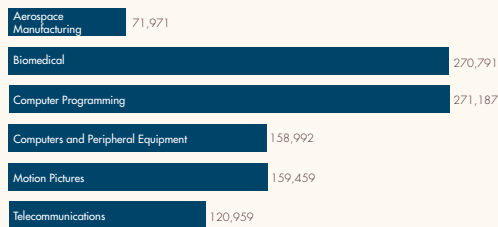


Life Sciences: Putting California to Work

California Biomedical Industry 2009 Report

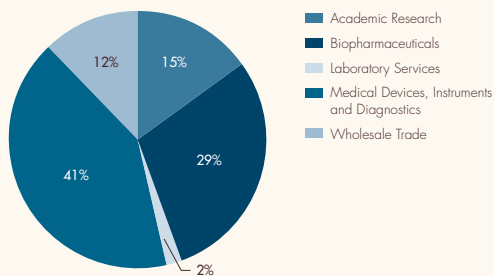
Employment in California's Life Sciences Industry

Figure 1: Estimated employment in California's high-tech industries, 2007



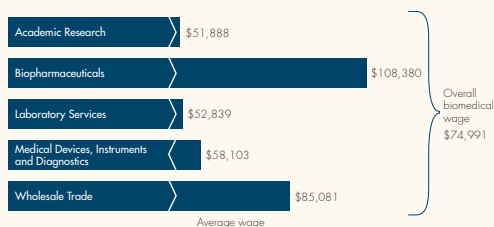
Source: California Employment Development Division, Bureau of Labor Statistics

Figure 2: Distribution of employment in California's biomedical industry by sector, 2007



Note: Numbers may not sum to total due to rounding. Source: California Employment Development Division Bureau of Labor Statistics and company-specific SEC filings.

Figure 3: Estimated average annual wage, by sector, 2007



Note: 2006 wages inflated to 2007 using the Consumer Price Index. Source: Bureau of Labor Statistics

California's biomedical industry has been a powerful engine of economic growth for the Golden State for nearly 30 years. As the following data show, California has built a workforce and industry that is vital to the state's economy—and to the country's continued leadership in scientific, engineering and medical innovation. Moreover, the partnerships and technology transfer agreements among California's biomedical companies and academic centers continue to nurture excellence in education here and innovations that are improving health, healthcare and quality of life the world over.

Taking the Industry's Measure

Jobs California is known for its high-tech industries. Two of these, biomedical and computer programming, employ the most people. Each industry employed roughly 271,000 people in the Golden State in 2007 (Figure 1)—the most recent year for which complete data are available.

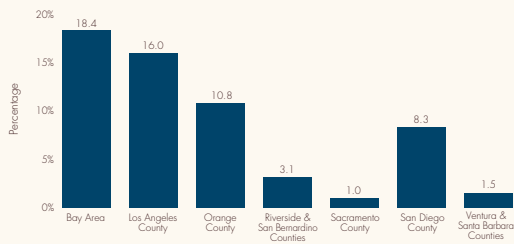
Of those employed in the biomedical industry (Figure 2), the medical devices, instruments and diagnostics sectors accounted for approximately 112,000, or about 41 percent of the overall total. Biopharmaceutical companies employed the next-largest segment with nearly 80,000 or about 29 percent. The state's academic research centers employed about 42,000 people in life sciences positions for approximately 15 percent of the total. Wholesale trade accounted for over 32,000 personnel or about 12 percent of the state's biomedical employees. The laboratory services sector rounded out the overall industry with approximately 5,200 employees or about 2 percent.

The biomedical industry in California also has been a steadily growing segment of the employment picture. Between 2003 and 2007, the industry added approximately 23,000 jobs and grew at an annual average rate of 1.76 percent. Each segment increased its overall employment levels, although the growth rates varied among the biomedical industry sectors. Biopharmaceutical employment expanded at an average annual rate of 2.64 percent, year-over-year, while laboratory services grew at the slower pace of 1.55 percent 2006-2007.

Wages In 2007, California biomedical industry employees earned a total of \$20.3 billion. For the year, the average annual wage for the industry across the state was nearly \$75,000, up approximately 9 percent from 2006.

The averages continue to vary among the industry's sectors (Figure 3). Biopharmaceutical companies pay the highest average annual wages, with 2007's mark reaching approximately \$108,000. Wholesale trade came in second with average annual wages of about \$85,000. Academic research, laboratory services and medical device organizations paid salaries in the low- to high-\$50,000 range. The variances in compensation are attributable in part to differences in required education and training and in the commercial success of the various sectors.

Figure 4: Distribution of employment in California's biomedical industry by geographic cluster, 2007



Source: California Employment Development Division Bureau of Labor Statistics and company-specific SEC filings.

