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New Career Paths for Science-Trained Professionals

A Progress Report on the Alfred P. Sloan Foundation's Professional Science Master's Degree Program

by Cassandra Simmons

The growth of high-tech industries depends greatly on the availability of a workforce that is adequate not just in numbers but, more importantly, in professional scientific qualifications. Even in the current downturn, the demand for a skilled scientific and technological work force outstrips supply in many areas. The gap is a result of vigorous growth in the decade 1992–2001. For example, the biotech industry more than doubled its employment in that decade from 79,000 to 191,000 and projections for the future indicate that the gap will continue to grow.¹ Several current trends will potentially affect employers' efforts to recruit the most desirable candidates. Some of these trends may be contradictory and it is hard to predict their net effect in specific cases. According to The Conference Board's recent study *Sustaining the Talent Quest*, most industries have found that electronic channels such as e-recruiting vastly

expand employers' access to some segments of the talent market they prize most highly.² Besides maximizing both the number and variety of respondents, e-recruiting also tends to bring them the Internet-savvy prospects they want. It has proved especially effective in proactive outreach efforts aimed at college students and even, on a modest but growing scale, at science-oriented high-schoolers.

Work force analysts are in broad agreement that the burgeoning needs of the science and technology industries demand more focused, more industry-responsive, and shorter, timelier educational opportunities. An urgent need is to prepare graduate students for specific scientific/technology careers outside of academia, in sectors of industry already beset by a significant and continuing shortfall in the workforce pool.

¹ Ernst & Young, cited by the Biotechnology Industry Organization on its Web site, www.bio.org/investor/signs/200210emp.asp.

² David Dell and Jack Hickey, *Sustaining the Talent Quest: Getting and Keeping the Best People in Volatile Times*, Research Report 1318, The Conference Board, 2002, p.16

Despite the current business downturn, science and technology industries continue to constitute a highly promising sector for economic growth in the United States and worldwide. This report describes a joint project of the Alfred P. Sloan Foundation and The Conference Board to help ensure that this potential will be fully realized.

The Sloan Foundation launched its Professional Science Master's (PSM) Degree Program in 1997 and, as The Conference Board survey reported here

confirms, it has already proven its value for helping to foster new professional MS Degrees. The Sloan/The Conference Board partnership is designed to broaden the reach of the program, to market it as a catalyst for other programs, and to institutionalize the value of PSM degrees in industry. The present report concludes with recommendations for the next steps needed to achieve those goals. For further information on the PSM program, you may go to the PSM Web site:
www.sciencemasters.com/recruiters

The Sloan Foundation/ The Conference Board Partnership

The Alfred P. Sloan Foundation's Professional Science Master's (PSM) Degree Program began in 1997 with 30 participating universities. The program is open to holders of bachelor's and other degrees, mainly but not exclusively in the sciences, mathematics, or engineering. The PSM program is aimed at students with an interest in wider career options than those provided by existing degree programs and, more specifically, those interested in careers outside academia. These careers include such fields as research management, technology transfer, consulting, banking, and insurance.

The value of the PSM concept is evident by the fact that 91 percent of the program's first graduating class had received job offers by 2002. The Sloan Foundation recognized, however, that by bringing corporations into partnerships with the universities, the program could become even more effective in increasing the pool of professional scientists qualified and motivated for careers in industry. In mid-2002, the Sloan Foundation and The Conference Board agreed to collaborate on an impact assessment of the PSM concept to examine the viability of increasing the number and effectiveness of these partnerships. The Conference Board would assess the achievement of the program, provide liaison and foster academic partnerships with employer companies in science and technology industries, and recommend further steps to broaden the reach of the program.

In the months that followed, The Conference Board conducted a Web-based survey of the first cohort of the PSM program's graduates. The survey questioned graduates about both their academic training experience and their subsequent work experience.

While the survey was underway, The Conference Board co-hosted a forum on the topic "New Careers, New

Career Paths for Science-Trained Professionals," with the New Jersey Institute of Technology. The forum began the formal integration of the two crucial aspects of the PSM program. The academic programs were presented to industry representatives, who, in turn, described their work environments and their need for a larger pool of scientific professionals oriented toward the business needs of biotechnology and other scientific industries.

The Conference Board's findings and the enthusiastic response of participants in its forum both confirmed that the Sloan Foundation had identified a compelling need and that its PSM program is an effective catalyst for building a scientific talent pool vital to the future of the U.S. economy. The program provides a strong basis for other joint initiatives to extend its reach, inspire similar programs, and demonstrate the value of the PSM degree in industry.

