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8th Annual Community College Program Day at BIO – Washington, DC - June 26, 2011

The Unsung Heroes of Biotechnology

The Eighth Annual Community College Program Day, presented by Bio-Link, NBC² and the National Center for the Biotechnology Workforce, brought together representatives of the nation’s community colleges, funding agencies, and corporations to share, learn, and, in turn, execute best practices in biotechnology training and education.



BIO’s Peter Pellerito gives a View from BIO at the 8th Annual Community College Day Program on June 26 held in conjunction with the BIO 2011 International Convention.

As Peter Pellerito, the Biotechnology Industry Organization’s (BIO) interim vice president for state government relations and alliance development, emphasized in his morning address, *The View from BIO*, “My colleagues and I at BIO believe the community colleges in this country are the unsung heroes of our industry because you bring some very important assets as in the people who actually man the operations.”

That’s operations of over 47,000 companies nationwide with 1.4 million workers. The biotech industry recorded continual annual growth of 2.5 percent for a decade. That percentage slipped to 1.8 percent in 2009 and 2010 during the past recession, which is still phenomenal growth when compared to a 6.2 percent drop in growth throughout other industry sectors. The growth in the biotech industry represents jobs that pay an average annual salary of \$77,000 per year versus \$45,000 in private industry.

It’s the community colleges and their training, Pellerito, a community college graduate, acknowledged, that play an essential role in shaping the industry’s “size and diversity nationwide” and defining the “vital building blocks creating a continuing climate for bioscience industry creation even in this challenging economic environment.”

Community colleges influence the climate around the biosciences because they are a constant in the economic development formula that attracts companies and launches entrepreneurial start-ups. “This is probably the most basic and most fundamental aspect of economic development models in the US,” he said. “The increased volume and accelerated pace of knowledge creation has created research and manufacturing processes so that no one scientist or institute can sufficiently prepare students in the workplace. The new reality makes the link between workplace and classroom more essential.”

Pellerito illustrated his point with examples of initiatives and legislation from around the country that support community college and workforce training such as the Illinois Department of Community Economic Opportunity’s Biotechnology/Bioscience Training Investment Program (BioTIP) that provides state-funded grants to companies for up to 50 percent of training costs for graduate students who find part-time employment as lab technicians or engineers in the biotechnology sector. The Baltimore Bioscience Initiative, a multi-faceted

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program, identifies and pairs low-skill workers with employment in the bioscience sector. Another example is the Georgia Innovation Crescent, the 13 counties spanning Athens to Atlanta, that receive a grant from the governor's office to sustain workforce development strategies for enhancement of life science career pathways from high schools to community colleges to universities.

From his perspective within BIO, Pellerito reminded Community College Day participants that "those states that have a road map and funding will be the place that companies want to locate." The roadmap must be built on industry support and involvement, a priority BIO advocates. "Industry support and involvement is the cornerstone for the continuing growth potential for our industry. Corporate leadership must support your efforts and work with community colleges and universities to create a workforce that can compete with any other state or nation."

The nation's community colleges, Pellerito emphasized, are and will continue to be the places where this competitive workforce is created.

National Credentials: The Toughest Issue

"In the last two weeks, we have been receiving relative support, all of us, from the White House as they focus more attention and resources to grow our industry and other tech sectors," said Peter Pellerito of BIO during his address, *The View from BIO*. "The White House hopes to develop a curriculum by the National Association of Manufacturers for an advanced manufacturing skills certificate system."

In June at Northern Virginia Community College, President Obama announced that The Manufacturing Institute (MI), the affiliated non-profit of the National Association of Manufacturers (NAM), is leading an effort to provide 500,000 community college students with industry-recognized credentials in the next five years to help them secure jobs in the manufacturing sector, which includes biomanufacturing. Pellerito commented that Obama plans to shift \$2 billion in funding to develop certifications for a variety of jobs needed in the manufacturing sector as part of The Skills for America's Future, a program by the Obama administration to improve partnerships between the manufacturing industry and community colleges to maximize "workforce development strategies, job training programs, and job placements."

