

# **Critical Skill Shortages Project: Addressing Potential Skill Shortages in Biosciences and Biotechnology in Greater Austin**

## **A Report for *WorkSource* – Greater Austin Area Workforce Board**

A Research Initiative of *WorkSource*-Greater Austin Area Workforce Board

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## Overview and Purpose of the Project

The Critical Skill Shortages Project aims to identify ways that the workforce development system can support economic development and help assure that residents benefit from the new jobs created. The guiding vision of the project is that improving the preparation and qualifications of residents to work in the new jobs being created will help foster both economic development and the well being of Austin area residents.

The Critical Skills Shortages Project began with an examination of the nine targeted industry clusters that the Greater Austin Chamber of Commerce (GACC) launched in 2004 in its five-year “Opportunity Austin” campaign to promote economic development.<sup>1</sup> The project assessed the suitability and receptiveness of each of these industry clusters for implementing workforce development efforts to remedy labor shortages and support the growth of the cluster. The project sought to identify mid-skill occupations in demand that could emerge into a labor shortage situation. To meet the criteria for selection, these occupations also should be suitable for targeting by the workforce system and employers in the industry sector should be sufficiently organized and receptive to collaborate on analyzing factors contributing to the shortages and to participate in the remedies.

On the basis of this initial assessment, the project narrowed its focus to two of the most promising clusters: biosciences and wireless technology. Both industry clusters are targeted in the GACC Opportunity Austin campaign and in Texas statewide economic development initiatives. Both selected industry clusters are emerging industries, populated by small firms, and characterized by fast changing technologies. Both biosciences and wireless technology have strong university-based research support in Austin. In each of these clusters, there are approximately 100 firms located in the Greater Austin area. However, at this time, neither cluster has an “anchor firm.”

### **Economic Development and Workforce Development: Different Perspectives**

The traditional approaches of economic development and workforce development differ significantly. In economic development, the key focus is on marketing or “branding,” while workforce concerns are limited to attracting high-level talent to fill top positions in management, engineering and marketing. Economic developers tend to leave details to the market after an initial assist through public sector incentives. On the other hand, the concerns that occupy workforce developers—including which occupations might be critical for a given cluster to flourish, how local residents might best be prepared for these jobs, how long the process of preparing the workforce might take and where the financing for it might come from—are found in these “details.” Effective and timely preparation of area residents often requires considerable planning and sustained investment of public and private resources. A “market approach” may take many years to accomplish, during which time area

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<sup>1</sup> The nine targeted industry clusters are Automotive Manufacturing, Biosciences, including biomedical, and pharmaceutical products, Product Manufacturing, Wireless Technology, Transportation and Logistics, Clean Energy, Computer Software, Semiconductors, and Digital Media.

residents will not be prepared for jobs, so companies will incur added costs and recruit out-of-town.

Also, individual businesses typically do not foresee skill shortages until they are faced with them. Firms in growing clusters frequently do not identify or project their future workforce needs and are unwilling to commit significant resources to planning.

To be effective, a workforce development system must give attention to needs for workers across the spectrum of skill levels. Workforce developers are aware that one must plan ahead to develop and deploy effective training programs. Yet the workforce system is primarily charged with addressing current workforce demands and training for existing jobs.

## The Bioscience Cluster

The bioscience/biomedical cluster encompasses a wide variety of enterprises, including the following:

**Biotechnology** is the use of biological processes to solve problems or make useful products. Biotechnology involves the use of microorganisms, such as bacteria or yeasts, or biological substances, such as enzymes or genes, to perform specific industrial or manufacturing or medical processes. Applications include the production of certain drugs, synthetic hormones, and bulk foodstuffs as well as the bioconversion of organic waste and the use of genetically altered bacteria in the cleanup of oil spills. Also included is the use by industry of recombinant DNA, cell fusion, and new bio-processing techniques.

**Biomedical Products/Medical Devices** include firms manufacturing products such as syringes, hypodermic needles, surgical instruments, wheelchairs, ECG devices, hip prostheses, operating tables, dental equipment, dental instruments, condoms and much more. Medical devices also include more specialized products such as pacemakers and other implants with a power source. In other words, almost all medical devices are products used for diagnosing, treating and helping sick people, except for medicinal products.

**Bioinformatics** is the science of informatics as applied to biological research. Informatics is the management and analysis of data using advanced computing techniques. Bioinformatics is particularly important as an adjunct to genomics research, because of the large amount of complex data this research generates.

