The Community College Program at BIO 2015

Annual Community College Program Unites Educators, Industry

The Community College Program at the 2015 BIO International Convention (CCP@BIO) was the twelfth time that educators from two-year colleges met in conjunction with the enormous biotechnology industry meeting. The 2015 program was held on June 16, 2015, in Philadelphia, Pennsylvania.

Welcoming 57 participants on behalf of Montgomery County Community College was Victoria Bastecki-Perez, provost and vice president of Academic Affairs at the Blue Bell, Pennsylvania, college.

The community college educators were also greeted by Peter M. Pellerito, senior advisor for Federal/State Economic Development Policy and University Relations for the Biotechnology Industry Organization known as BIO. He assured them that industry increasingly understands their importance.

"We are finding more and more that where our companies are and where they're successful, there is a community college that's there to be supportive," Pellerito said.

Pellerito encouraged the educators to use the meeting as an opportunity to network with each other and to familiarize themselves with the diverse biotech businesses of the 65 nations represented at the convention.

He predicted that in the future educators and biotech employers will be more "interdependent." He advised them, “Each of us needs to bring skill sets in the areas that we specialize in to be productive."

Pennsylvania Builds on BIO Talent Pool

Helping individuals start and grow small biotech companies is the focus of life sciences economic development in Eastern Pennsylvania.

Montgomery County Community College is among the educational institutions working with private and public initiatives to fill the void left from big pharmaceutical companies moving from the region as a result of mergers and acquisitions. The five-county region around Philadelphia is also responding to competition from Boston, the biotechnology vanguard in the Northeast.

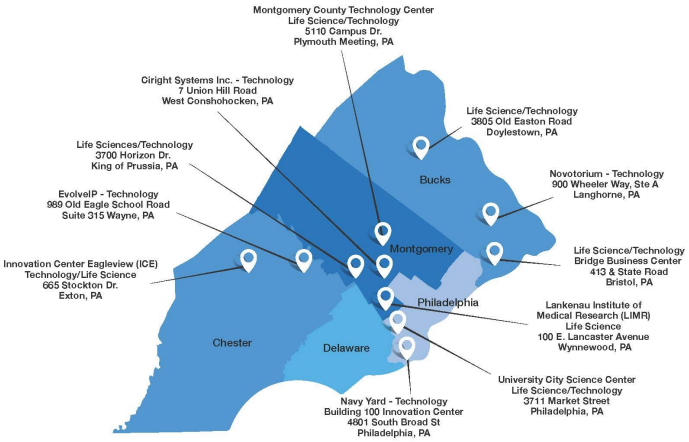
Nevertheless Eastern Pennsylvania has 40,000 life science jobs spread among 800 companies. The infrastructure of these companies and their employees contribute one of every six dollars generated locally, according to Anthony Green, vice president of the Technology Commercialization Group for Ben Franklin Technology Partners of Southeastern Pennsylvania. The non-profit corporation invested $7.5 million in 44 enterprises during 2014.

David A. Niles, executive director of the Montgomery County Development Corporation, cited young adults' desire to reside near where they work and more Pennsylvania college graduates choosing to stay in the Keystone State as an opportunity that he and his economic development partners are leveraging by establishing small biotech incubators in the suburbs of Philadelphia.

Community colleges play an important role in this dynamic environment, Niles said, by offering programs that attract new people to biotechnology and retrain "PhDs for a different skill set that they may or may not know they need."

Green pointed out, "Every job that your community college helps to create and fill [is] not a standard minimum-wage job. These are highly skilled jobs in an environment that requires that."

Philadelphia Bioscience Incubator **Facilities**



The greater Philadelphia 5-county area is home to a number of bioscience incubator spaces.

Source: Montgomery County Development Corporation and Benjamin Franklin Technology Partners.

Speakers Highlight Regional Biotech Development

It is not a coincidence that the regional powerhouses that are the biggest suppliers of biotech graduates have invested heavily in education programs to develop their bioscience workforces.

The Northeast has eight new certificate programs; California leads in terms of number of biotech employers and graduates; Florida is exceptionally diverse with five distinct industry clusters; North Carolina has the oldest biotech industry; and Massachusetts has the highest per capita employment in life sciences.

