A Strategic Plan for the California State University Program for Education and Research in Biotechnology (CSUPERB) – AY 2012-2015

Vision

CSUPERB will position the CSU as the premier source of biotechnology professionals for California and the global economy.

Mission

CSUPERB’s mission is to develop a professional biotechnology workforce by mobilizing and supporting collaborative CSU student and faculty research, innovating educational practices, and responding to and anticipating the needs of the life science industry.

CSUPERB will:

- Expand and provide access to biotechnology research opportunities in the CSU;
- Innovate educational practices to increase graduation rates and close the gap between CSU-based learning and biotechnology industry practice;
- Provide professional development opportunities for CSU students and faculty to promote partnerships, entrepreneurship and technology transfer activities;
- Communicate the critical role the CSU plays in the biotechnology segment of California’s economy.

What We Believe

CSUPERB recognizes that modern biotechnology preparation requires the integration of coursework, hands-on practice and team-based research projects. CSUPERB believes that the best way to engage, recruit and retain students in life science industry careers is to provide access to and opportunities in real-world biotechnology research settings. We know that these experiences are particularly effective at engaging and retaining students who are the first in their families to attend college or are from communities underrepresented in the life sciences. By working with CSU faculty scholars in the classroom and on research problems, students build a solid foundation for successful life science industry careers. CSUPERB knows that the CSU plays a critical role in California’s biotechnology industry by providing not only a professional, entrepreneurial workforce but also the innovative ideas that drive the growth and evolution of the industry. CSUPERB can best serve the evolving life sciences industry and California’s regional economies by partnering with external advisors and organizations.
I. Introduction

The life science companies, academic centers and research institutions that make up the biotechnology, or life sciences, industry in California employed over 267,000 professionals in 2011 (1). This workforce makes fundamental scientific discoveries and develops new products that impact human health and nutrition. These advances include drugs for treating diabetes, devices for repairing heart damage, and technology for detecting food contaminants. Universities play an inextricable and critical role in the success of the life sciences industry. California’s universities provide an available, skilled workforce and academic researchers contribute new knowledge and innovative ideas that drive the growth and evolution of the biotechnology industry.

The biotechnology industry (2) urges universities to integrate team-based research experiences into academic programs. These experiences provide students with the skills to solve real-world problems and develop innovative solutions. CSUPERB recognizes that research opportunities result in successful biotechnology students and skilled graduates for the workforce. This strategic plan also includes a commitment to build a more entrepreneurial university base for commercial development of emerging biotechnologies.

II. Program History

CSUPERB was organized between 1985 and 1987 by faculty from across the CSU led by Steve Dahms (SDSU, Co-Director), Crellin Pauling (SFSU, Co-Director), and Joe Bragin (CSU Los Angeles, Chair, Governing Board and Executive Committee). President Day (San Diego State University) championed the organization and in 1987 CSU Chancellor Reynolds officially approved and chartered CSUPERB. The CSUPERB Governing Board involved faculty from all CSU universities and acted on policy recommendations brought forward by its Executive Committee. Between 1987 and 1999 program governance was faculty-driven with loose reporting requirements to the SDSU President and Dean of Science. During this time, CSUPERB focused on acquiring resources and equipment necessary to incorporate molecular biology and genetic engineering techniques and concepts into the CSU curriculum and research laboratories. A travel grant program was also established to provide funds for faculty and student professional development.

In 1999 the program’s impact was recognized by the state with a special legislative line item (AB 968, Ducheny) to “maintain and enhance its role in the preparation of the biotechnology workforce.” This increased financial support allowed CSUPERB to broaden its focus and create additional grant programs. At the same time program governance was reorganized around a Presidents’ Commission (PC), a Strategic Planning Council (SPC), and a Faculty Consensus Group (FCG). A Program Operations Committee, including the Executive Director, program staff, SPC Chairs, and taskforce chairs manages and administers program operations.