**Diagnostic testing** involves services to assist in the determination of a disease, ailment or condition.

**Pharmaceutical Products** are health products that contain synthetically produced compounds not found in nature. Pharmaceutical health products are found in a prepared dosage form. Producers of these products are permitted to make claims regarding structure/function, risk reduction and

treatment. Pharmaceutical health products are regulated by health product legislation.

**Clinical Trials** are investigational trials to evaluate the effectiveness and safety of medications or medical devices by monitoring their effects on people. There are four levels or phases of human trials. Phase I investigates safety, appropriate dosage level, and patient response to the treatment. Phase II clinical trials assess the whether the new treatment is effective. Phase III clinical trials compare the effectiveness of the new treatment against the effectiveness of standard treatments and collect information on side effects. Phase IV clinical trials investigate the side effects of the treatment among larger groups of people.

## **The Biosciences Cluster in Austin**

Austin has representation in all components of the bioscience industries. Several Austin bioscience firms trade nationally or globally. Bioscience products made in Austin range from biomedical devices such as heart valves (Medical Carbon Research Institute, Carbomedics), hospital products (Abbott Labs), spinal implants (Abbott Spine), stem cell storage bags (OriGen Biomedical), diagnostic testing systems (Luminex), and laboratory analysis instruments for veterinarians (Seahawk Biosystems). Austin biotechnology firms also provide services such as drug testing and employee screening services (DTS Austin), and several produce innovative products used by scientific researchers, such as custom-produced RNA solutions for scientific research (Ambion, Inc.) or mutagenesis kits used in cloning studies (Stratagene). Austin is also home to a concentration of firms that conduct clinical trials (CEDRA Corporation, PPD Development, Quintiles Transnational, and Scirex Corporation, and INC), as well as firms that produce clinical decision support software and other informatics tools (Caducian, Inc.).

## **Promising New Developments: Austin's Strengths**

The bioscience industry is highly concentrated in a few regions. Nine metropolitan areas accounted for three-fourths of the largest biotechnology firms and three-quarters of the new biotech firms formed over the previous decade. These nine metro areas were Boston, San Francisco, New York, Philadelphia, San Diego, Seattle and Raleigh-Durham, Washington/ Baltimore and Los Angeles (Cortright and Meyer, 2002). According to Cortright and Meyer, these regions grew because they had two elements: strong research capacity and the ability to convert research into successful commercial activity. A recent report by the Milken Institute included Austin on a review of America's twelve top metropolitan areas with biotechnology concentrations, but Austin generally ranked last on the lists – except in the production of college-trained workers (Devoi et al, 2004). The same report showed that biotech employment in Austin grew less than the national average over the period 1997-2002 (p. 60). There is room for improvement in Austin's performance in biosciences.

There is certainly fierce competition for bioscience industries. According to the Biotechnology Industry Organization, in 2005, fully 40 states were specifically targeting biosciences in their economic development efforts

(<http://www.bio.org/local/battelle2004/>). Localities such as Kansas City have also become players, thanks in part to a \$1.1 billion gift by James and Virginia Stowers to fund the Stowers Institute for Medical Research. In addition, there is considerable international competition from Singapore, Saudi Arabia, and other areas.

Yet several developments bode well for the future expansion of bioscience industries in Austin and Central Texas, including the following:

Bioscience is an economic development target both for the State of Texas and for the Greater Austin Chamber of Commerce. Texas has targeted biotechnology as part of both the State Strategy on Advanced Technology and the Governor's Industry Cluster Initiative (State of Texas, August 2005). Three state funding sources are now established to help promote and finance economic development: the Texas Enterprise Fund (\$180 million), the Texas Emerging Technology Fund (\$200 million), and CAPCO, a variable pool of private venture capital administered by the Comptroller of Public Accounts and funded by Insurance Premium Tax Credits. Texas also is establishing a Regional Center of Innovation and Coordination (RCIC) in Austin focused specifically on biotechnology and life sciences.

The University of Texas at Austin is expanding its research on health sciences and biotechnology, with major efforts centered in its College of Pharmacy, School of Nursing, Institute for Cellular and Molecular Biology, Biomedical Engineering Department and Institute for Neuroscience. Currently the University of Texas has more grant monies from the National Institute of Health than from the National Science Foundation. The increase in life sciences research at UT is accompanied by new interest and activity to promote commercialization. In 2002, the University created the Office of Technology Commercialization, aimed at getting UT innovations to the marketplace.

Scientific research is the most powerful driver of the biotech economy, and university support is critical in the development process. A recent study in California concluded that scientists working at universities or private research institutes had founded nearly half of all venture-backed startups (Zhang and Patel 2005). Further, the study determined that university faculty generally prefer to locate these startups nearby. A local example of this is Ambion, Inc., begun in 1989 by former University of Texas professor Max Winkler.