"The credentials that would be developed through the federal program," Pellerito elaborated, "would not be an alternate to the two-year degree but would help potential employers understand what skills students have developed. The problem is that 50 states have different views of certification.

"I think the roadmap the President put forward is a wonderful idea," Pellerito continued. "I think that if there is enough interest from the public, industry, and other partners, there will be a foundational national standard. I think organizations like this have to be able to push the agenda. You're going to have to talk to your senators and your governors because it is very important. It is important enough to us to be involved with the White House on this. Hopefully, it is important enough to you to be involved."

NCBW Leads a Pilot Credentialing Program

Located at Forsyth Technical Community College (FT) in Winston-Salem, NC, the National Center for the Biotechnology Workforce (NCBW) is very involved. NCBW is one of the seven North Carolina Community College BioNetwork centers that specialize in training for the biotechnology and life science industries in the state. NCBW Executive Director Russ H. Read explained during his presentation in the *Evolving Biotech Programs* panel that his center is charged with staying abreast of national initiatives, trends, and grant opportunities from which BioNetwork develops and implements best practices, replicable curriculums, programs and partnerships. NCBW has tracked graduates for over six years as a way to define success factors in biotech training. The NCBW website, www.biotechworkforce.org is another resource that offers a place to advertise events and programs as well as a detailed timeline of initiatives and success.

The NCBW and FT won the attention of the Obama administration who visited the community college in December 2010. “When President Obama visited he was there for all of the community colleges and all of us are so pleased President Obama is pushing the community college agenda very, very strongly. This is fantastic for all of us,” Read said.

NCBW is in partnership with NAM and MI as one of four pilot programs implementing the NAM-Endorsed Manufacturing Skills Certification System. So far, Read said, the model for bioscience credentials is building off of those already established that are nationally portable, third party validated and industry driven. The bioscience competency model is a beginning point that illustrates educational and career pathways, entry level and occupation specific certificates and specifies basic academic, workplace, and technical skills that recognize the many bioscience sectors.



Russ Read, executive director of NCBW, explains the partnership with NAM to create national credentials for biotechnology training.

As a NAM-certified college, FT has awarded 178 national career readiness certificates and 85 certificates in metal working, welding and manufacturing skill sets. For establishing biotechnology credentials, they have scanned available credential programs in North Carolina and are applying for Department of Labor Grants to move the initiative forward. “Credentials are a signal to employers that the individual has endeavored to add knowledge skills to competencies and that is extremely important,” Read said. “So we will not do this in any kind of isolation. We have a partnering philosophy. We have to raise all the funds to bring all the right people together.”

Paying It Forward: Biotech Graduates Get Jobs and Give Back

The Faces of Success: Our Graduates on Their Careers, moderated by Elaine Johnson, PhD, director of Bio-Link, and Jo-Anne Hongo, scientific manager at Genentech and biotechnology instructor at City College of San Francisco, illustrated that the impact of community colleges only starts when graduates get jobs. The real testament to success is their efforts to give back and encourage others to follow in their footsteps.

A 2007 graduate of Great Bay Community College, the program of Sonia Wallman, executive director of NBC², **David Haddad** is now a lab assistant with Millenium Pharmaceuticals, an oncology-focused company. Haddad’s responsibilities include media preparation, stocking laboratories, dealing with vendors and assisting with research projects in various labs. His experiences so far have motivated him to participate in a program called DIGITS that brings industry professionals into sixth grade classrooms to talk about STEM-oriented careers. He’s taken part in job fairs and other panel discussions. At Millennium, he’s donated unused supplies to biotech programs in Massachusetts and a girls’ school in Kenya.



Left to Right: Elaine Johnson, Bio-Link, Tricia Castillo, Angie Yee, David Haddad, Aziz Ahmad, and Jo-Anne Hongo.

As a high school student at Abraham Lincoln High School in San Francisco, California, **Angie Yee** benefited from a biotechnology program started by a former research associate at Genentech. She graduated from the University of California, Davis in 2005 with a bachelor’s degree in genetics. While working at the University of California San Francisco Medical Center as a clinical administrative assistant, she attended Jo-Anne Hongo’s classes at City College. Through Hongo in 2010, Yee started work as a lab assistant at Genentech in the department of antibody engineering. Today, Yee regularly goes back to Abraham Lincoln High School’s biotech program to share her story and to offer career counseling to the students. When Hongo brings her students from City College to Genentech, Yee gives tours and again shares her experiences.

