



Center of Excellence in Industrial Biotechnology

in partnership with the

CSL Behring Fermentation Facility

Home of the Sartorius Fermentation Gallery and GEA Downstream Processing Suite

THE MARKET

In 2016, the US bioscience industry directly employed more than 1.7 million people, with the industry's economic output supporting a total of 8 million jobs throughout the U.S economy.¹ However, "...there is a global shortage of people who are suitably trained for the complex and rapidly-changing world of biopharmaceutical manufacturing."² Experts have noted that "...there are blockbuster biologics out there that aren't being developed because they don't have somebody at hand to be able to do that."³

ABOUT

The Penn State Center of Excellence in Industrial Biotechnology Center and the CSL Behring Fermentation Facility were established in 2017 through a \$4.92 million gift from CSL Behring. Additional equipment was donated by Sartorius Stedim Biotech and GEA North America. Together, the Center and Facility serve as a focal point for Penn State's research activities, educational initiatives, and outreach efforts in the broad area of industrial biotechnology.

The Facility is the Huck Institutes of the Life Sciences' only corporate-named core research facility delivering unique capabilities for an academic institution. The Facility was designed to highlight state-of-the-art equipment, from bench-top to pilot scale, supporting these aspects of fermentation technology:

- Growth of a wide range of microorganisms
- Production/purification of microbial-derived products (recombinant proteins, industrial enzymes, biofuels, and bio-based chemicals)

The Center and Facility's collaboration provides the training required to ensure Penn State's students enter the biotechnology market skilled and ready to impact this evolving market. Students learn on the exact equipment used in global biotechnology research and manufacturing facilities, providing them with hands-on experience with pilot-scale fermentation and purification technology.

¹ TEConomy/BIO https://www.bio.org/sites/default/files/TEConomy_BIO_2018_Report.pdf

² Skills Shortage: An Imminent Threat to Life Sciences Innovation, 4 17 2019 <http://www.pharmexec.com/skills-shortage-imminent-threat-life-sciences-innovation>

³ Eric Langer, 11 14 2018, <https://bioprocessintl.com/bioprocess-insider/global-markets/staffing-shortage-leaving-blockbuster-biologics-undeveloped-says-expert/>



2018–2019 HIGHLIGHTS

STUDENTS

- Nine hundred hours of student Facility volunteerism produced students adept in upstream and downstream processing
- Over 200 Penn State students toured the Facility through courses or other activities
- Sixty-two students from 13 Penn State departments completed fermentation projects

RESEARCH

- Novel self-healing materials from a recombinant version of a squid protein (Melik Demirel)
- New purification methods for CRISPR-Cas9 ribonucleoproteins of interest in gene therapy (Andrew Zydney)
- Thirty-six investigators exploring other areas: malaria, cow tuberculosis vaccine, gene editing
- Six companies conducting early stage development research
- Five projects supported by Center funds spanning three academic colleges and five departments

OUTREACH

- Fifty John Browne High School students (Flushing, NY) visited the Facility to learn the role of fermentation in drug development
- First CSL Behring sabbatical (Bern, Switzerland) for a Penn State faculty member
- Inaugural fermentation technology workshop (10/2019) for industry employees leveraged technical staff and faculty expertise

ABOUT CSL BEHRING

CSL Behring is a global biotherapeutics leader driven by its promise to save lives. Focused on serving patients' needs by using the latest technologies, it develops and delivers innovative therapies that are used to treat coagulation disorders, primary immune deficiencies, hereditary angioedema, inherited respiratory disease and neurological disorders. The company's products are also used in cardiac surgery, organ transplantation and burn treatment, and to prevent hemolytic disease of the newborn. CSL Behring operates one of the world's largest plasma collection networks, CSL Plasma. The parent company, CSL Limited (ASX:CSL; USOTC:CSLLY), headquartered in Melbourne, Australia, employs over 25,000 people, and delivers its life-saving therapies to people in more than 60 countries. For more information, visit www.CSLBehring.com or follow CSL on www.Twitter.com/CSLBehring.

ABOUT GEA

GEA is one of the largest suppliers for the food processing industry and a wide range of other industries that generated consolidated revenues of approximately EUR 4.8 billion in 2018. The international technology group specializes in machinery, and plants as well as process technology and components. GEA provides sustainable energy solutions for sophisticated production processes in various end user markets and offers a comprehensive service portfolio. The group generates around 70 percent of its revenue in the food and beverages sector that enjoys long-term sustainable growth. As of December 31, 2018, the company employed about 18,500 people worldwide. GEA is a market and technology leader in its business areas. The company is listed on the German MDAX (G1A, WKN 660 200), the STOXX® Europe 600 Index and selected MSCI Global Sustainability Indexes.

ABOUT SARTORIUS STEDIM BIOTECH

Sartorius Stedim Biotech is a leading international supplier of products and services that enable the biopharmaceutical industry to develop and manufacture drugs safely and efficiently. As a total solutions provider, Sartorius Stedim Biotech offers a portfolio covering nearly all steps of biopharmaceutical manufacture. The company focuses on single-use technologies and value-added services to meet the rapidly changing technology requirements of the industry it serves. Headquartered in Aubagne, France, Sartorius Stedim Biotech is quoted on the Eurolist of Euronext Paris. With its own manufacturing and R&D sites in Europe, North America and Asia, and an international network of sales companies, Sartorius Stedim Biotech has a global reach.

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