Upcoming location of medical research facility in Austin. The Central Texas Institute for Research and Education in Medicine and Biotechnology – a consortium composed of various components of The University of Texas, Seton Health Care Network, St. David's Health Care system, and the Greater Austin Chamber of Commerce – is establishing an academic health campus in Austin. This new facility will include a Center for Clinical Research and, when complete, is projected to accommodate more than 120 physician residents. The Central Texas Institute has developed specific plans, identified a location on the former Mueller airport site, and has started a campaign to raise private funds to finance construction.

High production of university-educated talent. Student enrollment in biosciences is increasing and several promising new programs have recently been started, including Bioengineering at the University of Texas and Bioinformatics at St. Edward's University.

## **Workforce Issues that Could Potentially Affect Economic Development**

A previous report (Glover et al., July 2005) outlined the workforce situation for biosciences in the Austin area. To summarize, Austin has an abundant flow of college graduates, but many employers complain that recent college graduates lack applied skills and often have unrealistic expectations about jobs available to them. Insufficient numbers of associate-degree-level workers are produced in Austin. The report found no evidence of widespread shortages; but employers reported that some key jobs were difficult to fill from Austin-area sources. As the industry cluster grows, these may develop into skill shortages.

The Austin education and training institutions are currently not prepared to accommodate rapid growth in biosciences employment at the sub-baccalaureate level. Sudden increases in demand for bioscience workers cannot be addressed with quick training. Most jobs require longer-term academic preparation; even lab technicians require at least one-year of study in a community college certificate program.

Yet biosciences could produce rapid growth in employment.

### **Difficult-to-Fill Occupations**

One recruiter specialized in biosciences compared the Austin labor market to the labor markets in other cities with an active bioscience industry. "There are not enough 'worker bees' in Austin," she explained.

More than most industries, bioscience places a keen emphasis on academic credentials. Only about 15 percent of jobs in the industry cluster require less than a bachelor's degree. Yet some firms reported that pre-baccalaureate jobs were difficult to fill from local Austin sources, such as lab technicians, production technicians, and clinical trial assistants.

### **The Demand for Biological Technicians**

The Capital Area Workforce Development Area (Travis County) and Rural Capital Workforce Development Area (the nine counties surrounding Travis in the Capital region) constitute the relevant labor market. The employment projections currently available for biological technicians (occupational code 19-402) from 2002 to 2012, as developed by the Texas Workforce Commission Labor Market Information (LMI) TRACER SYSTEM, are as follows:<sup>2</sup>

Capital Region (Travis County)	
2002 employment	300
2012 projected employment	350
Increase	50 (16%)
Per year increase due to:	
Growth	5
Replacement	5
Total annual increase	10

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<sup>2</sup> <http://www.tracer2.com/?PAGEID=67&SUBID=114>

Rural Capital	
2002 employment	50
2012 projected employment	50
Increase	0(0%)
Per year increase due to	
Growth	0
Replacement	0
Total annual increase	0

The above data apply to biological technicians with the educational equivalent of an associate's degree. The data do not separate out technicians with bachelor's degrees.

These employment projections are necessarily derived from past experience. They do not take into account that biotechnology is an economic development target for both the state of Texas and the Greater Austin Chamber of Commerce. For a variety of reasons, these projections most certainly understate the demand for biological technicians.

The projected annual turnover rate for biological technicians at 1.7 percent is too low. Actual annual turnover rates actually run closer to 10 percent. This would mean replacement of 35 biological technicians each year across the two workforce areas.

Similarly, the annual projections for new jobs due to growth are underestimated. One biotechnology firm in Austin alone reported hiring at the rate of five new biological technicians per year. The "no-growth" scenario projected for the Rural Capital Region clearly is also clearly already incorrect. In Bastrop County alone, several biotechnical firms have grown since 2002 and have hired additional biological technicians.

Conservatively estimated, the actual annual demand is at least five times the total annual need of ten (10) biological technicians projected for the Capital Area and Rural Capital by the Texas Workforce Commission.

Even more incredible, the Labor Supply Estimator provided to prospective employers by the Texas Workforce Commission showed a total of 73,970 available workers in employment related to biological technicians in the Capital Area (Travis County) during August 2005, based on an "O-NET-based Knowledge, Skills and Abilities matching routine." (<http://www.texasindustryprofiles.com/apps/lae/laetable.asp> Accessed August 24, 2005) Yet 70 percent of biotechnology students at Austin Community College already have a bachelor's degree, but find that they are unable to secure a position as biological technicians because they do not possess the applied skills needed!