A senior at St. Edwards University in the forensic program, **Tricia Castillo** started her journey in the biotech field as a high school drop-out determined to make a better life for herself and her children. She earned her GED and then enrolled at Austin Community College (ACC) in their biotech program where she graduated in the summer of 2009. At St. Edwards, she didn't receive full credit for all of her classes. Her response was to help forge an articulation agreement between the schools. She also helped install a new lab at ACC and wrote the protocols for the equipment. She goes to elementary schools to talk about science and leads CSI camps.

Aziz Ahmad received his medical degree in 1975 from the University of Kabul in Afghanistan. He worked at Duke University Medical Center in the Department of Clinical Pathology for over 21 years. After retiring, he decided to earn an associate of applied science in biotechnology at Forsyth Technical Community College. He now works at FT as an adjunct professor and researches drug delivery systems for the eye.

Tori Barron, a graduate of Madison Area Technical College (MATC), works for Life Technologies in Wisconsin and teaches stem technologies at MATC (read more about Tori on page 6).

Lori Lindburg, director of BayBio Institute in South San Francisco, California, closed the panel with news of a web portal, Bio-Community.org, which her institute launched to facilitate connections between educators, students and industry. The web portal allows teachers to develop a profile and post their needs. Companies can take advantage of the menu of opportunities to get involved with biotechnology education and training.

Opportunities in Regenerative Medicine

Long before regenerative medicine was an industry, it was a concept that reverberated through the human consciousness from the time of Greek mythology's Prometheus through Frankenstein to 1935 and the invention of extracorporeal perfusion by Alexis Carrel, winner of the Nobel Prize in Physiology and Medicine in 1912, and Charles Lindbergh, the pilot who made the first solo, nonstop flight across the Atlantic in May 1927.



John Ludlow, PhD, of Tengion, talks about *Regenerative Medicine, Today and Tomorrow*

From Carrel and Lindbergh's ideas, the heart-lung machine was invented and the evolution of the regeneration of new tissue to replace damaged or diseased tissue continued to evolve through the late 20th century with treatments like kidney transplants, bone marrow transplants and skin grafts becoming common. John Ludlow, PhD, senior director process research and assay development for Tengion in Winston-Salem, NC, defined regenerative medicine in his morning talk, *Regenerative Medicine: Today and Tomorrow*, as taking "cells from the body and using a biodegradable scaffold or biomaterial to make a framework and then we harness the body's innate ability to rebuild new tissue." Through building on the body's abilities, "there are 100,000 individuals who have benefitted from regenerative medicine therapies whether it be skin grafts, bone grafts, or, in the case of Tengion, bladder regeneration," Ludlow said.

Tengion, a tissue engineering and regenerative medicine company that spun out of the work of Dr. Tony Atala at Wake Forest Institute of Regenerative Medicine, is part of an industry that has only recently stabilized. According to Ludlow, it wasn't until 2008 that regenerative medicine became a "substantial entity with a biomedical and engineering workforce, many papers, approximately 50 companies, a billion dollars in total revenues and a variety of products reaching the market."

As a board member of the internship program at Forsyth Technical Community College in Winston-Salem, Ludlow has placed five FT interns at Tengion. "We're now in two clinical trials with tissue engineering products," Ludlow said. "The five students we hired from FT were instrumental in getting those products into the clinic. I can't stress enough how important it is for the jobs you are doing educating the workforce we need to get the job done and benefit patients. I appreciate the opportunity. . . to

thank you all for the work you do as educators training and educating workers that are so vitally important for the field of tissue engineering and regenerative medicine.”

NSF Is Serious About Funding Community Colleges

Celeste Carter, PhD, program director of the National Science Foundation’s (NSF) division of undergraduate education (DUE), wants community colleges to know that the NSF is serious about supporting STEM projects at or involving community colleges.