The PSM Employment Survey

Many factors can affect the success of such programs and their continuing attraction for students. The Conference Board's PSM Employment Survey was designed to determine how successful PSM graduates were in securing employment and how various factors in the PSM programs might have contributed to this success. The survey was conducted in two rounds in 2002 among graduates of 12 participating universities. The first round occurred in May. The second round in November went to graduates who had not responded to the first and to others who had been contacted by their schools in the interim.

The link to The Conference Board's confidential Web survey was distributed to PSM graduates by participating universities. Upon completion, the survey was transmitted directly to The Conference Board for compilation and analysis. This process ensured the confidentiality of each respondent.

The participating universities are as follows.

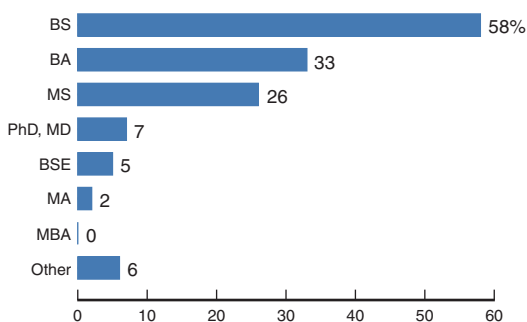
- Case Western Reserve University
- Claremont Graduate University
- Georgia Institute of Technology
- Keck Graduate Institute of Applied Life Sciences
- Michigan State University
- New Jersey Institute of Technology
- Northeastern University
- Rensselaer Polytechnic Institute
- University of Arizona
- University of California, Santa Cruz
- University of Southern California
- University of Wisconsin, Madison

The 56 responses from the graduates of these universities' programs represent an 89 percent response rate and provide a profile of the graduates, their job search strategies, and their placement and compensation, as well as insights into features of the programs and their perceived usefulness.

Survey Participants

The recent PSM graduates in the survey had already earned a variety of other degrees, including 96 percent holding bachelor degrees (Chart 1). About two-thirds of these were BS or BS in Engineering (BSE), while the rest were BA degrees. 27 percent held a master's degree (overwhelmingly MS degrees and no MBAs). A sprinkling of "other" degrees included both Ph.D. and MD degree recipients.

Chart 1
Previous Degree Granted

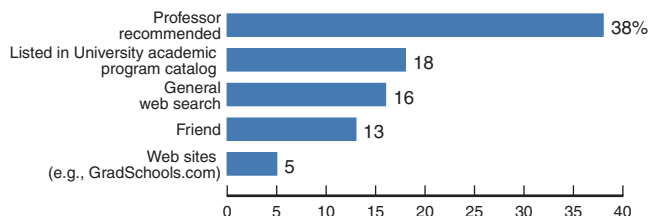


As already noted, the over-all attraction of PSM programs is that they can increase candidates' marketability in the industry talent markets they aspire to. Each student's choice of a particular program, however, results from a recruiting process, in which a university convinces the student that its program is an appropriate fit with his or her particular goals and previous academic accomplishments.

Most universities face limits on resources they can use to recruit prospective graduate students. Recruitment efforts generally involve representation at selected regional graduate recruitment fairs, the placement of ads in scholastic journals, booths at meetings of professional societies, and use of the Internet to describe opportunities available at respective institutions.

Of these several recruiting channels, over a third of the students rated professor recommendations as an important way of initiating them to the PSM partnership at their school (Chart 2). Less than one-fifth of the respondents reported that they learned of the program through Internet searches, university catalogs and program descriptions, or other contacts.

Chart 2
How Did You Find Out About the PSM Program?



Recruiting for the PSM programs parallels to some extent both the processes of corporate recruiting of employees and the search strategies of job candidates. As noted earlier, a recent Conference Board study found that for many companies e-recruiting vastly expands access to some of the most desirable segments of the talent market. But, although job seekers often have their first contacts with employers via the Internet, job boards, or corporate Web sites, many recruiters find that their most successful recruitment efforts depend at some point on creating a sense of personal relationship or "fit." E-channels can begin the building of such relationships, for example, through targeted outreach to specific colleges or student populations. But, at some point before hiring, personal contact can be critical. Such relationships are a major reason for the popularity of "employer branding."

The importance of the personal word showed in several findings. Recommendations from professors and from friends were mentioned by more than half of the graduates (38 percent). Listings in universities' catalogs of academic programs were the second-most-cited source (18 percent) of information about the PSM programs. The surveyed graduates indicated that the academic caliber of their respective programs and the presence of interdisciplinary curricula were important factors in their choice.