The Texas LMI system reports average hourly wage levels of \$14.12 at entry and \$19.80 for experienced biological technicians in the Capital area (Travis County) in 2004 (<http://www.tracer2.com/cgi/dataanalysis/?PAGEID=94>).

## **Factors Contributing to “Difficult-to-Fill” Occupations**

As indicated in a previous project report (Glover, et al, July 2005), several factors contribute to the difficulties in filling occupations from Austin local sources, including the following:

- Continual change—in markets, technologies, and in processes—keeps the emerging bioscience cluster in ferment.
- ACC has a strong biotechnology program, but it is underutilized and under publicized and has graduated few students.
- Training for some bioscience specialties at the associate degree level, such as biotechnological instrumentation technician, does not currently exist in Austin.
- The public lacks awareness about the range of job opportunities available in biotechnology/biomedical industries.
- The bioscience industry has no effective vehicle for organizing industry-wide networking across the region. To date, the Greater Austin Chamber has sponsored only an occasional networking event in biosciences.

## **Exploring Solutions to Potential Workforce Shortages**

In providing workforce development to support economic development, there is a need to anticipate future needs and to think and act ahead of the market because the required training is often a long-term endeavor.

Austin Community College plays important roles in implementing solutions in this arena. Among postsecondary education and training institutions, technical and community colleges are the most cost-efficient, accessible and experienced institutions in adult learning (Rosenfeld, 2004, p. 235). While Austin has an abundance of fresh graduates with bachelor’s degrees, not enough graduates at the associate degree level are being produced.

The process for identifying solutions in this project has included interviews conducted with industry and community partners, a focus group of industry representatives convened by the Greater Austin Chamber of Commerce, an email summary distributed for validation, and follow-up discussions based on these ideas.

In the course of the research, several recommendations were made for enhancing the workforce development system to support development of the regional bioscience industry in Greater Austin. These are organized into categories that were developed in our earlier report: training utilization issues (Is existing training used?), training capacity issues (Is training available?), and training fit (Does existing training match employer needs?)

## **Recommendations/Suggestions based on Stakeholder Input**

### ***Training Utilization***

1. Fill out the enrollment in ACC's Biotechnology Program, especially by supporting the recruitment of underserved minority populations from East Austin.
2. Continue, improve, and expand the Skillpoint Summer Educator Biotechnology Institute begun in 2005 to raise awareness about biotechnology careers and skills.

### ***Training Capacity***

3. Expand and improve quick-start training options (customized training, and other courses) through ACC Continuing Education.
4. In collaboration with industry, design and establish a program at ACC's Electronics Department in biomedical instrumentation/biotechnical instrumentation/medical instrumentation
5. Establish training programs for personnel in clinical trials research in ACC Continuing Education.

### ***Training Fit***

6. Increase the use of student internships with industry.

### ***Other Recommendations***

7. Establish an incubator at Austin Community College, to include facilities for "wet lab" activities.
8. Develop a bioscience network to increase the visibility of the industry and to communicate industry needs to education and training providers.
9. Recommend that Texas Workforce Commission make it easier for employers and job applicants in this industry to find one another by adding special categories for economic development targets in the WorkinTexas.com job matching system.

Let us review each of these in greater detail:

### **Training Utilization**

1. **Expand enrollments to reach full capacity of the ACC Biotechnology program**

ACC's Biotechnology program can accommodate double its current enrollment. Biotechnology Department Chair Dr. Linnea Fletcher has implemented several best practices already (including outreach to eight area high schools, tech prep articulation, recruiting presentations to biology and chemistry and English-as-a-Second-Language classes at ACC, and various summer programs for high school and middle school teachers). Faculty

members from the biotechnology department also teach selected online courses through ACC Continuing Education to reach individuals unable to attend on-campus regular classes.