NORTHEAST

The 12-state Northeast region, which NBC2 serves in New England and the Mid-Atlantic, added eight certificate programs since 2012. The region had 320 biomanufacturing graduates in 2015. Nearly half of these were in Massachusetts. The other states in the region average about 16 biomanufacturing graduates annually.

"It's not a lot, but it's an elite group," said Sonia Wallman, founding principal investigator of NBC2. She explained that students' rigorous coursework and hands-on laboratory experiences prepare them so they are "ready to go into the industry."

CALIFORNIA

With 235,000 biotech jobs among 8,000 businesses, California leads the nation in life sciences employment.

Middle skills occupations, those that require less than a bachelor's degree, have an average hourly wage of $20 per hour or about $42,000 per year, according to *Life Science & Biotechnology Middle Skills Workforce in California*. The study was prepared by Centers of Excellence for Labor Market Research, Bio-Link, and the California Life Sciences/Biotech Initiative.

John Carrese, director of the Centers of Excellence for Labor Market Research, estimates that average annual job growth in the biotech sector will be 3% in California.

Carrese explained that his research for the study combined state labor market data with Burning Glass's job posting data, and the centers' one-on-one interviews with the faculty of 16 community college biotech programs. Faculty reported having 423 "job ready" students exiting their programs in 2013 when there were 3,297 biotech job postings statewide. Carrese identified the gap between postings and community college-prepared biotech workers as an opportunity for colleges and individuals.

Bio-Link principal investigator Elaine Johnson noted that Bio-Link's Bridge to Biotech program and other initiatives are trying to fill this gap by bringing mid-career and immigrant students into biotech programs at California community colleges. "We have some very special students in our programs," she said, calling the talent pool "enormous."

FLORIDA

Florida's beaches and lack of income taxes have helped attract biotech companies to Florida since 2003 when the state invested $1 million to diversify its economy with biotechnology.

Life sciences enterprises in five subsectors—biotechnology, pharmaceuticals, medical devices, healthcare, and agricultural feedstock and chemicals—have grown in clusters, mostly along Florida's coasts. Their employment is expected to continue to grow at a rate of 9 to 10% annually.

"Our industry is still relatively young," said Tamara Mandell, assistant director for Education and Training at the University of Florida's Biotility. She estimates that between 30 and 40% of Florida's biotech companies are in the start-up phase.

Biotech program enrollments are growing thanks to statewide articulation of secondary school biotech program credits to associate degree programs. Academic program development has also been helped by state and federal funding, and by partnerships with community workforce boards and economic development agencies.

Mandell considers the certificate programs offered by Florida's state colleges a particular strength.

The college credit programs, like the credential for biotechnician assistants, provide short-term training for immediate employment in regulated environments and can be applied toward two-year degrees. Advanced technical certificates are designed for degree holders who lack the hands-on life sciences or biomanufacturing experience that employers seek.

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Tamara Mandell describes the diversity of Florida's booming bioscience industry.

Burning Glass Identifies Opportunities for Two-year Colleges

Burning Glass Technologies' deep dive into life science employment data finds significant opportunities for two-year biomanufacturing programs to address skill gaps.

"I actually think if you really understand demand, the big opportunity is to challenge it. The market as currently behaving doesn't make sense in a lot of cases," Burning Glass CEO Matthew Sigelman said during his keynote address at the Community College Program at the 2015 BIO International Convention. The Boston-based company uses information from job postings for its analyses of market trends.

Sigelman sees "enormous opportunity" for associate-degree granting colleges to teach critical skills and knowledge to people seeking jobs in emerging fields like bioinformatics.

He also sees strong demand for individuals with biomanufacturing skills in states known for robust biotech economies. Burning Glass identified regional pockets where per capita biotech employment is growing. In these places it can take months for employers to fill bioscience positions.

"The job market is filled with market failures; market failures manifest themselves as skills gaps," he said, adding that he considers them information gaps.

"Supply doesn't meet demand because supply doesn't know all the things employers are expecting," he said. Burning Glass is currently working with textbook publishers to make sure the content they cover is "sign posted" to job market relevance. He encouraged two-year college educators to make sure their students identify their skills with the terms employers use.

Sigelman identified the "exciting" work of two-year college educators as deciding "how do we leverage the really great existing programs, and figure out what are the specific skills for the jobs in our community?"