In fact, Carter reported, the Advanced Technical Education (ATE) program, which is part of her division, has supported close to 1,000 projects and centers from its inception in 1994 to 2010, which translates into \$654.7 million in support for community colleges. Overall, the NSF supports community colleges in areas such as education, human resources, math, physical sciences, geosciences, biological sciences, computer and information sciences, engineering, and economic sciences.

The focus now is to advance the national goals established by President Obama to have the highest proportion of college graduates in the world by 2010, and have community colleges produce an additional five million graduates. The President’s goal reflects statistics advanced by the American Association of Community Colleges that 44 percent of undergraduate students in the US are served by community colleges and that half of all students who receive a four-year degree attend community college in the course of their undergraduate studies.



Celeste Carter, PhD, programs director of the NSF division of undergraduate education.

Visit www.nsf.gov and go to the Division of Undergraduate Education to take advantage of funding opportunities in programs like STEM Talent Expansion Program (STEP). STEP increases the number of students receiving associate or baccalaureate degrees in established or emerging STEM fields. Another program is NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM). Institutions receive funds for scholarships for academically talented, but financially needy, students pursuing associate, baccalaureate, or graduate degrees.

The Noyce Program encourages talented mathematics, science, and engineering undergraduates to pursue teaching careers. Transforming Undergraduate Education in STEM (TUES, formerly CCLI) stimulates, disseminates, and institutionalizes transformative or innovative developments in STEM education through the production of knowledge and the improvement of practice.

Take time to review the NSF website for more information about all of their funding opportunities.

Evolving, Emerging, Innovative, and New – Examples of Biotech Training

This panel was moderated by Lisa Seidman PhD, Madison Area Technical Community College and Russ H. Read, executive director of the National Center for the Biotechnology Workforce. Topics on this panel included the NCBW’s Application of NAM Endorsed Credentials on page 2 and Preparing Students for New Opportunities in Stem Cell Technologies on page 6 as discussed by the following panelists:

BioOhio - US DOL Workforce Training Program

Bill Tacon, PhD, BioOhio Senior Director, Workforce & Education

Bioscience employment in Ohio has grown two percent on average each year since 2000 while total employment in all sectors has declined. The biosciences have a strong foothold in Ohio with companies located in 72 of 88 counties providing over 195,835 jobs and tax revenues exceeding \$3 billion. Through a three year, \$5 million grant from the US Department of Labor that started in March 2010, BioOhio is building a community college bioscience infrastructure to

provide an entry level development and manufacturing workforce. The goal is to train 700 unemployed, displaced and underemployed workers, especially former autoworkers, and find them jobs within Ohio's bioscience industry. Over half of the award is allocated for tuition reimbursement and scholarships for two-year degree programs and certifications. Program partners are community colleges, Council for Adult & Experiential Learning (CAEL), AFL-CIO/UAW, Ohio's One Stop Centers, Ohio Department of Development, and Regional Industry Advisory Boards.

Using Portfolios for End-of-Program Assessment

Eileen Lyons, founding Biotechnology Program Coordinator and acting dean, STEM Division, St. Louis Community College-Florissant Valley

The Perkins IV TSA Requirement in Missouri requires a Technical Skills Attainment (TSA). Collaborating with the Missouri Department of Education, Missouri's community colleges developed portfolio assessments in 2010. Portfolios reflect the rigor of the program and demonstrate soft skills, oral, written, and electronic communication, and ability to read and follow procedures. Students must have excellent laboratory notebooks, completed presentations in biotech classes, prepared resumes, participated in mock job interviews, and used the career and placement e-recruiting system. To complete the portfolio TSA, students present an advanced biotechnology topic, present lab notebooks for review, and respond to questions from three industry evaluators who score the students. In 2011, the first year, six graduates each scored above 80 percent.

The New Bio-Link: Expanding the Impact

Elaine Johnson, Principal Investigator and Executive Director Bio-Link

Bio-Link is an NSF ATE National Center for Biotechnology and Life Sciences. The mission is to increase the number and diversity of well-trained technicians in the workforce; meet the growing needs of industry for appropriately trained technicians; institutionalize community college educational practices that make high-quality education and training in the concepts, tools, skills, processes, regulatory structure, and ethics of biotechnology available to all students. To do this Bio-Link delivers direct services including consulting, professional development, maintenance and replication of an equipment depot, instructional clearinghouse, and faculty internships. Bio-Link shares information and promotes collaboration with a web-based community through the use of Web 2.0 tools, conference presentations, and Synergy collaborator. Finally, Bio-Link expands and improves information for students and life-sciences companies with national survey information, career matrix, and video career scenarios.