The ACC Biotechnology program has numerous attractive features. It provides excellent practical preparation for “wet bench” jobs in industry. The program has remarkable industry contacts as reflected in its strong advisory committee representing a wide diversity of employers of biological technicians. Employees from industry (especially Ambion) participate as adjunct instructors in the program. Industry contributes equipment and consumable supplies to the program. The program has well equipped, new facilities. It enjoys a good placement rate. The ACC Biotechnology program has active outreach to eight high schools and middle schools across the region through tech prep. ACC Biotechnology faculty have conducted summer institutes for high school teachers and offered them other instructional support. Selected biotechnology courses are dual-listed in continuing education and in college credit programs. The program actively participates in state-level and national-level networking activities. Dr. Linnea Fletcher, Department Chair also serves as the regional leader for the South Central States in the Bio-Link program, a biotechnology network funded by the National Science Foundation. Bio-Link participates with other community colleges and universities in a variety of jointly sponsored research and teaching projects. The ACC Biotechnology Program was designed based on a review of best practices from other biotechnology programs across the country, acquired through Bio-Link. The ACC biotechnology program is located on the ACC Eastview campus, convenient to Austin’s neighborhoods of underserved minority populations in East Austin. Specific recommendations include:

- (a) Provide outreach for new entrants to the Biotechnology Program with a strengthened K-12 feeder component in underserved communities.
- (b) Industry should join Austin Community College as an active partner in the recruiting campaign for students. In the late 1990s, SEMATECH and area semiconductor manufacturing firms collaborated with Austin Community College to conduct a successful recruiting effort and build enrollments in the Semiconductor Manufacturing Technician Program. Industry personnel joined ACC faculty to provide orientation sessions for youths and adults on a series of Saturday mornings. Firms held career open house events, inviting the public into their facilities.
- (c) Support efforts to recruit individuals in underserved minority groups through the “Bridge to Biotech” program at Austin Community College. This new initiative aims to recruit students from disadvantaged backgrounds into ACC programs in Biotechnology and Allied Health programs. Beginning in spring 2006, the program will offer a basic introductory course to biotechnology, along with a related course in mathematics. The aim is to attract and interest underrepresented students into biotechnology and other applied science careers. The program is based on a model developed by the City College of San Francisco, which developed the curriculum through an NSF grant. City College successfully recruited in the Mission District (for Hispanics/Latinos) and in Bayview-Hunter’s Point (for African

Americans). The biotechnology company, Genentech, participated in the program by hosting tours. City College initially recruited students and ultimately attracted their parents as well.

Since Austin does not have the extensive population of biotechnology firms found in San Francisco, the proposed program in Austin would be broadened to focus on Careers in Applied Science, including Allied Health occupations. The one-semester program will offer an integrated package of courses in biotechnology and mathematics taught in a block on Mondays, to enable the participants to work for the rest of the week to support themselves and their families.

Ambion and Stratagene, two local biotechnology firms, have recently begun second-shift operations. The plan is to place students in jobs in these and other firms, providing exposure to applied science occupations along with opportunities to earn money to support themselves and their families while they attend classes. Dr. Linnea Fletcher anticipates that single mothers will enroll and foresees that lack of transportation and childcare may become barriers to participation in the program.

**2. Continue to sponsor, improve, and expand Summer Educator Institutes in biotechnology to improve career awareness**

In June 2005, Stratagene joined with the ACC Biotechnology Department, Texas State University at San Marcos, and the Austin Police Forensics Crime Lab to co-sponsor an Advanced Summer Educator Institute in Biotechnology. The Institute was organized by Skillpoint Alliance and attracted twelve high school teachers from across the region. Such an institute is an excellent way for business to leverage its contacts with students through their teachers. Using lessons learned by the Skillpoint Alliance in developing Summer Educator Institutes and the sponsors of the summer 2005 institute, biotechnology firms in Austin can continue to improve the biotechnology educator summer institute over time. Such institutes give teachers direct contact with biotechnology workplaces and make them aware of career opportunities in biotechnology.

### **Training Capacity**

**3. Expand and improve quick-start training options (customized training, and other courses) through ACC Continuing Education**

At the request of industry a few years ago, the ACC Biotechnology Department began offering a course in Molecular Techniques through ACC Continuing Education because firms needed their workers trained in these advanced techniques. Industry personnel helped to teach the course. The collaboration proved such an excellent experience that it began a regular practice of having industry representatives teach specific advanced techniques. Since then also, selected biotechnology courses have been dual listed so that they can be taken as either continuing education courses or for college credit. Also college students and teachers have been invited to participate with incumbent employees in industry training sessions on advanced techniques.

The role of colleges is not just to train entry-level workers, but also to continually transfer knowledge back and forth through high-level and sustained interaction with firms. Firms can help provide instructional staff to teach modules, offer internships for students and externships for faculty, and access to advanced equipment for use in the classroom. In such a fast moving industry, firms must help educators stay up to date with new developments and innovations in the industry (Rosenfeld, March 2004).