Reach Geographically speaking, biomedical industry jobs support workers all over California (Figure 4). The largest concentration of industry-related jobs is centered in the San Francisco Bay Area. Companies and academia there employ nearly 50,000 people or nearly 18 percent of the state's total. In Southern California, San Diego, Riverside and San Bernardino counties were home to approximately 31,000 biomedical employees or 11 percent of the total in 2007. Los Angeles County companies and institutes employ more than 43,000 people or approximately 16 percent, and Orange County encompasses nearly 29,000 or about 11 percent. The remaining 86,000 or 32 percent of California's biomedical employees work at companies or institutions outside of the concentrated clusters.

Many of the jobs within the biomedical industry require high levels of specialized training, and the industry employs a substantial number of scientists, researchers and clinicians with doctorate degrees, both Ph.D.s and M.D.s. At the same time, opportunities exist within academia and companies for individuals with high school diplomas and undergraduate degrees. The industry also employs professionals with business, information technology, human resources and other areas of expertise.

Additionally, the biomedical industry exerts a "multiplier effect." For each direct job, another three to five people are employed to provide the industry with products and services. The full biomedical industry footprint in California, therefore, is estimated at more than 1 million workers.

Although the financial climate in California appeared grim at year-end 2008, 57 percent of respondents to the California Healthcare Institute/PricewaterhouseCoopers (CHI/PwC) survey expected to increase headcounts over the ensuing 12 months. Only 8 percent anticipated reductions in staff. Figure 5 shows employment opportunities in the industry in each cluster.

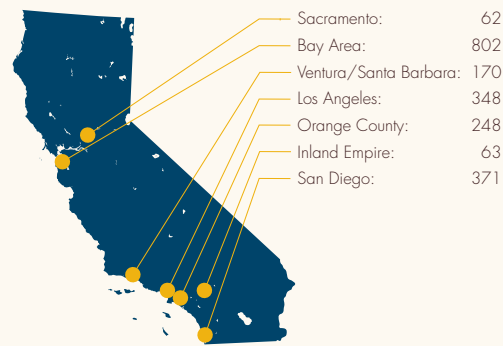
Developing the Work Force

To continue to drive innovation in medicinal compounds and medical devices, researchers must be well-versed in math and science and insatiably curious about human conditions and diseases. Recruiting, managing and retaining today's brightest is a challenge that companies and universities spend significant resources addressing.

Yet the biomedical industry must and does take the long view on workforce development. Through a number of programs (see sidebar on back page), California companies are working to develop elementary and high school students' interest in math, science and engineering. Some programs are directed at the students themselves, while others are designed to give their teachers the tools and insights they need to make the sciences more compelling and relevant to young people.

California's commercial and academic organizations also have collaborated in a number of ways to draw college students and working adults to life sciences careers. From biotechnology curricula at community colleges to business-focused skills training in post graduate programs, universities and industry are working together to ensure that prospective employees are equipped to succeed.

Figure 5: Employment Opportunities in the Biomedical Industry in California



Source: Job listings from Monster.com as accessed on Dec. 10, 2008

Faces of California Biomed



MARTHA A. ORNELAS
B.S., Biopharmaceutical Chemistry,
Autonomous University of Baja California
Chemist for Pfizer Inc., La Jolla, CA

Ornelas joined Pfizer as a temporary employee eight years ago...and knew within six months that it was the perfect job for her. "The everyday challenges were and still are a constant stimulation for continuous learning and improvement," she said. "What I like most about Pfizer, is that I continue to learn a great deal from my co-workers...Here, teamwork is taken seriously."



SHIVA MALEK, Ph.D.
B.S., Biochemistry, University of
California, Los Angeles
M.S., Chemistry, University of
California, Irvine
Ph.D., Biochemistry, University of
California, San Diego
Scientist at Genentech, South San Francisco, CA

Malek focuses on small-molecule oncology products and says she finds great personal satisfaction in working to advance therapies in areas like cancer where present treatments are inadequate. "Most of us who work in biotech really take our work personally," she said. "Helping patients and expanding science and medical knowledge are big components of why people pursue careers in the biomedical industry."



ANGUS SINCLAIR, Ph.D.
B.S., Molecular Biology,
The University of Edinburgh
Ph.D., Hematology, National
Institute for Medical Research/
University College London
Principal Scientist for Amgen, Thousand Oaks, CA

Sinclair joined Amgen after working eight years in academic research and said that he especially enjoys the multifunctional teams of highly motivated and qualified people with whom he now works. "In conducting basic research in academia," he said, "you're often working as a sole scientist on projects that you hope would one day benefit patients and would help others better understand disease...Here, we are doing groundbreaking research that leads to products that are helping real people in real time."