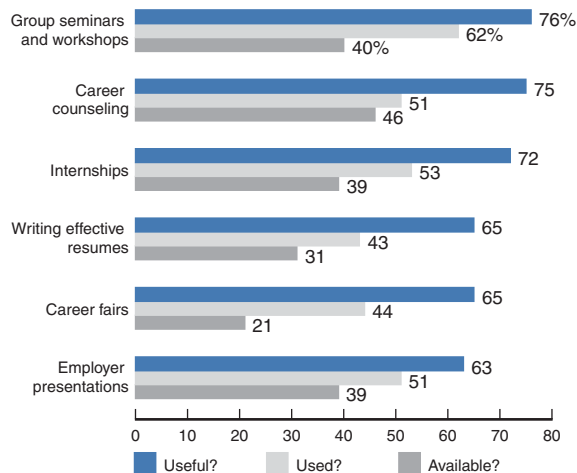
However, Web-based resources were probably at least as important. More than 16 percent of graduates said they had found out about their programs through general Web searches and another 12 percent gave credit to information taken from specific Web sites. These findings suggest that potential candidates for programs such as PSM are most likely to choose their program through some combination of "high tech" and "high touch."

Use of Career Services

Although academic features, reputations, and recommendations carry great weight in students' choices, the continued attraction and success of PSM programs will depend largely on their graduates' success in securing solid first jobs and establishing promising career ladders. Numerous studies underscore the importance of graduate students exploring their career options early in preparing themselves for the job market. So it is important for PSM programs not only to deliver the academic training appropriate to a career but also to provide support for eventual successful marketing of the degree. Such support generally comes from a university's Office of Career Services. While one-third of the graduates surveyed had used their Office of Career Services in support of a job search, more than half of those responding had not (Chart 3).

In addition, the graduates surveyed did not necessarily choose or benefit from the most commonly available services. Students most often took advantage of group seminars and workshops and internships. The services judged most useful were career counseling programs and group seminars and workshops. The services judged least useful were career fairs and programs in writing effective resumé and cover letters.

Chart 3
Use of Career Services

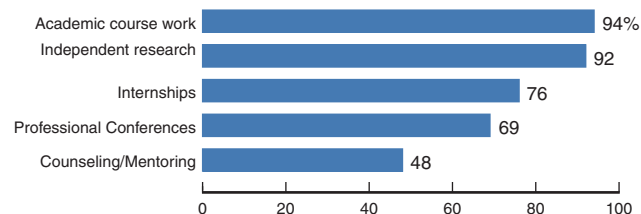


Use of Academic/Co-Curricular Activities

In addition to the career services offered, another benefit of the PSM program is the opportunity to participate in a variety of academic and co-curricular activities. An implied premise of such programs is that they should supplement students' science training with other kinds of educational experience. Some of the skills needed for business careers can come from academic courses and others through alternative sources.

Course work was cited as important by 94 percent of the respondents (Chart 4). A very close second (92 percent) was independent research, which at this level must be considered an integral part of the academic experience. Co-curricular programs, presumably coordinated by a career services office, were deemed less important. Among these programs, internships and attendance at professional conferences received a significant rank and counseling/mentoring ranked considerably lower on the scale.

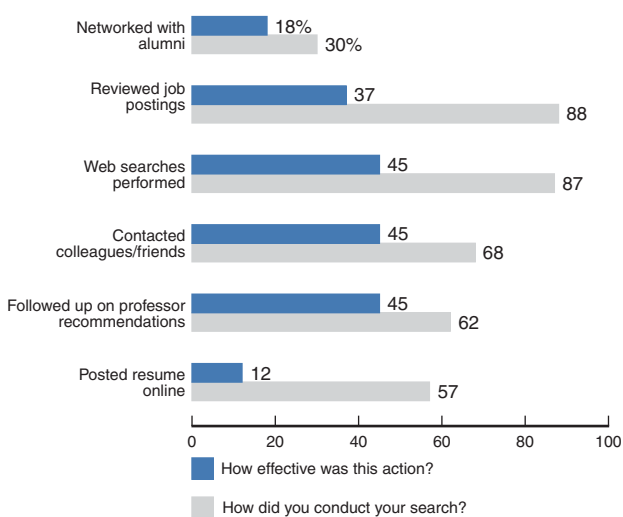
Chart 4
Importance of Academic/Co-Curricular Activities



The Job Search Process

The typical job search strategy of the surveyed PSM graduates was parallel to what they used to pick their PSM programs, in that both searches relied mainly on Web research and personal networking. Reviews of job postings and Web searches tied as the most-cited actions for job search (Chart 5). Also popular, if not as universally cited, were contact with colleagues and friends and follow-up on professors' recommendations.