4. **In collaboration with industry, design and establish a program in biomedical instrumentation/biotechnical instrumentation/medical instrumentation**

Biomedical and biotechnical firms use a variety of electronic equipment that must be fabricated, properly calibrated and maintained in good working order. Currently no training is available in Austin for these jobs. A new associate degree program in Biotechnology Systems was approved to start in September 2005 at the Texas State Technical College (TSTC) campus in Waco. Faculty members at Austin Community College have held discussions with TSTC representatives about developing a joint program for biomedical instrumentation/ biotechnical instrumentation/medical instrumentation. TSTC would teach courses on optics and lasers, which are not available at Austin Community College. To date, no decision has been made about this initiative.

Industry should validate any new curricula to certify that it meets immediate and anticipated needs. Educators and industry periodically should jointly review and update existing curriculum content as well.

5. **Provide training to build on Austin's capabilities in clinical trials research**

Texas is the site of more clinical trials than any other state, and Austin is the headquarters of several firms who specialize in conducting clinical trials. In September 2005, there were 1,578 clinical trials underway in Texas and 201 underway in Austin registered with the federal government (<http://www.clinicaltrials.gov/ct/search> Accessed September 26, 2005). Austin could leverage this leadership position to expand relationships with firms conducting the trials and prepare more local residents to work in this industry.

Currently, training in clinical trials research is available through a variety of programs; however, none of these programs are located in Texas. Some training is available through the Internet. Staffing firms, such as Kelly Scientific or Unitek College, offer fee-based online training in clinical trials. Similarly, both Duke University and Durham Technical Community College offer selected online courses in Clinical Trial Research for college credit. These Internet courses can be accessed in Austin. Non-profit organizations, such as the Society of Clinical Research Associates (SoCRA), offer traveling workshops and certifications in Clinical Trial Research. The current SoCRA schedule shows regular visits to Houston and selected visits to Dallas, Lubbock, San Antonio and Temple—but none to Austin.

Outside of Texas, sixteen community colleges and universities across the U.S. and Canada offer specialized training at various levels ranging from certificate programs to Master's degrees in clinical trial research

(<http://www.socra.org/faq.htm>). An excellent example of community college training in clinical trials research can be found at Durham Technical Community College in Durham, North Carolina. The Durham Clinical Trials Research Associate curriculum prepares individuals to assist investigators and clinical researchers in the initiation, administration, coordination, and management of clinical research studies for the development of new drugs, clinical products, and treatment regimens. Course work includes in-depth study of drug development, relevant federal regulations, and good clinical practices and research processes. Supervised fieldwork provides skills application in protocol and clinical trial design, subject recruitment, regulatory compliance, accountability for drugs and devices, and auditing documentation in clinical research studies.

## **Training Fit**

### **6. Expand the use of student internships**

Student internships and teacher externships are important to help keep schools and teachers connected with industry and up to date on industry practices. Internships provide a vehicle to help assure direct industry engagement, and give college students opportunities for applied, practical experience. Internships serve as effective screening devices for employers; they offer opportunities for students and firms to check out one another. Internships can lead to regular full-time employment for students. The availability of paid internships in a program area also attracts students to enroll.

Fortunately the faculty in many workforce programs at Austin Community College already value student internships. In fact, the electronics department now requires industry partners to commit student internships before any new program is established. The biotechnology program at ACC offers unpaid internships in industry and in university research labs as a “capstone” experience for students during their final semester of courses.

Paid internships are easier to arrange in large firms than in the smaller firms, which at this point comprise most of the bioscience industry in Austin. Internships are difficult for small firms to maintain, due to economic pressures. But even if difficult, internships are valuable to firms, schools, and students.

## **Other Recommendations**

### **7. Consider establishment of an incubator at Austin Community College to include facilities for “wet lab” activities**

ACC could offer space for a “wet lab” incubator for biotechnology firms. In return for participation in the incubator, staff from firms in the incubator could commit to help teach students and offer student internships and mentoring as part of their compensation for use of the incubator. The Austin Technology Incubator currently has no wet lab space, so such a community college incubator could fill a gap. Across the country, about one half dozen community colleges sponsor incubators. Establishing an incubator is a longer-term endeavor that needs to be built into ACC’s master plan for future facilities.

**8. Develop a bioscience network to increase the visibility of the industry and to communicate industry needs to education and training providers**

The most popular recommendation from the focus group conducted with biosciences representatives at the Greater Austin Chamber of Commerce in July 2005 was developing a regional bioscience network similar to BioCom in San Diego to bring greater visibility to the bioscience industry in Central Texas and to communicate industry needs to education and training providers. The Greater Austin Chamber currently sponsors occasional networking events, in collaboration with the Austin-based Texas Biomedical and Healthcare Institute (TBHI). To date, there has been little participation in Austin's networking efforts from local governmental entities or from venture capital firms.