He urged the educators to make sure their programs are structured for efficiency and excellence. In this way "people can graduate and unlock a set of high-paying, high-mobility opportunities." Rather than be discouraged by the degree inflation, Sigelman suggests educators use the Burning Glass data to start conversations with employers who require bachelor's degrees for entry-level biomanufacturing jobs.

In many instances, he said, the four-year degree requirement listed as a job qualification is "a proxy for other skills" that employers want entry-level biotechnicians to have. When Burning Glass compared associate degree holders' and baccalaureates' skills it found many matches, with the only significant differentiations occurring among employers who need technicians with specific domain skills.

Keynote speaker Matthew Sigelman, CEO of Burning Glass Technologies, summarizes the findings of a survey of bioscience job postings and illustrates how community colleges can best prepare students for job interviews and employment.

Sigelman referred to long unfilled jobs as employer "pain points" that have the potential to push them to reconsider credential requirements.

By raising questions with employers and responding to what they say, educators could "create a more effective talent timeline," he said.

MassBio used Burning Glass data to engage employers and created a stackable program series that responds to the skills employers want.

Beth Nicklas, general counsel and vice president of Academic and Workforce Programs for Massachusetts Life Sciences Center (MLSC), says discussions with employers are a process that takes time. She recounted her success with a CEO of a contract resource organization who initially would not hire community college students.

When MLSC offered to pay for community college interns, the CEO agreed to take two. They performed so well that the firm has hired two community college students on a permanent basis and is looking for others.

"We think we are changing perceptions … about the quality of community college students," Nicklas said.

View presenters' slides and other CCP@BIO resources online at www.biomanufacturing.org

Faces of Success Panel Highlights Community College Graduates

The annual Faces of Success panel at CCP@BIO recognizes outstanding community college graduates and programs from across the country. The panel was moderated by Elaine Johnson, Principal Investigator of Bio-Link at City College of San Francisco and included presentations from five community college graduates with diverse backgrounds.

The 2015 panel participants, pictured at right, are (from left) Robin Zuck, Richard Wollover, Daria Kotoski, Sarah Schober, and Kevin Brown with panel moderator Elaine Johnson.

Curiosity and Ambition Lead to Non-traditional Bioscience Career

Sarah Schober had been laid off as a delivery truck driver when a sign advertising the new biotechnology program at Asheville-Buncombe Technical Community College caught her attention. "Huh, that sounds cool," she thought of the message that beckoned—"If you like science, math, and chemistry, you will love biotechnology."

"I ended up graduating with three degrees [AAS in biotechnology, AS in biotechnology, and AA] just because I could not help myself," she said with a laugh during her presentation.

In 2006 while taking courses for those associate degrees, Schober began working a few hours a week in the BioNetwork lab, which was located just up the stairs from her college classrooms. BioNetwork is a North Carolina statewide organization that provides education and training resources, as well as laboratory facilities, to biotechnology and life sciences employers.

Over the years Schober's hours and responsibilities grew. In 2008 she became a full-time employee and continued to rise through the organization's ranks.

Now as senior director of industry training, she helps established businesses and entrepreneurs with employee training in laboratory, manufacturing, and regulatory practices. She also does needs-analyses for companies.

Schober earned her bachelor's degree in industrial technology with an emphasis in bioprocessing at East Carolina University. Recently she earned a certificate in food safety through the University of Southern California's online graduate program in food security.

She credits the hands-on learning of her two-year college experience with helping her succeed in the other, more theoretical, progrmas.

"It gave me hands-on skills that I didn't get at any of the other colleges I went to," she said, adding, "I wouldn't have understood the theory of so much of what I did without having done [it], without the community college experience."

c^3bc Works with Industry on Skill Standards

Russ Read, project director of the Community College Consortium for Bioscience Credentials (c^3bc) at Forsyth Technical Community College (FTCC), moderated the panel discussion about consortium activities and partners' work on skill standards. Read also leads the National Center for the Biotechnology Workforce at FTCC.

Since 2012 c^3bc has provided bioscience training to more than 2,300 people with support from a US Department of Labor Trade Adjustment Assistance Community College Career Training grant. As of June 2015, students enrolled in c^3bc-supported training programs had completed 26,837 credit hours.

In addition to revising curricula to accelerate students' entry to the bioscience workforce, 12 colleges in the consortium had received funding to enhance their lab equipment.