Standing Up to Mounting Pressures

California residents, businesses and institutions are feeling the impacts of the international financial crisis in a broad range of metrics. Unemployment is climbing—from 5.9 percent at year-end 2007 to 10.5 percent in February this year.¹ Housing values, which grew faster in California as compared to much of the rest of the country, have dropped between 43 percent in the Bay Area and 39 percent in the Los Angeles and Orange County regions since September 2006.² State and local revenues have dropped significantly on diminished sales, income and property taxes; budgets and services are being slashed accordingly, and still the state faces record budget deficits.

These challenges are not unique to California. They do, however, present added layers of complexity for the future of California's biomedical companies and academic research institutions. These entities rely heavily upon the capital markets, government grants and philanthropy to fund their work—and to generate ideas that could become medical breakthroughs that will ultimately save and improve lives.

Historically, the biomedical business model worked as follows. Academic scientists discovered an invention. The inventors collaborated with venture capitalists, who put up seed money to found a company and hire a team that could do the essential development work and negotiate the arduous path from laboratory discovery through regulatory review at the U.S. Food and Drug Administration (FDA). Typically, progress was slower, more time-consuming and more costly than originally projected. Still, if the technology were promising, the company could complete an initial public offering (IPO), raising money by selling shares in the stock market. In the best case, as with Genentech, Amgen and Gilead, the company would eventually launch successful products that both saved lives and rewarded their investors.

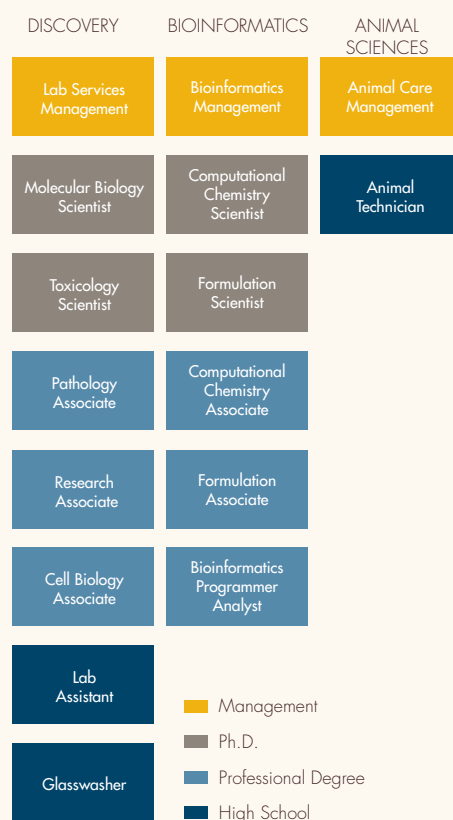
The financial and political shifts of 2008-2009 pose distinct challenges to this model. At its most basic level, the financial crisis is spurring a global reevaluation of risk. This has profound implications for the biotechnology industry, which from inception has been characterized by high risks and high rewards. As investors across the spectrum try to squeeze risk from their portfolios, less capital is available for early stage companies. By mid-2008 the window for IPOs had been firmly shut and, with it, the opportunity for early investors to capture returns on their capital. Intensifying focus on healthcare reform may also reduce incentive for investments in new treatments and medical technologies. To adjust to these new financial realities, biomedical companies will likely undergo serious consolidation, with smaller, cash-strapped companies being acquired by larger players and venture investments going to fewer startups and more proven businesses.

Many California researchers, innovators and entrepreneurs work for organizations that count their funding in “months remaining.” It remains unclear how deep the financial crisis will cut, how many projects might be shelved, indeed, how many enterprises may ultimately fail before the economy recovers.

Biomedical Career Ladder

The biomedical industry offers excellent opportunities, pay and benefits to employees with all levels of education. The following career ladder shows a partial list of job titles within drug discovery organizations with corresponding required levels of education ranging from high school to post-graduate level degrees.

Research and Development



Source: Career ladder information provided by The Biotech Work Panel, developed through a grant awarded under the President's High Growth Job Training Initiative, as implemented by the U.S. Department of Labor's Employment and Training Administration.



TAIYIN YANG, Ph.D.

B.S., Chemistry, National Taiwan University
Ph.D., Organic Chemistry, University of Southern California

Senior Vice President, Pharmaceutical Development and Manufacturing at Gilead Sciences in Foster City, CA

When Yang decided to join Gilead Sciences in 1993, “I saw it as an opportunity to make a difference at a company whose values very much mirrored mine. I saw the chance to help discover, develop and commercialize therapies for life-threatening conditions.” Fifteen years later, she says Gilead’s mission continues to motivate her and is one reason that she fully recommends a career in the biomedical industry to young people.