Between 1999 and 2004 the SPC developed a set of strategic goals and objectives. The 2004 Goals and Objectives document outlined areas of potential interest to CSUPERB, including education, research, faculty development, industry/government relations, and communications. In 2008 CSUPERB developed its first three-year (2009-2012) strategic plan, subsequently approved by Chancellor Reed.
Based on the 2009-2012 strategic plan, CSUPERB partnered with employers and industry associations on curriculum and workforce development projects. CSUPERB provided initial support, bolstered by significant funding from the Alfred P. Sloan Foundation, for the development of biotechnology-related Professional Science Masters’ (PSM) degree programs. There are now 13 biotechnology-focused PSM programs across the CSU. A 2009 Small Business Administration grant to CSUPERB, along with Chancellor’s Office support, led to the development of new online extended education courses and a website that collates and curates industry-relevant CSU courses and programs (www.csubiocompass.org). CSUPERB served as a catalyst to make California Institute for Regenerative Medicine (CIRM) funding available to CSU students interested in stem cell research. Fourteen CSU campuses now have Bridges to Stem Cell Research programs that received over $19 million in CIRM funding. CSUPERB mobilized public-private partnerships aimed at increasing the number of clinical laboratory scientists and other skilled professionals in California; two CSU-led teams won 2010 federal Department of Labor funding to support this effort. For each of these projects, CSUPERB partnered with industry advisors and advocates to define strategies, priorities and tactics. These partnerships enhanced our ability to serve both California’s students and the life science industry.

Since 2008 CSUPERB has studied and reported on the impacts of its grants and awards programs. CSUPERB supported over 550 CSU students and faculty each year since 2009. The applicant pool continued to expand across campuses, disciplines and the faculty. 40% of applicants each year since 2009 were first-time applicants. The fiscal return-on-investment of the major grant programs averaged 1:10 (or 1000%), based on CSUPERB dollars awarded in the five academic years (AY04/05 – AY08/09) compared to follow-on funding received by CSUPERB-supported faculty. Final reports from students supported by CSUPERB hint at even greater, transformative impacts. The graduation rates of CSUPERB-supported student researchers is greater than 80%, far exceeding the averaged CSU STEM six-year graduation rates (28% for freshman entering in 2002). The same proportion of CSUPERB-supported students (~80%) continue on in life science career paths, whether accepting jobs in the life science industry or entering professional and graduate school programs.

CSUPERB continues to mature and evolve with the dynamic, cutting-edge sector it serves. The SPC and the Presidents’ Commission recognize the unique value of system-wide, multi-disciplinary faculty participation in CSUPERB. CSUPERB’s leadership councils, the FCG and SPC, provide feedback and direction on issues impacting biotechnology education and research at CSU universities. The greater CSUPERB community, including recipients of CSUPERB grants and awards, continues to grow and expand the program’s disciplinary diversity. CSUPERB’s network of external partners changes as companies develop and as new applications of biotechnology surface. Based on input from these various groups during the summer and fall of 2011, we developed this document. The 2012-2015 strategic plan is crafted to ensure an agile, responsive program supporting excellence in biotechnology education and research across the CSU system.

III. Goals and Strategies

The 2012-2015 CSUPERB strategic plan identifies three priorities for the program: 1) expand biotechnology research and experiential learning opportunities across the CSU; 2) innovate biotechnology education practices; and 3) anticipate the needs and direction of the life sciences industry. To address these priorities simultaneously over the next three years,
CSUPERB will need support, advocacy and resources from the CSU, external industry partners and policy makers. Tactical plans in all three areas of priority include professional development programs, communication and outreach plans, and an emphasis on building an entrepreneurial culture within the CSU’s biotechnology community.

**Strategic Goal #1: Expand biotechnology research opportunities in the CSU**

More than 80% of the professionals working in the life sciences industry have an education at or below the master’s degree level (3). The CSU educates bachelor’s and master’s degree graduates who carry out research and development in the biotechnology industry or continue onto professional and graduate school programs. To recruit, prepare and graduate students to work in this field, CSU faculty and students need the infrastructure necessary to perform collaborative, innovative research. Research opportunities and internships, supported by scholarships or grants, allow students access to cutting-edge science and technology. Research support also allows students to focus on scholarship without extending time to graduation or relying on unrelated employment to support their studies. Financial support of research experiences may be particularly impactful for at-risk students not supported by other training or scholarship programs. Research grants provide faculty with the resources required not only to successfully compete for follow-on, externally funded grants, but also to involve greater numbers of students in their scholarship and research programs.

CSUPERB will expand support for faculty-student collaborative research within the CSU and, as a result, create new professional development opportunities for students and faculty. CSUPERB will expand its investigations into the impact of research experiences, and other experiential learning opportunities, on student retention, graduation rates and post-graduation career plans. With the need to address emerging industry sectors, CSUPERB will mobilize and promote multi-disciplinary, multi-campus collaborations, along with partnerships within and external to the CSU. Meetings with program officers will be organized to develop faculty grantsmanship skills and entrepreneurial expertise. Recognizing that the CSU may not have research capacity for all interested students, increased emphasis will be placed on supporting student internships in industry or government research laboratories. CSUPERB will support faculty sabbaticals in or cooperative research agreements with university, government or industry laboratories working in emerging areas of biotechnology. This strategic goal requires ongoing support, internal and external partnerships, industry collaborations, and federal and state grants.