To "harmonize" the skill standards so entry-level technicians learn the skills that employers want across multiple bioscience sectors, consortium leaders worked with medical device manufacturers, biomanufacturers, and laboratories.

The most ambitious of these efforts involves creating skill standards for technicians in the medical device industry. NBC2, with National Science Foundation support, introduced biopharmaceutical manufacturing skill standards in 2004 and has since updated the standards in 2007 and 2013. Elaine Johnson, principal investigator of Bio-Link, has led the effort to update skill standards for laboratory technicians.

Sengyong Lee, chair of biotechnology at Ivy Tech

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Certificate Program Helps Scientist Re-enter Workforce

Robin Zuck had what she calls "a life detour and speed bump." Until she began looking for a job, she thought her doctoral course work in biochemistry, her previous employment as a research chemist, and a master's degree in computer science would impress employers.

But when she began her job search after 20 years out of the workforce to raise her children, not a single employer responded to the 100 applications she filled out.

Determined to find a job, Zuck enrolled in the certificate program at Montgomery County Community College (MCCC) to refresh her lab skills.

What she got was a "fantastic" education in molecular biology, a new understanding of good manufacturing practices (GMP), and an enormous boost in confidence from several independent lab projects she did with Maggie Bryans, assistant professor of biotechnology and NBC2 co-principal investigator.

"This aided me immensely when I got an interview," Zuck said. Interviews finally happened when her resume was updated with information about the four biotechnology courses she completed at MCCC.

Zuck traces a job offer from Vascular Strategies LLC, a contract research organization that specializes in atherosclerosis, directly to her independent studies at MCCC. After her second interview with the company, Zuck bolstered her answers about documentation by emailing a thank you to the interviewer and attaching the report from her independent study on cells.

For the cell project Bryans explained that Zuck "developed the protocol for growing the cell line, documented everything she did, and wrote a really nice report." Bryans describes Zuck as "a natural in the lab" whose enthusiasm and dedication shined through her independent studies.

When Vascular Strategies had an opening two months after Zuck sent the email, she was the first person the interviewer contacted.

Now as a senior scientist at the company, Zuck has responsibilities that include client studies as well as assay development and validation. Zuck likes that her drug development work uses both her biomanufacturing skills and her academic background, and that it pays well.

Mount Wachusett Graduate Customizes Bioreactor for Start-up

While taking courses in the Biotechnology Academy at Minuteman High School in Massachusetts, Kevin Brown was excited about the possibility of a biomanufacturing career. However, employers deemed him too young and too inexperienced when he applied for biotech jobs right after he graduated from high school in 2008.

He worked for a couple years in a hospital kitchen before making his way back to biotechnology through the biomanufacturing workforce training program at Mount Wachusett Community College. Finishing that program in 2010 qualified him for an internship through Massachusetts Life Sciences Center, a state-funded investment agency that has an internship-matching service as part of its support for life sciences innovation, research, development, and commercialization.

Kevin Brown works on the bioreactor he customized as part of his job duties at BioTechnic Products Limited.

Brown said the combination of courses he continued to take toward his associate degree and his internship experiences led to his part-time job at BioTechnic Products Limited.

Speaking about Brown, Lara Dowland, chair of the Biotechnology/Biomanufacturing Program at Mount Wachusett Community College, said, "Kevin was a student who took an active role in his education, always taking advantage of every opportunity that came his way. He has an enthusiasm for the biotech field that inspired his fellow classmates."

During his presentation—just a few weeks after his Mount Wachusett graduation—Brown described his ongoing role at the seven-person, start-up company where he worked while attending classes. He proudly showed photos of a low-cost bioreactor he customized for the cell lines the company uses for drug development. His work in large-scale production means that he also makes all the media that the company's other employees use.

Brown hopes to pursue a bachelor's degree while he continues to work in research and development.

Faces of Success stories are continued on Page 7

Two-Year Colleges Facilitate Biotech Incubator Growth

Pasadena City College in California and Austin Community College in Texas are growing regional biotech incubator spaces that assist start-up companies and help students gain authentic work experiences.

CALIFORNIA

"Lab mom is my job," is how Wendie Johnston humorously describes her role nurturing biotech incubators and matching students with the small companies that use those spaces.