Within Texas, BioHouston is currently the most active regional network. BioHouston was recently formed as a non-profit consortium of major research and higher education institutions, local governments and economic development entities, life science and biotech companies and venture capital firms. Its proclaimed mission is "to create an environment that will stimulate technology transfer and research commercialization, thereby generating economic wealth for the Houston region and making it a global competitor in life science commercialization" ([www.biohouston.org/common/page.asp?pageid=245](http://www.biohouston.org/common/page.asp?pageid=245)).

The task of organizing a regional network is primarily a responsibility of the Greater Austin Chamber of Commerce, although WorkSource can be supportive in this effort. Cluster organizations represent a collective voice for the private sector and therefore are more effective in the design and development of educational programs. The most effective clusters are those that can officially represent and speak for the industry, not just for their own companies (Rosenfeld, March 2004, p. 39).

**9. Add special access buttons in WorkinTexas.com for job listings in industry clusters targeted for economic development**

If Austin and the state of Texas want to foster economic development in biotechnology and bioscience, the workforce system needs a counterpart emphasis. Presently the computer job matching program, WorkinTexas.com is not sufficiently "user-friendly" to either employers or job applicants in biosciences. A job seeker searching through WorkinTexas.com would not find categories for "biosciences" or "biotechnology." Most jobs in biosciences are subsumed under the broader category of "Life, Physical and Social Sciences" and cannot be isolated directly. Jobs in medical device manufacturers are found under "production occupations," biotechnology and clinical trials may be part of "health care practitioners and technical," and bioinformatics is likely to be classified as "computer and mathematical."

## Possible Demonstration Projects to Address Training Issues

Based on input from industry and education partners captured in the recommendations above, the following are possibilities for demonstration projects in the near term:

### DEMONSTRATION PROJECT #1

Promote expanded enrollment in the Biotechnology Program at Austin Community College through supporting inclusion efforts for underrepresented minorities through the *Bridge to Biotech* program.

This approach builds on existing strengths, but also provides a specific opportunity for collaboration between *WorkSource*, ACC, and other organizations to improve utilization of a strong training program that already has some industry partners.

- ACC has funding as a pilot site in a National Science Foundation grant to test the *Bridge to Biotech* program in Austin beginning spring 2006. The grant provides funding for teacher salaries. In addition, the ACC Biotechnology Department has available a scholarship fund of \$7,000 contributed by Ambion to finance tuition for students from low-income families.
- *WorkSource* could provide significant assistance by aligning supportive services, including childcare and transportation, to overcome barriers to participation for eligible students who enroll in this training, and by orienting *Workforce Center* staff to the program opportunities for outreach to potential candidates.
- Organize student internships and jobs on second shifts with bioscience companies such as Ambion and Stratagene.
- Organize outreach to high schools, with marketing materials linked to the ACC College Connection with AISD, and specifically recruit and sponsor teachers from schools in disadvantaged neighborhoods to participate in the next Summer Educator Institute in Biotechnology.
- ACC will work with candidates on support for passing the college entrance tests under the Texas Success Initiative (formerly the TASP test). For those who prefer a speedier, more intensive route, access to the Capital IDEA College Prep Academy could be made available to prepare for the required tests.

### DEMONSTRATION PROJECT #2

Support the development of new specialization in biomedical/biotechnology/medical instrumentation in the electronics department at Austin Community College.

At least three Austin bioscience firms (Luminex, Ambion, and Stratagene) have expressed interest in establishment of a specialization within the ACC electronics

department in biomedical/biotechnology/medical instrumentation. This specialization would consist of a sequence of three or four courses including an internship in industry. This program would be an optional specialization for students who had completed core courses in electronics. It would prepare workers to build, calibrate and maintain various pieces of electronic equipment used in bioscience firms.

The demonstration would involve developing the new courses needed (perhaps in collaboration with the Biotechnology Systems program at Texas State Technical College in Waco) and recruiting and training an initial cohort of students in this specialization.

## **Solutions Cannot Come From Workforce Alone**

Workforce preparation is only one component of a broader strategy needed to promote the development of the bioscience industry cluster in Austin. Also necessary are efforts to improve the process for commercializing innovations (especially from university researchers), to attract venture capital for early-stage financing, and to provide an effective incubator/accelerator infrastructure that fosters the development of startup firms. The process of developing new biopharmaceutical products is uncertain, time consuming, and expensive. Development of a new drug typically takes between five and twelve years (Cortright and Mayer, 2002). Given the lengthy period required for product development and approval, "patient" venture capital is especially important in this industry.