Preparing Students for New Opportunities in Stem Cell Technologies

To take advantage of the opportunities in stem cell technologies, a foundation of regenerative medicine, booming in the Madison, Wisconsin area, Madison Area Technical Community College (MATC) launched a Stem Cell Technologies program. Lisa Seidman, PhD, instructor in the Biotechnology Laboratory Technician Program, described the program during the *Evolving Biotechnology Program*, which she moderated with Russ Read of the National Center for the Biotechnology Workforce.

A major step in forming the program was a licensing agreement with WiCell Research Institute, a nonprofit with a mission to enhance and expand the study and therapeutic potential of human pluripotent stem cells, to provide cells for free and to contribute scientific expertise. With a recent National Science Foundation grant from Advanced Technical Education, the program will be expanding and receiving new space.

The program is taught by Tori Barron, a graduate from MATC. Participating in the *Faces of Success Panel*, Barron, who now works for Life Technologies in Wisconsin, earned a bachelor's degree in psychology with a minor in genetics and then worked in human resources before becoming a stay-at-home mother. In 2002, she enrolled in MATC's two-year, post-baccalaureate biotechnology certification. Seidman was her first instructor. She went on to earn a master's in biotechnology at the University of Wisconsin and a job with a biotech start-up.

As the bioeconomy matures, more biotechnology programs focused on industrial biotechnology and biomanufacturing are springing up all over the nation. Moderated by Sonia Wallman, PhD, Executive director of NBC², this session showcases a food safety program in Florida; a student run Contract Manufacturing Organization within a community college biotechnology/biomanufacturing program in Utah that makes instructional materials for local high school biotechnology programs; diverse programs to support the development of the infrastructure for biotechnology/biomanufacturing in an economically depressed tri-city area in upstate New York; the EDGE program for training biofuels technicians in partnership with two University of California campuses in San Diego and a program to excite high school students in biomanufacturing within the Mesa, Arizona high schools.

The NBC² has been in existence since 2003 and has led the work with biomanufacturers to develop a global, harmonized skill standard for biopharmaceutical manufacturing. NBC² publications, hands-on biomanufacturing laboratory manuals and an Introduction to Biomanufacturing textbook are available at www.lulu.com. The NBC² is working with biomanufacturing technicians and educators to create a certification examination for program graduates. The NBC² hands on laboratory manuals and Introduction to Biomanufacturing textbook written by industry are available at www.lulu.com.

The Institute for Food Safety Biotechnology Program at Florida State College at Jacksonville

R. Kevin Pegg, Ph.D.

Florida State College at Jacksonville Institute for Food Safety began in 2008 in collaboration with local industry. Jacksonville is a major site for seafood importation. The seafood industry is ruled by numerous and conflicting regulations. With financial support from Beaverstreet Fisheries and an NSF ATE grant, a separate track in FSCJ's biotechnology program and a curriculum were developed that emphasizes working in a regulated environment, chain of custody, sample prep, basic lab skills, microbial techniques, spectroscopy, HPLC, and PCR. Quickly expanding to other foods, the food safety program opened a fee-for-service testing laboratory, recruited Eurofins Scientific, a laboratory testing service and support company, and built shared and mirrored equipment and laboratory spaces for students and Eurofins. Students gain opportunities to job shadow and participate in internships immediately. In 2010-2011, the first year, nine students were in the program and 19 new students begin this fall 2011. Plans are already underway to expand the program.