At Pasadena City College Johnston was the designer and first director of the Biological Technology Program, which started with state funding. In her current job as lab director of the Pasadena Bioscience Collaborative, or PBC as the incubator is now known, she oversees three facilities that by the end of 2015 will have a total of 17,000 square feet of wet lab space.

Since 2004 PBC has incubated 42 companies and created more than 80 jobs. The successes Johnston mentioned during her presentation include Deton Corp., YSL Bioprocess Development Co., CALiMMUNE, BCN Biosciences, Neumedicines, and CohBar, Inc.

The 20 companies that rented space and shared equipment at PBC in 2014-15 provided internships to 58 community college students, 105 high school students, and eight university students or post-doctoral fellows. PBC's alumni include company founders and managers and lead technicians.

In addition to Pasadena City College, PBC has memorandums of understanding with CalTech, eight California State University campuses, and the Southern California Biomedical Council.

TEXAS

Internship opportunities and other work experiences for students are expected to grow when Austin Community College (ACC) opens a $4.9 million biotech research lab and business incubator space in 2016.

Linnea Fletcher, chair of ACC's Biotechnology Department, explained that a Bio-Link report influenced her to start a contract research organization that brought small companies' projects into the college's lab for students to work on.

"Once a company has discovered the value of using our interns to do a project, they ask for more. That is the bottom line ... because we get things done for them that would normally cost them quite a bit of money. And we can accelerate their product development," Fletcher said in an interview.

During her presentation Fletcher shared her hope that students' experiences interacting with companies that rent space in the 8,400 square foot lab (currently under construction in an old mall that ACC is renovating as its Highland Campus) will provide a model for other disciplines and other colleges.

Wendie Johnson (left) and Linnea Flectcher describe efforts to create partnerships between community colleges and small companies in bioscience incubator spaces.

Power Skills amid Tumult: DNA Sequencing and Bioinformatics

At CCP@BIO, Todd M. Smith, head of business and software development at Digital World Biology, made a strong case for teaching DNA sequencing and bioinformatics. Smith considers DNA sequencing "an analytical staple" that drives businesses involved in discovery, diagnostics, and quality control.

For students this means understanding

- the relationship between a DNA sequence, its translation into function, and mutations;
- how to access and extract relevant information from bio databases;
- how to work with different kinds of computer programs and data; and
- how to interpret structures, sequences, and images.

These skills are particularly important at virtual and start-up biotech companies where everyone among the small group of employees will have to understand the scientific underpinning of the work and interpret data.

Even at larger companies where the bioinformatics tasks of data collection, classification, storage, and analysis may be assigned to specialists, understanding the origin and organization of biological and biochemical information using computers will be a key attribute.

"Employers may not ask for bioinformaticians, but what they do want is computer competency in the lab," he said.

Community College Puts Student on Fast Track to Employment

Richard Wollover appreciates that Bucks County Community College helped him begin a biotechnology career more quickly than if he had remained at a four-year university.

After graduating from a vocational high school, Wollover attended a university until the cost became unaffordable. As he considered his options, Wollover was impressed by information about the biotechnology degree program he saw on Bucks' website. He enrolled, though he was unsure about which aspect of biotechnology to pursue.

With his transfer credits it took him just two semesters to complete a biotechnology associate degree while working part time. "It was a good initial [way] for getting me into the field, to show me what's out there," he said.

Linda Rehfuss, associate professor of biotechnology at Bucks and NBC2 co-principal investigator, remembers Wollover as "a very motivated student who wanted to learn above and beyond what was taught in the classroom." She explains, "He was the first student to volunteer during the biomanufacturing course for weekend or evening duty, when samples have to be taken and analyzed outside of class time."

A summer internship at the college after he graduated in 2014 gave him additional experience with instruments similar to those he now uses at KVK Tech, a pharmaceutical company. Rehfuss said Wollover also sought faculty assistance to prepare his resume and hone his interview skills.

As a quality control associate at KVK Tech, he receives and processes quality control samples for tests and supports sample stability studies. His responsibilities include helping to write standard operating procedures for inventory management.

His next academic goal is a bachelor's degree in pharmaceutical science or chemistry. In the meantime, Wollover plans to gain analytical laboratory experience and broaden his skills in order to advance his career as the company grows.

Quincy College Graduate Makes a Difference with Novel Biologics Work

Daria Kotoski's attainment of a research associate position with a two-year degree is evidence of her determination and thoroughness.

