

# Building California's Future Workforce

California's Biomedical Industry 2008 Report

## Average industry wage continues to outshine the state average

Figure 1. CHI-PwC Survey: Rate the following areas of the adequacy of California's emerging workforce:

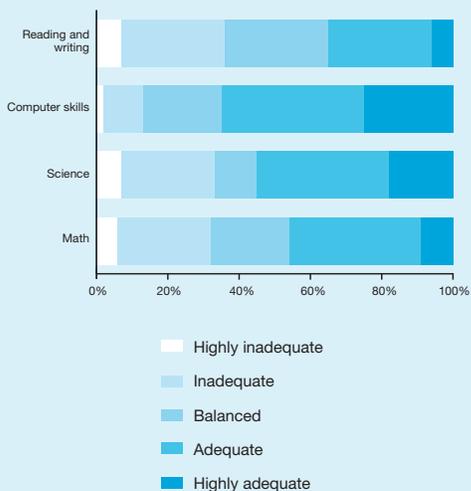
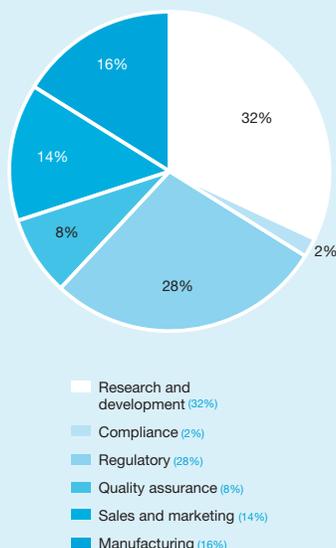


Figure 2. CHI-PwC Survey: The workforce in California is least prepared to work in these capacities:



The biomedical industry employs more than 267,000 people in high-wage, highly-skilled positions and ranks near the top among high tech employers in California. The average industry wage of \$71,300 outpaced by 61.4 percent the estimated average annual wage of \$44,180 for all other occupations in the Golden State<sup>1</sup>. The workforce in this industry is diverse, tapping all levels of education and experience and provides ample opportunities for advancement. Employment in California's biomedical industry grew an estimated 5.4 percent between 2001 and 2006, while overall employment in the state increased at a lower rate of 3.1 percent in the same period.

*"The problem lies in the lack of students interested in math and science education. As an industry, we should look for ways to help our schools—K through 12 and at the college level—better prepare students and fuel their passion for science."*

— Todd Kaufman, director of state government affairs at Genentech

Entrepreneurial spirit infuses the industry in California, exemplified by small companies striving to produce innovative products. Start-up companies consistently demand highly educated talent. At the other extreme, large manufacturing companies with sophisticated and highly technical processes need both scientists and a steady stream of skilled workers. Sixty-nine percent of California's biomedical companies responding to the 2008 California Healthcare Institute/PricewaterhouseCoopers Survey said they expect to increase their workforce in the next two years. However, when asked to rate the adequacy of the emerging workforce, 32 percent found them under-prepared in math and science and a surprising 36 percent found the same in reading and writing. The workforce is least prepared to work in compliance, regulatory and quality assurance—the backbone of the industry. The greatest need for improvement rests on the educational system at the K through 12 level.

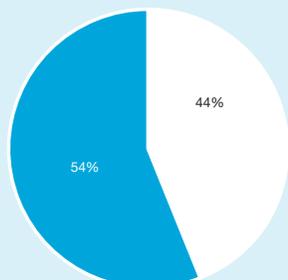
In an era of globalization and increasing competition from other states and countries, California needs to strengthen its position as an industry anchor. The state will have to keep pace with industry in education and training to fill the growing demand for diverse talent. The state should consider economic incentives to encourage companies to continue to operate and expand here. As the industry transforms itself to a global presence, California needs to fully awaken to the consequences and focus on the changing balance of research and development and manufacturing necessary for success in the 21<sup>st</sup> century.

## Perspectives

# Gail Naughton, Ph.D.



Figure 3. Providing California's life sciences workforce



The CSU produces 44 percent of the state's undergraduates in life sciences.

- CSU prepares 100 percent of the state's graduates in gerontology and cognitive psychology and psycholinguistics, 92 percent in health professions and related sciences, 89 percent in communication disorders sciences and services, and 64 percent in nursing.
- At the graduate level, the CSU produces more than 41 percent of the state's graduates in healthcare and life sciences. CSU campuses are national leaders in terms of the number of students in science-related fields who go on to earn doctoral degrees.

Dr. Gail Naughton is an experienced and superbly accomplished leader in California's biomedical community. As co-founder and co-inventor of core technology at Advanced Tissue Sciences, Dr. Naughton oversaw the design and development of the world's first up-scaled manufacturing facility for tissue-engineered products and took several products from concept through market launch. Since 2002, Dr. Naughton has served as dean of the College of Business Administration at San Diego State University, where she was instrumental in developing innovative graduate degree programs that align rigorous science preparation with the needs of high growth industry sectors, including biotechnology. She also holds more than 90 U.S. and foreign patents. In a recent interview, Dr. Naughton shared her views on the hurdles California's biomedical industry faces to maintain its global competitiveness and described the programs she helped develop to prepare students for careers in the life sciences.