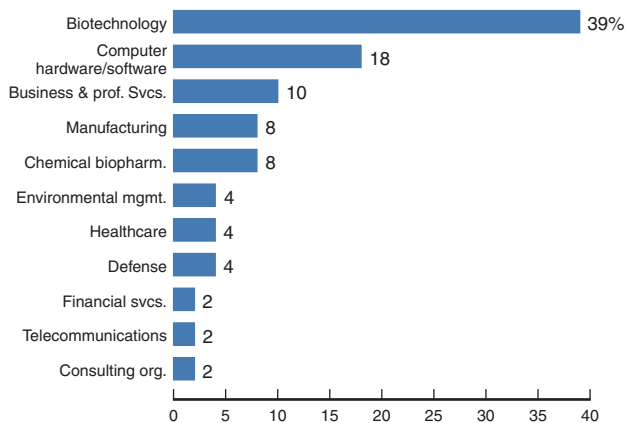
Chart 5
Job Search Actions



As to the relative effectiveness of these actions, there is a three-way tie between networking with colleagues and friends, following up on professors' leads, and Web searches. 45 percent rated these strategies either effective or very effective strategies, whereas reviewing job postings and networking with alumni yielded less favorable results. (Some other actions taken by graduates, in order of effectiveness, included using personal networks, responding to jobs listed in publications, attending professional conferences, and posting resumes online.)

When asked where they were employed or seeking jobs, 39 percent of those surveyed named biotechnology (Chart 6). This is more than twice the response given to the second most-cited industry, computer hardware and software (18 percent). These two industries together

Chart 6
In Which Industry Are You Employed or Currently Seeking Employment?



were the job destinations of nearly three graduates in five. When the chemical/biopharmaceutical industries and business services industries are added in, the four together account for more than seven graduates in ten. The rest were scattered in small numbers among eight identified industries plus a few "others."

Geographic Limitations for PSM Graduates

The dominance of the biotechnology industries in graduates' career aspirations and job placement raises an important issue relevant to their job search strategies, specifically, a willingness to look beyond one's own geographic area. The biotechnology industry in the United States is clustered in nine metropolitan areas: San Francisco, Boston, Philadelphia, New York, San Diego, Seattle, Raleigh-Durham, Washington D.C./ Baltimore, and Los Angeles. Only five of the surveyed institutions are within a reasonable distance from these major biotechnology industrial clusters. This concentration pattern requires graduates to be somewhat flexible in seeking both internships during the summer as students and employment as graduates. When graduates were asked where they had sought employment, nearly half said they had limited their search within their current geographical location (see Chart 7 next page). Of those who did so, 81 percent cited family responsibilities as the main reason for wanting to stay in the general area of their PSM program.

Job Search Results

Even despite the limits some of the recent PSM graduates imposed on their mobility, as a group they met with impressive success in securing employment in a time of economic retrenchment. The Conference Board survey found that 91 percent landed full-time positions within their field (Chart 8). Of the 25 graduates who indicated the number of job offers they received, two-thirds had received one job offer, under one-third had received two to four job offers, and the remainder had received four or more job offers. In terms of employment numbers, the PSM programs had a high rate of success and, of those who were not yet employed, 70 percent were still actively searching.

As noted previously, biotechnology industries employed nearly 40 percent of the graduates of the surveyed programs, and the second-highest concentration was in the computer hardware/software sector. The graduates are represented across the industry sectors and assume positions such as:

Associate Product Manager	Laboratory Manager
Product Manager	Bioinformatics Programmer/Analyst
Project Scientist	Quality/Process Engineer
R&D Associate	Science Editor
Transportation Planner	Research Scientist

Of the salary ranges reported by PSM graduates, about two-thirds of them reported earning above \$50,000, and 12 percent earned above \$70,000 (Table 1). A majority of graduates reported receiving additional compensation incentives as part of the hiring package. These incentives included payment of relocation expenses, signing bonuses, and tuition reimbursements. A few graduates reported offers of stock options and consulting bonuses.

Table 1
Annual Salary Range

14%		less than \$40,000
12%	\$40,000	less than \$45,000
6%	\$45,000	less than \$50,000
28%	\$50,000	less than \$55,000
18%	\$55,000	less than \$60,000
8%	\$60,000	less than \$70,000
12%	\$70,000	or more

Evaluating the Programs

On the whole, these findings confirm the essential success of the programs and they also suggest that the students who went into these programs did so with a sharp focus on their career goals. It appears, in fact, that opportunities to prepare for careers in such burgeoning fields as biotechnology are a powerful attraction of these programs.