LARRY L. WOOD, MBA

B.S., Business Administration, University of Phoenix
MBA, Pepperdine University
Corporate Vice President

of Transcatheter Valve Replacement at Edwards Lifesciences in Irvine, CA

Wood joined American Hospital Supply Corporation, a predecessor to Edwards Lifesciences, in 1985 with a high school diploma and a drive to learn and grow through his job. He enthusiastically recommends the biomedical industry to anyone who is passionate about helping patients. “There will always be unmet patient needs,” he said, “especially in cardiovascular medicine...I feel very blessed and very fortunate in that I get to do work that motivates and excites me every day.”

Participating in the Solution

The biomedical industry has grown to be a key and vibrant component of California's economy. The partnerships among academic institutions and biomedical companies have generated important medical products for patients and their caregivers, incomparable learning opportunities for students and researchers of all ages and academic training levels, and revenue streams for employees, companies, universities, government agencies and investors.

Industrialized nations around the world—and most of the 50 states—strive to attract biomedical companies. Such firms deliver and further develop an educated workforce, create high-value intellectual property, manufacture products for export, and run clean and typically environmentally friendly facilities.

California has invested wisely to build the leading biomedical presence in the country and the world. Now the state's life sciences industry must be involved in crafting the solution to the complex issues facing policymakers. The industry brings much to the discussion as it is an integral player in the key priorities set forth by President Barack Obama and his administration: employment, education and healthcare.

Employment California's biomedical industry directly employed 271,000 people in 2007 and, through a multiplier effect, about 1 million overall. This group, spread across California, is well compensated and highly motivated. The industry also is at the forefront of promoting diversity in the workplace and honoring the contributions of numerous professionals working in cross-functional teams. These are jobs that should be saved.

Education Life sciences researchers at California's universities and research centers and within its companies work together to promote education, research, the practical application of knowledge and innovation via many avenues. Both academia and industry support programs to encourage youngsters to explore math, science and engineering, and both sponsor learning and training opportunities for elementary and secondary educators.

Through the National Institutes of Health (NIH) and other federal grants, researchers are able to move discoveries from their labs toward patent applications. These, in turn, form the basis for technology transfer agreements that further fund the universities and fuel the commercialization of medical breakthroughs.

Healthcare Biomedical employees and researchers are passionate about their work, which they believe will benefit patients. By identifying key receptors or designing a new implant or deciphering a gene's activities, they might enable children to avoid a particular disease or help them live longer and better despite their ailments. They could lessen the stress, effort and heartache of individuals caring for aging parents or other loved ones—a challenge that promises to grow as our population lives longer. They may improve the prognosis for soldiers or citizens who suffer trauma.

The goal they hold in common with policy makers is to ensure that patients can access the knowledge, medications, diagnostics and medical devices they need for improved health, longevity and quality of life. California's biomedical industry looks forward to helping move this objective forward and brings important insights to discussions of comparative effectiveness research, follow-on biologics, stem cell research, FDA preemption, conflicts of interest in marketing practices, and Medicare and Medicaid reimbursement policies, among other pressing issues.

1. Source: Bureau of Labor Statistics. Accessed at: <http://www.bls.gov/data>.

2. Source: S&P/Case-Shiller Home Price Indices. Accessed at: http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_csmahp/0,0,0,0,0,0,0,0,0,0,1,3,0,0,0,0,0,0.html

Industry-Supported Programs to Improve STEM Education and Diversity

A number of organizations throughout the United States are working together to excite young people about science, technology, engineering and mathematics (STEM) education opportunities—and the careers for which that training could prepare them. Recognizing that future growth, success and products depend on STEM programs today, California's biomedical companies are committed to supporting and developing learning opportunities for the Golden State's students. Among such programs are:

Amgen Scholars

Bayer's Making Science Make Sense

Biogen Idec Community Lab

Biotech Partners

Cedars-Sinai Youth Employment and Development Program

Discovery Science Center

Elementary Institute of Science

High Tech High

Inner World Discovery

Life Sciences Summer Institute (LSSI)

Pfizer Education Initiative

Preuss School

San Diego Science Festival

Science Matters

Skyline College Biomanufacturing Training Partnership

United Negro College Fund/Merck Science Initiative

Alliance/Merck Ciencia Hispanic Scholars Program



CHI—California Healthcare Institute

CHI represents more than 250 leading biotechnology, medical device, diagnostics, and pharmaceutical companies, and public and private academic biomedical research organizations. CHI's mission is to advance responsible public policies that foster medical innovation and promote scientific discovery.

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