### **The Need for Employer Engagement**

There are indications that the bioscience industry is receptive to collaboration in response to the right approach. The larger firms seem to be more responsive. Some existing examples of collaboration are noteworthy.

- The high degree of involvement by Ambion in helping to start the ACC Biotechnology program in 1999 and in actively supporting it since then.
- The willingness of Stratagene to co-host an Educator Institute in summer 2005.
- The willingness of Luminex and other Texas medical device firms to sponsor internships for University of Texas biomedical engineering students.

Whatever course of action is taken, employer engagement will be key. Austin Community College workforce development programs in biosciences should be employer driven, work in partnerships with firms, and stimulate economic development by helping to attract new firms and helping existing firms to expand and compete.

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## Appendix A: Bioscience Activities in Other Localities

A well established national network of bioscience educators funded by the National Science Foundation can be found at the following website:

<http://www.bio-link.org/>

California Community Colleges have a statewide Biological Technologies Initiative, which has had a network in place for workforce training and education in biotechnology and biosciences since 1996.

<http://www.cccbitech.org>

A new national network of biotechnology programs in community colleges has been established through a recent grant from a \$5 million grant from the U.S. Department of Labor to Forsyth Technical Community College in North Carolina

(<http://www.biotechworkforce.org/>). Forsyth specializes in biotechnology research and development (<http://www.forsythtech.edu/student/biotech.html>).

Included in this network are four other technical and community college programs:

New Hampshire Community College (Biomanufacturing.org)

<http://biotech.nhctc.edu/>

Specializing in Biomanufacturing in the Northeast

Indian Hills Community College in Ottumwa, IA

<http://www.ihcc.cc.ia.us/biodevelopment/index.asp> and

(<http://www.ihcc.cc.ia.us/ihcc/Learn/advtech/bioprocess.asp>)

Specializing in Agriculture & Food Processing in the Midwest

Bellevue Community College, Life Science Informatics Center in Bellevue, WA

<http://www.bcc.ctc.edu/informatics/index.htm>

Specializing in Life Science Informatics in the Northwest

Miracosta Community College in San Diego, CA

<http://www.miracosta.cc.ca.us/BIOTECH/>

Specializing in Bioprocessing in the Southwest

### Other Programs in Bioprocessing:

1) Solano Community College – Jim DeKloe

<http://www.solano.edu/degrees/catalog%5F200304/biotechnology.htm>

2) New Hampshire Community College – Sonia Wallman

<http://www.biomanufacturing.org/>

3) Alamance Community College – Bill Woodruff

<http://www.alamance.cc.nc.us/newsite/>

4) MiraCosta Community College – Michael Fino

<http://www.miracosta.edu/biomfg/>

## **Examples of bioscience business incubators sponsored by community colleges:**

1) Pasadena Community College – Wendie Johnston -

<http://www.paccd.cc.ca.us/instadmn/lifesci/biotech/>

This incubator was established based on a detailed feasibility study commissioned by the California State Legislature. See Economic Competitiveness Group and Smith Group, *Pasadena Bioscience Innovation and Training Center Feasibility Study*.

Chancellor's Office, California State University, December 2000. Available on line at <http://www.pasadenabiosciencecenter.org/Pasadena%20Biotech%20Study%20DEC%2019.pdf>

2) Salt Lake Community College – Tamara L Goetz

(801) 957-5284 or (801) 957-5292

The Miller Business Innovation Center runs a business incubator program, housing start-up and young companies' business operations. The incubator program is designed to help new companies achieve high growth through an array of operational and educational services, along with business resources and networking opportunities. The Innovation Center includes 30,000 square feet of Class A and Class B office space, which it makes available to selected companies at below-market lease cost.

3) San Diego City College Center for Applied Competitive Technologies – Armando A. Abina

<http://www.cact.org/sandiego/>

This incubator targets biotech as well as other high technology industries.

4) Asheville-Buncombe Community College in North Carolina – C. Max Queen

This college center makes available wet-lab and office space in an incubator for emerging biotechnology firms.

<http://www.abtech.edu/ce/summer/biotech%20web%20tour.asp>

5) Madison Technical College, Madison, Wisconsin – Dr. Edward Clark

The Technology, Education Commerce (TEC) Center is operated by a non-profit organization formed by the college working in collaboration with a developer, who owns the property.

6) Contra Costa College, California

This incubator is part of the California Community College Biological Technologies Initiative

<http://www.cccbitech.org>