, they’ll be well positioned in a changing pharmaceutical industry.”

NOR IS COURSEWORK the only avenue for students to gain pharmaceutical experience. Some academic programs have stepped in to fill the development void left by drug companies that have cut back on

research and innovative science, and students are benefiting from the new work. Academic labs increasingly are forming partnerships with industry to develop treatments for diseases often bypassed by biotechs and big pharma. Students in these programs work alongside university staff researchers—many of whom were formerly employed by pharmaceutical companies—as they usher a prospective molecule from basic science to clinical trial.

P. Jeffery Conn at Vanderbilt University called on experience from his former job at Merck & Co. to establish Vanderbilt’s Program in Drug Discovery. Last year, Vanderbilt received \$10 million in an up-front payment from Janssen Pharmaceutica, the mental health arm of Johnson & Johnson, to develop schizophrenia treatments (C&EN, Jan. 19, 2009, page 10). The school will receive further payments if it meets certain milestones.

LOOKING FOR JOBS

Medicinal chemists face higher unemployment than all chemists

EMPLOYMENT STATUS	ALL RESPONDENTS		MEDICINAL/PHARMA SPECIALISTS	
	NUMBER	PERCENT	NUMBER	PERCENT
Full time	6,273	87.7%	657	86.6%
Part time	224	3.1	14	1.8
Postdoc	177	2.5	24	3.2
Not working but seeking employment	271	3.8	42	5.5
Not working and not seeking employment	68	1.0	13	1.7
Fully retired	136	1.9	9	1.2
TOTAL	7,149	100%	759	100%

SOURCE: 2009 ACS comprehensive salary and employment status survey of members

complements the traditional educational approach, in which students work independently on a single project for a single mentor. “That’s not the only attribute you really need to have to be effective to work in industry, particularly in small or medium-sized companies,” says Carston R. (Rick) Wagner, director of Minnesota’s medicinal chemistry graduate program.

In fact, those graduate students and postdocs who are strictly trained in organic synthesis are having problems finding jobs, according to Wagner. Candidates who have more biology and pharmacology in their background seem to have better prospects. “The days of going into big pharma and getting a job in making molecules the rest of your life and retiring after 30 years are over,” Wagner says. “There’s a tremendous amount of opportunity that exists in the arena of drug design and biotechnology. It’s

“The more creative and innovative solutions or approaches they can bring to problem solving” the better.

Vanderbilt students benefit from exposure to the 90 staff scientists in the program's labs. These staff researchers are non-tenure-track faculty, and so unique to academia that the university's human resources staff had to create a new salary system for them.

In the course of their program, medicinal chemistry students also work with those from other areas such as the drug metabolism and clinical pharmacology departments and help ferry promising molecules and drug candidates through the discovery and testing process. Even so, as they work toward the program's goals, the staff scientists encounter the same obstacles their industry counterparts face: They must discard once-promising drugs because of a problem with metabolism, lack of market, or some other flaw. Yet these failures are useful teaching tools. "Those compounds can still tell great academic stories, and that's what the graduate students work on," says Craig W. Lindsey, director of medicinal chemistry at the Vanderbilt program.

Previously, medicinal chemistry students at Vanderbilt—just like their counterparts at other schools—were trained purely in synthetic organic chemistry and picked up biology at the drug firm that hired them. The new style of training goes much further. "When they go for an interview, they've got all the classical stuff that companies look for, but now they can also show how they actually worked on a real drug discovery project the same way we worked on programs at Merck and Pfizer and Lilly," says Lindsey, who previously worked at both Merck and Eli Lilly & Co.

Other universities are also broadening their students' horizons. Emory University and Temple University have drug discovery programs similar to Vanderbilt's (C&EN, April 20, 2009, page 25). And Pfizer announced last month the first of a series of academic networks to accelerate the translation of basic science to drugs (C&EN, Nov. 22, page 5). Such partnerships have generated concerns about academic freedom and intellectual property rights (C&EN, Nov. 29, page 3). Yet they may become more common as academic endowments recover from losses suffered in 2008 and 2009, according to Berkeley's Marletta.

Although exposure to the drug discovery

process is highly valued by some employers, that experience shouldn't be obtained at the cost of the basics. In the ACS Virtual Career Fair webinar early last month, two veteran researchers still working in industry stressed the importance for students entering the drug design field to first master chemistry, then supplement that training with knowledge of biology.

ONE OF THOSE veterans—Bruce F. Molino, senior director of medicinal chemistry at Albany Molecular Research Inc.—said scientists continue to push drug candidates that are challenging to synthesize in a lab. "The art and the science of synthetic organic chemistry is very much alive and needed today," Molino told the webinar's audience. "The requirement to be able to make complex molecules is absolutely essential."

David Kimball, chief scientific officer for Cambridge, Mass.-based Hydra Biosciences, said during the webinar that it's critical for today's drug discovery researchers to be

person who has the fundamentals, the tool kit, and we will be the finishing school," Barrish says. "We really think that high-level drug discovery is hard to do in academia, and it's really best taught on the job."

Successful job candidates bring to the table an eagerness to learn about new areas, an ability to lead, and masterful problem-solving skills. And once BMS has brought them up to speed on drug discovery techniques, these employees are ready to tackle "the really game-changing challenges—trying to identify novel ways to expand the druggable genome, trying to bridge gaps between protein therapeutics and traditional small-molecule drugs," Barrish says. "To me that's what you're looking for, the people who can really make a difference there."

It appears many of today's students are undaunted by the sour job prospects that are plaguing others. For better or worse, students—including Michigan's first-year medicinal chemistry graduate student Aubrie Harland—are following their heart

ACS MEMBER SUPPORT

Help For The Unemployed

Many chemists are still struggling to find jobs. The American Chemical Society offers special discounts and career assistance to its unemployed members.

National dues: Waived^a

National meeting registration: Free

Regional meeting registration: Reduced registration fees

ACS-Harvard business skills courses: Enroll in one for \$25, get three free

ACS Leadership Development System: Reduced rate^b

ACS ProSpectives and Short

Courses: 50% discount

ACS Member Insurance Program: Life insurance premiums deferred

For a full listing of benefits for unemployed members, visit www.acs.org/unemployed.

Free career-assistance tools for all ACS members:

Virtual Career Fair
ACS webinars

"ACS Careers" blog

Personal career consulting

Access to the ACS

Network (www.acs.org/ACSnetwork)

For more information, visit

www.acs.org/careers.

^a Apply for a waiver by contacting ACS with your name and member number via e-mail at service@acs.org or by calling (800) 333-9511 or (614) 447-3776. Dues may be waived for up to two years for unemployed members in good standing. ^b Enroll in one online course for \$25, get three online courses free.

grounded in chemistry and biology. But a fundamental understanding of synthetic and mechanistic chemistry is essential. "Everything else can be learned later, but the basics are the most important things," he said.

Bristol-Myers Squibb's Barrish dismissed some notions that graduates and job seekers who lack broader science knowledge are struggling to find jobs. He said BMS still seeks talented synthetic chemists and then bolsters their knowledge with needed skills in biology and other sciences. "We're okay with bringing in a

and their love of chemistry. Concerns about looking for a job will come later for them. "Right now, my next step is choosing a lab to join and working on my Ph.D.," Harland says. "I suppose once I am a fourth- or fifth-year I'll start thinking about my next move."

Emanuele believes the market will change between now and the time he receives his Ph.D. "I am not very worried about getting a job when I graduate," he says. "I have about five years until I receive my degree, and I think the pharmaceutical industry will bounce back by then." ■