For the staying power of such programs, it is important for them to fill a niche that no alternative fills. Employers' welcoming reaction to the programs' graduates in an uncertain economy is a sign of approval. The programs that The Conference Board studied have another advantage that sets them apart from typical graduate experience. In the talent market as a whole, increasing numbers of Ph.Ds end up in positions that are far from their interests, expectations, and academic qualifications. In contrast, PSM graduates matriculate from programs they have specifically chosen to prepare them for careers in applied research and development and/or industrial administration or management. The interdisciplinary nature of the programs provides solid grounding in students' respective technical fields buttressed with certification and/or training in complementary disciplines such as business and communications.

Chart 7
Did you limit your search geographically?

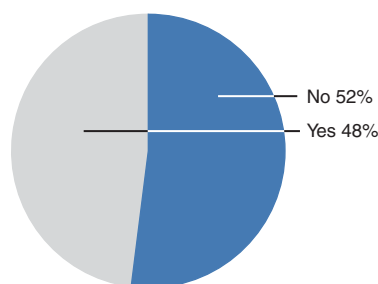


Chart 8
PSM Students Employed

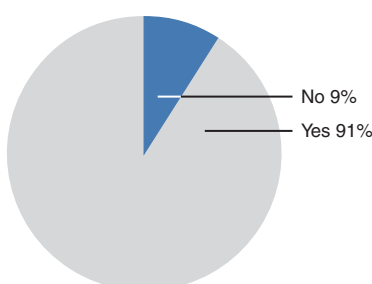
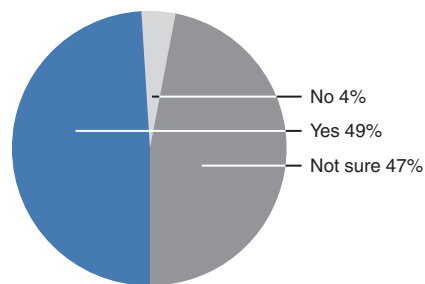


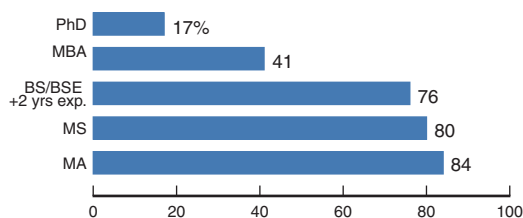
Chart 9
Do You Feel That Employers Will Value Your Degree?



A major concern for program developers was how employers would value the PSM degree in comparison with others. The survey asked PSM graduates if they felt that employers would value their degree. Although very nearly half (49 percent) of the graduates believed employers valued the PSM degree, almost as many (47 percent) were not sure (Chart 9). This ambivalence is not surprising, given the newness of the PSM initiative and the likelihood employers are not familiar with the degree.

But when graduates were asked how they viewed the PSM degree in competition with others, they gave it high marks. They overwhelmingly rated the PSM competitive with an MA or an MS degree and with the traditional BS/BSE plus two years job experience (Chart 10). A significantly smaller number felt that the degree was as competitive as an MBA and only 17 percent said that they considered it competitive with a Ph.D.

Chart 10
PSM Degree Is Competitive

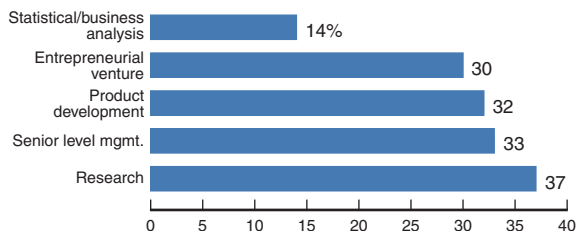


These findings indicate that PSM graduates, armed with their specialized degrees, have confidence that they can penetrate the work force and achieve a high degree of success. As more graduates of PSM programs realize their expectations, their performance will increase employers' awareness of the degree and bolster its value in the scientific talent market.

Long Term Goals

This conclusion is supported by students' responses on their long-range career goals (Chart 11). In a survey sample oriented toward science, it was not a surprise the top-ranked long-range career goal cited by respondents was research (37 percent). Nor was it surprising, given the nature of the degree they sought, that about one-third of them also cited aspirations to senior-level management (33 percent), product development (32 percent),

Chart 11
What Are Your Long Range Career Goals?



and entrepreneurial ventures (30 percent). Survey findings suggest that these ambitions are feasible, not only because typical PSM students came to their programs with a considerable depth of scientific/mathematics training, but also because other aspects of the programs—for example, realistic internship experiences—provided for assignments to authentic industrial team projects, thereby fostering the importance and development of teamwork and complex problem-solving skills.