**Strategic Goal #2: Innovate Biotechnology Educational Practices**

The retention of existing companies and the ultimate expansion of the biotechnology industry in California are dependent upon a continuous stream of innovations and qualified personnel from our educational institutions. CSU bachelor’s degree programs provide students with the basic technical skills and knowledge needed for entry-level biotechnology jobs. Master’s level programs provide individuals with more advanced skills for project management, discovery research and product development positions upon graduation. The CSU has a strong record of preparing and sending students into doctoral and health professional programs, that in turn provide the high-level talent for basic discovery programs and clinical research in the biotechnology industry. Historically programs in chemistry and biology have served biotechnology sectors. However, in addition, biotechnology advances today depend on experts from many fields working on transdisciplinary teams, bringing together clinical,
computer science, physics, business, engineering, public health and mathematics expertise. Further, graduates aiming for careers in commercial, product-focused companies need to understand the regulatory and milestone-based environment in which they will work. New PSM programs developed across the CSU address many of these workforce needs and provide post-baccalaureate bridges into biotechnology jobs.

Our strategies to innovate biotechnology education across the CSU are multipronged. CSUPERB seeks to increase cross-disciplinary involvement through outreach to “non-traditional” biotechnology departments. Increased disciplinary involvement will drive biotechnology curriculum development and curricular revisions related to medical school admission (4) and emerging science and technology. CSUPERB will support the development of online materials and the assessment of innovative educational practices, which can be broadly shared across the CSU. CSUPERB taskforces will provide in-service training for CSU faculty in the newest findings and methods in biotechnology so that faculty members can incorporate appropriate materials and experiential learning into the curriculum. CSUPERB will continue to reach out and partner with companies and industry professionals to identify workforce needs and develop industry-relevant curriculum and programs to bridge gaps. CSUPERB will continue to organize the Annual CSU Biotechnology Symposium to bring faculty and industry experts together, to spur and support educational innovation, and to feature emerging science and technologies.

**Strategic Goal #3: Anticipate the needs and direction of the life sciences industry**

Although CSU universities prepare a significant portion, perhaps even the majority, of the professional workforce for the California biotechnology industry, the CSU could play a more prominent and responsive role in the evolving scientific and business landscape. The recent national economic downturn has increased the pressure on universities to serve as hubs of economic development (5). CSU biotechnology faculty and students report increasing interest in learning from and working with entrepreneurs, small business development centers, regional innovation hubs, and companies. All stakeholders acknowledge that effective two-way communications between the CSU and the biotechnology industry are needed to establish and sustain working relationships, partnerships and collaborations. The CSU has a vested interest in reporting and reaching out to the legislature and elected officials to raise awareness of the CSU’s impact on California’s bioeconomy; our best advocates are our industry partners.

CSUPERB will partner with biotechnology industry and advocacy organizations throughout the state, such as BayBio and BIOCOM. CSUPERB will work with these groups and others on regional and statewide workforce development projects, as well as knowledge- and technology-transfer projects. CSUPERB will mobilize and organize networks of industry advisors and professionals for curriculum development projects, to serve as student mentors, and to broker research partnerships. Emphasis will be placed on developing a summer internship program for students and sabbaticals for faculty in university- or industry-based research laboratories. CSUPERB will continue to invest in social networking (FRESCA, Facebook) to publicize CSU biotechnology expertise and knowledge, along with other web-based (the CSUPERB websites and blog) systems to publicize and share CSUPERB news. CSUPERB will publish student outcomes and impact data related to research experiences, and other experiential learning opportunities, to inform public relations, corporate development and government affairs colleagues across the CSU.
IV. Success Indicators

- Increased numbers of CSU students and faculty involved in biotechnology research
- Increased sharing of biotechnology curricula CSU system-wide
- Increased internship and exchange opportunities for students and faculty in emerging biotechnology-related fields, especially involving California companies
- Increased number of seminars and workshops to bring transdisciplinary groups together, with a special focus on entrepreneurial and commercialization education
- Increased industry participation at the Annual Biotechnology Symposium, including sponsorships
- Timely reporting, including annual reports, impact reporting (student outcomes, follow-on funding, etc.) and workforce demand data
- Increased number of press releases and/or press coverage for CSUPERB activities and participants, along with greater connection and engagement of CSU faculty and students at CSUPERB’s social networking sites
- Board level involvement of CSUPERB leadership with biotechnology industry associations

References Cited