She is one of the few associate degree holders working in biologic formulation at Takeda Pharmaceuticals. Her work on novel biologics involves particle characterization and sizing. She also assists with studies to extend the shelf life of products and to make treatments less painful for patients.

All of this requires following federal guidelines, and Kotoski hopes her performance will encourage the company to hire other associate degree holders.

Takeda hired her in 2014 as a full-time contractor midway through her summer internship. She had just graduated with honors from Quincy College, earning an associate degree in biotechnology and compliance. Kotoski also had significant hands-on laboratory experience thanks to her work-study job as a lab assistant for Quincy's biotech program.

"I knew that I wanted to make a difference in helping people. I didn't know quite how to make that fit in until I found this program. Now I know I can help the quality of life of other people by helping make medicine for them," she said.

Her long-term goals include earning a PhD in bioengineering and creating a therapeutic product that treats endocrine disorders. Her current enrollment at Harvard's Extension School is her first step toward this next phase of her career.

Daria Kotoski recounts her path to employment as a biotechnician at Takeda Pharmaceuticals.

Join us for the 2016 Community College Program at BIO!

CCP@BIO will take place in conjunction with the International BIO Convention, June 6-9, 2016, in San Francisco, California. More details will be announced in early 2016.

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NORTH CAROLINA

Since it began in 1959, the biotech industry in North Carolina has grown to 600 companies that employ 60,000 people whose average annual salaries are $81,000.

"It is the strongest sector in terms of our North Carolina economy," said Maria Pharr, executive director of BioNetwork and Life Science Initiatives. There was a 30% increase in bioscience jobs in North Carolina between 2001 and 2012, compared to a 1% growth in private sector jobs statewide.

Pharr credits the North Carolina Community College system with facilitating the success of the biomanufacturing industry. BioNetwork and NCWorks are two state workforce development initiatives that work in concert with the community colleges and employers to deliver customized training.

BioNetwork's 650-square foot mobile lab is emblematic of North Carolina's responsiveness to employers' needs. The lab, which a semi-truck moves from place to place, is available for on-site training of new and incumbent technicians, for short courses at community colleges, and as temporary lab space for small companies.

During 2013-14 BioNetwork trained 918 incumbent workers, taught 1,325 students in 114 hands-on courses, and provided resources to 88 companies.

MASSACHUSETTS

NBC2 materials were used as the jumping off point for a meeting the Massachusetts Life Sciences Center (MLSC) convened with community college faculty to see if their curricula are meeting industry needs.

This initiative is part of the $10 billion Massachusetts has invested since 2008 to support development of its life sciences workforce.

Life sciences enterprises, which grew 24% in Massachusetts since 2004, now employ 115,000 people. The sector is expected to grow 13% through 2022.

Beth Nicklas, general counsel and vice president of Academic and Workforce Programs for MLSC, said Massachusetts is "proud to be number one in per capita life sciences employment." Research and development and biomanufacturing are the biggest bioscience employers in the state.

Noting that research conducted by Burning Glass Technologies found lots of different biomanufacturing jobs in Massachusetts, Nicklas declared, "STEM fields are the job growth engines in the US economy."

Continued from page 4

Community College Bloomington and lead of the medical device hub of c^3bc, organized four meetings between representatives of medical device manufacturers and eight partner colleges.

Working together industry leaders and educators identified program gaps and refined regional skill standards, which colleges had developed with local employers, into five matrixes of core skills across the medical device industry.

A parallel c^3bc initiative combines the medical device standards with updated biomanufacturing and laboratory skill standards for common core standards for bioscience technicians, which were outlined by Linda Rehfuss, associate professor of biotechnology at Bucks County Community Colelge and NBC2 co-principal investigator.

After c^3bc's grant ends in 2016, the individual and common bioscience industry skill standards will be disseminated nationally.

CCP@BIO is organized the Northeast Biomanufacturing Center and Collaborative (NBC2), Bio-Link, and the National Center for the Biotechnology Workforce. For more information, visit

www.biomanufacturing.org ***www.bio-link.org*** ***www.biotechworkforce.org***

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Text by Madeline Patton

Photos courtesy of Madeline Patton (pp. 2, 3, 4, 6, 7) and Kevin Brown (pp. 5)