### On California's educational system and its ability to produce the biomedical workforce of tomorrow

For K through 12, it's critical that we do more to excite students about math and science at a very early age. One group that recently opened its program to California students is Project Lead the Way, a national, nonprofit organization that offers middle and high school students the knowledge they need to succeed in high-tech fields. Student participants and their teachers spend a summer at university campuses learning fun things about engineering. They create projects, conduct experiments and learn engineering basics to ignite their interest in science and engineering careers. The program also offers teachers a greater practical knowledge of science, which they can then take to their classrooms. California needs additional general sciences programs to offer hands-on experience, to inspire middle and high school students to participate in junior internships, and to encourage them to explore science programs at colleges and universities. We also need programs that get teachers involved in cutting-edge science so that it becomes more exciting and less daunting.

### On gaps in the educational system and how to improve the system:

Administrators of California's public school system should examine the entire curriculum at the school level, which offers very few mandatory programs in math and science. When California's public school system is compared with those in Massachusetts and North Carolina—systems that have become truly cutting edge—I believe they are better at cultivating their own talent. I also believe lab time for students is insufficient. We should truly engage students in what can be an exciting career for them—one with solid salaries, upward mobility and the opportunity to make a significant impact in people's everyday lives.

Even elementary students should learn very basic science so that they can embrace new technologies as they become adults. Also, I'm not aware of any current funding that supports mentoring programs for middle and high schools to bring in scientists and engineers—representing diverse cultures and backgrounds—to talk about their careers. We also need to make a concerted effort to allow students to meet with mentors who look like them. Whether they're women or Hispanics or African Americans, it makes such a difference for a 10-year-old child to say, "Wow, this person looks like me." It is a relatively lowcost alternative that would have a tremendous impact.

## On California State University (CSU) programs that help train a workforce to meet industry demands

At CSU, we developed four professional science master's (PSM) degree programs—the largest PSM initiative in the nation—in partnership with industry. These programs concentrate on biotechnology, bioinformatics and biostatistics. The impetus to create the programs was in response to industry's resounding cry that academia does not provide enough graduates who can hit the ground running and bring immediate value.

There are also some San Diego State University-specific programs that would add tremendous value if we could expand them statewide. One of them, an online Master's of Science program in regulatory affairs, is taught by regulatory professionals. This program teaches students to take a product from concept to FDA approval, including foreign regulatory approval.

Industry professionals also teach our quality control program, which focuses on the processes involved in developing a company's standard operating procedures, such as bringing a product from early-stage clinical trials to product approval, and all of the extensive training and statistical analysis that must take place for successful results.

Most recently, we've taken the best of these programs and designed an executive MBA program—the first MBA professional degree in the state educational system to focus on life sciences. It incorporates aspects of regulatory affairs and quality control, as well as general MBA courses, all tailored to life sciences.

FDA officials will teach some of our courses and provide students with real-time FDA projects. We're very excited about this program and hope other California universities will take measures to duplicate it.

Student interest and enrollment in these programs are very strong, driven in part by high starting salaries that graduates can command. In terms of success, we use follow-up interviews with the hiring companies to ensure the students continue to receive and develop the knowledge they need.

## Perspectives

# Regis B. Kelly, Ph.D.



Regis B. Kelly, Ph.D., is a distinguished neuroscientist and former executive vice chancellor of University of California, San Francisco, where he oversaw the university's research enterprise. Dr. Kelly is currently the director of the California Institute for Quantitative Biosciences (QB3), a cooperative effort among three campuses of the University of California system and private industry. QB3's mission is to harness the quantitative sciences to integrate an understanding of biological systems at all levels of complexity.

### On problems science and engineering students confront in pursuing biotechnology careers

Our major problem is that many young people work toward careers in the biological sciences, but very few are entering the physical sciences. It is difficult for them to decide to work in biomedical research because many view it as a risky career—one that is not well defined.

To solve this conundrum, QB3 tries to move us away from “reverse engineering.” Our mantra is to make biology an engineering science so that it is predictable, exact and scientists can engineer life-forms that actually do what they intend them to do. Relatively few scientists are familiar with or have expertise in the engineering field, so it is difficult to attract engineers to quantitative biology.

### On whether California's educational system offers students the resources necessary to produce the biomedical workforce of tomorrow

Currently, science in K through 12 is taught like history—out of books—when it should be taught more like carpentry, as an apprenticeship. Students who never have the opportunity to perform hands-on experiments fail to truly learn and get excited about science. People who are interested in science should have access to advanced scientific equipment. That is missing right now—the opportunity to experience the thrill of conducting an experiment and seeing a result. Of course, we also need to better compensate and train mathematics and science teachers, but insufficient hands-on scientific education is the primary problem. Like K through 12, California's university students would also benefit from increased hands-on training, particularly with state-of-the-art scientific equipment. Such training would provide greater real-world experience and create a better-trained workforce for a career path in biotechnology. Additionally, the state's higher education system needs improved video-conferencing facilities, which, in QB3's case, would facilitate the combined strengths of all three campuses and improve the quality of the learning experience. Making lectures available online is also essential; a revolution in the way lectures are taught is coming, and we want to stay ahead of the game.

<sup>1</sup> Bureau of Labor Statistics, U.S. Department of Labor, “May 2006 State Occupational Employment and Wage Estimates: California,” [http://www.bls.gov/oes/current/oes\\_ca.htm](http://www.bls.gov/oes/current/oes_ca.htm), accessed Sept. 19, 2007.

## **Biomedical companies support education**

*Amgen Scholars*

*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*

*Pfizer Education Initiative*

*Preuss School*

*Science Matters*

*Skyline College Biomanufacturing Training Partnership*

*United Negro College Fund / Merck Science Initiative*

## CHI-California Healthcare Institute

CHI-California Healthcare Institute is a non-profit public policy research organization for California's biomedical R&D industry. CHI represents more than 250 leading medical device, biotechnology, 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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