The Innovative and New Programs in Biotechnology and Biomanufacturing Panel

STUDENTfacturED

Vivian Ngan-Winward, Salt Lake City Community College, Salt Lake City, Utah

STUDENTfacturED is a contract manufacturing company run by students that provides "a real-world, contextual manufacturing environment for students to learn, apply, and reinforce industry-specific concepts and skills" by manufacturing instructional biotechnology reagents and supplies for college and local high school instructors. Students learn about compliance as they utilize cGMP (current Good Manufacturing Practices); quality systems; production; packaging; finances; business development and marketing; and legal issues. The program was formed as a collaboration between Salt Lake City Community College's Biomanufacturing Program in the Biotechnology Department and the School of Business. The program is underway with key technical and business personnel identified, a steering committee created, project and quality manuals prepared, and key functions defined. The first participants are trained and producing their first product, *Halorubrum salsolis* DNA sequencing kits.

Biotechnology and Biomanufacturing-Redefining the Workforce

Peter A. Schaefer, Principal Investigator, DOL/ETA Workforce Development Grant, Hudson Valley Community College, Troy, New York

Through a DOL/ETA grant, Hudson Valley Community College is leading the creation and implementation of a training program for entry-level and advanced laboratory technicians in biotechnology and biomanufacturing. The two focus areas are the high school students and the unemployed. Albany and Rensselaer counties are experiencing nine percent unemployment and have identified a shortage of skilled technicians in the workforce. The three year, \$5 million US DOL grant gives Hudson Valley the resources to conduct specialized training in biotechnology and biomanufacturing

laboratory techniques and to stimulate interest in and establish a pathway for bioscience in public schools using the community college as a resource.

Arizona High School Biotechnology Program Embraces 21st Century Skills with a Historical Twist

Xan Simonson, Career and Technical Education Biotechnology Specialist, Mesa Public Schools

The mission of the Arizona High School’s Biotechnology Program is to provide students with the skills and knowledge needed to make a seamless transition into a successful post high school education or related position within the bioscience industry. The biotechnology program is a four year study in biotechnology that is a school-within-a-school format with a rigorous college preparatory (STEM), career related curriculum. Students gain knowledge of science and the global impact of biotechnology and also wildcraft native plants with medicinal properties from the Arizona desert. Using the plants, the students produce products like lip balm that are then sold. (Xan distributed samples for all attendees.)



Xan Simonson, Mesa Public Schools

Educating Technicians for Biofuels Production & Analysis

Ric Matthews, dean of Math and Science, MiraCosta College, Oceanside, California

San Diego, California is a leader in the biofuels industry. In 2010, the San Diego Biofuels Initiative was awarded a \$4 million grant from the California Department of Labor to create and implement new curricula and workforce training programs for the biofuels sector. The EDGE Initiative (Educating & Developing Workers for the Green Economy) is a program that will recruit unemployed and incumbent workers in the San Diego region so that there will be a trained workforce to fill the jobs being created by the biofuels industry. With industry input and feedback, training programs and certificates, such as the Biomass Production and Analysis Certificate at Mira Costa Community College, are being created to teach techniques in the production and analysis of biofuels, including ethanol from starch, cellulosic ethanol, biodiesel from microalgae and hydrogen from bacteria.

	<p>MISSION</p>	<p>VISION</p>
<p>www.biomanufacturing.org</p>	<p>To coordinate local and regional efforts into a national biomanufacturing education and training system to promote, create, and sustain a qualified workforce.</p>	<p>To be the nationally recognized center of excellence that develops a world-class sustainable biomanufacturing workforce to improve the quality of life.</p>

	<p>Bio-Link is the Next Generation National Advanced Technological Education (ATE) Center of Excellence for Biotechnology and Life Sciences. Bio-Link originated in late 1998 with a grant from the National Science Foundation as a National ATE Center for Biotechnology. The ATE program was created to improve and expand educational programs that prepare skilled technicians to work in the high-tech fields that drive the U.S. economy.</p>
<p>www.bio-link.org</p>	

	<p>The National Center for the Biotechnology Workforce (NCBW) was created through a US Department of Labor High Growth Grant Initiative in September 2004 and operated in this capacity until September 2008. On October 1st, 2008 the NCBW became a seventh center of BioNetwork, a statewide Biotechnology training and educational initiative through a cooperative agreement between the US DOL, Forsyth Technical Community College and the NC Community College’s BioNetwork.</p>
<p>www.biotechworkforce.org</p>	

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