The final question of The Conference Board's survey asked, "If you have been previously employed as a professional or have another advanced degree, how has this job-seeking experience compared with other job-seeking experiences you have had?" The question, being open-ended, drew far fewer responses than the easier to answer formulaic questions. Some of the graduates described the experience noncommittally as "not much different" than or "similar" to their previous job hunts. Others said their post-PSM search was harder. As a reason for both answers, many respondents cited the current economic downturn and job market rather than any essential differences attributable to the programs themselves. One respondent concluded from his experience: **"It has been difficult to find industries interested in hiring former college professors, even with updated skills."**

Another implied that the program had added a new dimension to his problem: **"It is much more difficult. With a Master's, I appear overqualified for entry-level positions and without biotech work experience I'm unqualified for most others."**

Another respondent found the experience “quite different,” meaning better, but perhaps harder because of its complexity: **“I have many more avenues of exploration. Just the process of narrowing focus and finding positions in my area of interest is challenging this time.”**

The responses approving the programs’ results were also few, but they were noticeably enthusiastic and detailed. One graduate reported:

“This job-seeking experience went more smoothly than previous job-seeking experiences due to the help I received from program faculty and staff.... They helped me get my foot in the door with an internship and it was easy to do the rest on my own from there.”

Another said,

“I feel more confident and much more technically prepared.”

A graduate of a PSM program in computational biology, who had already earned an MS in applied chemistry, noted:

“The internship I am doing at [a major maker of pharmaceuticals] has been made possible by both but certainly more so because of the comp bio program.”

Another graduate in the same specialty reported:

“My marketability has remarkably improved with my PSM, especially due to the small population that shares this background. One is very limited with regard to seeking employment with just a bachelor’s degree. Employers assume that you have not gained the expertise in a particular field. My salary increased 30 percent, attributable to my advanced degree. Also, employers tend to extend more respect to people who have devoted themselves to post-bac education.”

Finally, students’ appreciation of the expanded contacts associated with the PSM programs was summed up by the graduate who benefited from increased opportunities to market himself by “speaking with people and convincing them of my native wit, sagacious celerity, and trainability.”

Employers’ Perspectives: The Forum

On September 27, 2002, The Conference Board co-sponsored a forum on “New Careers, New Career Paths for Science-Trained Professionals,” with the New Jersey Institute of Technology. The forum began the formal integration of the two crucial aspects of the PSM program: the academic programs were presented to industry representatives, who, in turn, described their needs and issues and their own efforts to enlarge the pool of scientific professionals for the business environment.

“Bridging the Gap: Establishing Private and Public Partnerships,” was the keynote theme presented by Dr. Kirk E. Jordan, Emerging Solutions Executive with IBM. Dr. Jordan is responsible for overseeing much of IBM’s high-tech research. Alluding to the well-known characterization of IBM as “I’ve Been Moved,” he said the nickname covers both the work opportunity and the work challenge, meaning employees will never be bored and they must learn to welcome change. For IBM, the ideal partnership with academic institutions is a two-way street. Since the company is always seeking technologically skilled problem solvers, that goal must give the partnership its direction and there must be quantifiable gains for IBM. He cited several elements as keys to successful partnerships:

- IBM employees serving on Ph.D. committees.
- IBM employees consulting with faculty experts about real problems.
- IBM’s identification of student interns and future employees. (IBM employs 400 summer interns for its Yorktown Heights, New York, facility alone.)

Dr. Jordan observed that IBM, like most large organizations, has many rules and hierarchical procedures and processes. To succeed there, professionals must be able to learn the rules and then find ways to work through them in pursuit of business goals. Determination, perseverance, and creative thinking are crucial attributes. The company needs skilled scientists who can communicate effectively, both orally and in writing, and understand the finances of a business.

Life at IBM is a serious challenge, said Dr. Jordan, especially to scientists, who tend to be more comfortable with clear problems and clear solutions. But it is a challenge worth meeting.

Business Need for Science Skills

A panel with representatives from AT&T Labs and Pharmacia further explored the theme of the need for skilled interdisciplinary scientists.

Elaine Laws, AT&T Labs' District Manager for University Relations and Recruiting, said she needs scientists who can both use their secure subject area knowledge and have the ability to leverage their knowledge to solve practical business issues when they deal with customers. They must be able to work effectively on teams as well as to lead them and to understand and design cost-effective solutions. They must also be convincing when speaking, writing, and staging effective multimedia presentations. She said she fares better finding these talents in experienced people who can "hit the ground running."

Dr. Terence Adams, head of Global Competitive Intelligence at Pharmacia (now owned by Pfizer), said he values partnerships with academic institutions as a pipeline to future employees. He seeks professionals whose training makes them fundamentally sound in their science but not limited to a narrow area of interest. Dr. Adams seeks individuals with a breadth and depth of knowledge covering the areas of finance, intellectual property, and communication skills. In addition, since work needs must constantly be changing, he wants professionals who can be flexible. Like Ms. Laws, he looks for effective written and oral presentation skills. He wants his research scientists to serve on school curriculum committees and supports many summer internships. Both strategies foster awareness of the Pharmacia "brand" on campuses, ensure students who are trained for Pharmacia's work needs, and allow him to identify and hire the best students for Pharmacia.

Three Current PSM Programs

Representatives from three universities discussed their experiences running a PSM program.

Michigan State University (MSU) is renowned for its math programs and built its Professional Masters in Industrial Math Program on that expertise. Prof. Charles R. MacCluer, who runs the program, said the students selected for it come from a variety of math concentrations and the program's course work in other concentrations broadens their perspective and gives them a deeper understanding of computational issues.

MSU's micro-MBA is the program's "jewel in the crown," said Dr. MacCluer. It is a certification program designed by the business school, the communications arts department, and industrial advisors. Over ten weekends, students learn the basics of financial management and work in teams and in conjunction with a faculty advisor and a industry liaison on a case study drawn from a real company's business issue. They must produce a written technical report, present it orally to the company, and then deliver the final version of the report. This experience has led to the hiring of many students, not only as interns but also as consultants to continue working on the projects.

"I tell my students they have to get comfortable with being uncomfortable about problem solving," said Dr. MacCluer. He believes the unique advantages of the MSU PSM program include:

- breadth of substantive math courses;
- industrial experience through work on real business projects;
- focus on team work, which is unusual for math students;
- focus on written and oral presentations;

- the business know-how gained from the micro-MBA component;
- students' ability to add value across many different specialties; and
- students' confidence that they can take on anything.

Georgia Institute of Technology's Bioinformatics Masters Program focuses on meeting the needs of the genomics industry for data mining in biology. Dr. Jung Choi, who heads the program, said the program was built around the school's expertise in math and computer science. The program accepts students with a variety of graduate degrees and has designed special courses to bring each one up to speed in other disciplines, including biology, computer science, and math. They also receive an introduction to legal issues in biomedical engineering and technology transfer. Faculties from all the participating disciplines have been very supportive, Dr. Choi said. They use students in their own research and they tap into their own industry, government, and academic networks to help them get jobs.

An ironic twist on the success of the program's graduates is that their new industry bosses, who are often Ph.Ds, suggest that they return to school for Ph.Ds! But since the point of the program is to increase the number of competent science professionals faster than the Ph.D. track, he tells those students in effect, "Go back to work. You've already had all the same course work as Ph.Ds, so why spend the next three to five years on a narrow problem in an academic lab? Better to spend it on the problems in your industry." Since very few senior managers have Ph.Ds, Dr. Choi said a PSM degree should not limit opportunities for promotion. Dr. Choi even had some managers tell him that they prefer non-Ph.Ds because they are more flexible, a quality companies value.

Keck Graduate Institute, organizationally a part of the Claremont Colleges while Keck pursues independent accreditation, has focused efforts on institutionalizing internship programs with industry partners so that graduating students have a direct pipeline to good jobs. Elaine Turner, who directs the internship program, said it began by assembling a database of contacts suggested by members of the institute's board and advisory committee, corporate donors, and faculty, who have developed wide networks from research and guest speaker engagements. She uses Web tools to communicate regularly with the network and makes many follow-up telephone calls. Ms. Turner has established a Career Services Advisory Council, with representatives of industrial human resources departments, head hunters in biotechnology, faculty and industry student mentors, and intern work supervisors. These coordinated strategies develop a student population that is equipped to perform at a high level and a devoted cadre of industry supporters.

Ms. Turner said she feels personally accountable for students' achievement in the talent market. She makes sure they know business etiquette and values such as, for example, "Do what the boss wants, not what you want!" They get coaching in preparing resumés and cover letters and in how to conduct themselves in a telephone interview. She assists them in housing and transportation issues, which are often confusing problems for students with a summer job.

An Alternative Path

Mr. Terry Hueneke, a board member and former executive vice president of Manpower, Inc., described another path to good high-tech science jobs and careers through Manpower's Professional Division and its Empower Group. The Professional Division provides its client companies' contract employees with scientific skills. These positions can an employee build a resumé and smooth their transition to full-time employment. They also allow Manpower to build lasting relationships with individual line managers as well as those in human resources. The Empower Group also develops contacts through HR consulting services such as, for example, after mergers and acquisitions. These assignments help both Manpower and its contract workers to build a network of division level managers at many companies.

Mr. Hueneke observed that despite a sluggish economy, unemployment has been lower than would have been likely in the past, owing to such factors as periods of “zero population growth” in the 1960s and 1970s and a continuing decline in visas for international professionals. In this complex of issues, he said, jobs in the computer and information industries, research, and medical and biological sciences far outpace the available labor pool and the gap is predicted to get even wider.

As a result, he concluded there are great opportunities for larger numbers of skilled scientists. There is also an incentive to tap into untapped or underused labor pools—the disabled, minorities, and senior citizens—who, with additional training and some simple workplace accommodations, could become productive and independent.

Recommendations

As The Conference Board survey findings and observations indicate, the Sloan Foundation PSM initiative has energized progress toward an educational concept of great value to science and technology industries. With the foundation’s support, the participating academic institutions have developed a variety of degree programs, built on individual institutional strengths and driven by the creative passion of the program directors. Stronger working relationships between academic institutions and The Conference Board’s network of corporate members can help to ensure that the number of PSM degree programs expands, that the employment pipeline is formalized, and that the institutions can fine-tune their programs to the needs of the ultimate users, the companies who will employ their graduates.

The Conference Board offers the following recommendations for immediate action:

PSM programs need to incorporate more effective career services programs to familiarize students with career opportunities outside of academe and increase their job search skills. The majority of students surveyed did not attend events sponsored by their career services department yet engaged in Web searches that sometimes produced minimal results. Apparently, many students had not learned to craft effective resumés and cover letters that engage the interest of prospective employers.

Interviewing skills should also be an essential component of a career services program targeted for PSM students.

Programs should host co-curricular events specifically targeted to PSM students that facilitate their success in achieving both academic and career goals. They should also establish Career Services Advisory Committees consisting of HR personnel, recruiters in biotech, industry mentors, and supervisors of interns. University career services programs are overwhelmingly geared for the undergraduate population. Services targeted for the specialized disciplines of graduate students are vital in the identification of industrial sectors where employment opportunities exist.

Institutions should develop a database of all graduates and they should be invited back to the campus for annual regional and national meetings and forums.

As more graduates enter the workforce, institutions should make strong efforts to track earlier graduates. Alumni can play a critical role in expanding the network for students in the pipeline. They can assist with the identification of internship, employment, and research opportunities. Additionally, they can cultivate relationships between faculty and industrial partners. Through systematic efforts to keep alumni engaged, universities can increase the visibility of their interdisciplinary programs, feature their unique offerings, and receive valuable feedback from the field so that students and faculty can make mid-program calibrations.

Academic institutions need to cultivate and expand their industrial partnerships so as to ensure access to internships and job placement and enhance exposure to realistic job situations. They should also develop relationships with staffing agencies, which have direct access to line managers and, because they are highly attuned to staffing needs, can spot potential internships and job slots. Faculties need to redouble their efforts to contact local industries for students who cannot relocate because of family responsibilities.

Program representatives should talk with industry recruiters to increase their awareness of the specifics of the scientific/mathematics/engineering fields. Many recruiters may not recognize these requirements and thus may not know exactly which graduates their corporations need.

Program directors should identify and cultivate relationships with key corporate decision makers. Relationships between faculty and industry partners should be strengthened by such means as invitations and appointments to join curriculum or other advisory boards and by adjunct positions or guest lectureships.

Annual national and regional PSM meetings should be convened for program directors, faculty, students, and industry partners. The purpose of these meetings should be to continually promote the success of the programs, identify best practices, facilitate the development of student/alumni networks, and generate opportunities to expand multidisciplinary research. The development of a PSM network was overwhelmingly supported by 80 percent of the PSM graduates.

Other Conference Board suggestions for action include:

- Offering opportunities to increase diversity representation by appealing to minority students who are qualified in scientific disciplines yet cannot afford to pursue a doctorate or lack interest in doing so.
- Universities exploring the possibility of establishing a “certificate MBA program” modeled after that awarded by Michigan State University.
- Encouraging program faculty members and professional societies to lobby the Bureau of Labor Statistics on occupational guides that categorize certain jobs as requiring Ph.D. degrees.
- Programs should identify multiple venues to market their success stories through all appropriate media.

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