
CAREERS IN BIOTECHNOLOGY

Job Shadow Program Booklet



NCERC at SIUE
Advancing Biorenewables Research

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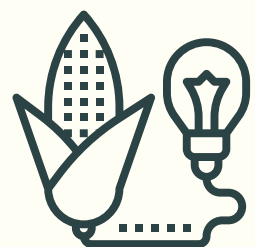
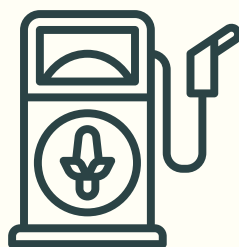
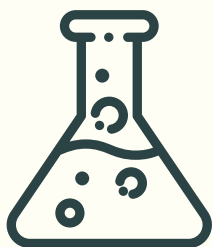
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Letter from the Director

Welcome to the National Corn-to-Ethanol Research Center!

NCERC was created under the Research Title of the 1996 Farm Bill. With a Federal Appropriation of \$14 million in 1997, complimented by nearly \$7 million of capital funding administered by the Illinois Department of Commerce and Economic Opportunity (ILDCEO), NCERC was no longer a vision, but a reality.



Ground was broken in 2001, with doors opening for operation in the Fall of 2003. Over the last 19 years, we've seen the product offerings of NCERC evolve. A key evolution of NCERC has been the development and deployment of our workforce training and education offerings.

I became Executive Director on Monday, October 16, 2006. At this time, the Renewable Fuels Standard (RFS) was driving unprecedented growth in the corn ethanol industry. The RFS, included in the Energy Policy Act of 2005 (EPACT05), called for 7.5 billion gallons of renewable fuels, primarily ethanol from corn, by the year 2012. Because of the RFS, new corn ethanol biorefineries were built all across America. From the Mid Atlantic, to the Central Valley in California; from North Dakota, to Arizona, our energy industry was revolutionized through the growth of the corn ethanol industry.

The emergence of this clean, green, renewable fuels industry generated immeasurable economic opportunity. Through economic opportunity came job creation and new employee demand. By January of 2007, NCERC was on the front lines in fulfilling the need for highly qualified, competent, hard working employees desired by Managers and Executives of corn ethanol plants. From there, NCERC's workforce training and education programs were born.

In the early years of NCERC's workforce training and education programs, funding came primarily from companies in the private sector, who would fund custom-designed training programs carried out by the staff of NCERC. Over time, the NCERC workforce training and education programs became more grant focused, highlighted by a \$10 million U.S. Department of Labor training grant that NCERC received in 2014. Today, our workforce training and education programs are funded through a combination of dollars from the private sector, trade associations, and grants. The one constant, regardless of funding source, is the unlimited opportunities for students of Southern Illinois University Edwardsville. To date, hundreds of SIUE students have received hands-on, applied training at NCERC. Since 2014, 100% of the students who have received training at NCERC, have utilized that training experience to obtain highly-skilled, well-compensated, gainful employment in the private sector.

Regardless of where a student is at on their education pathway, there is an opportunity for them at NCERC. From undergraduates who choose an internship at NCERC, to graduate students who come to NCERC as a Graduate Assistant, to recent grads with a STEAM degree who obtain a highly coveted Research Fellowship, the opportunities reside at NCERC.

Thank you for your time and interest in NCERC. Together, we turn visions of opportunity into reality!

Many thanks,
John Caupert

A handwritten signature in black ink that reads "John Caupert". The signature is written in a cursive, flowing style.

History of NCERC

Roots in Corn Ethanol | Future in Biotechnology

In its early days, NCERC provided a hub for the ethanol industry to set standards for its workforce and hands-on training for operators and professionals. This relationship existed for many years, and NCERC eventually expanded its workforce training programs to students from all phases of their higher education journey.

In 2014, a major milestone was met when NCERC received a \$10 million grant from the Department of Labor through the Trade Adjustment Assistance Community College Career Training (TAACCCT) program and established an Illinois state-wide network with partners with the mission to create training opportunities for future bioeconomy leaders.

Our Mission:
To facilitate the commercialization of new products and technologies to be utilized in bioindustrial manufacturing.



The National Corn-to-Ethanol Research Center (NCERC) at Southern Illinois University Edwardsville (SIUE) is a successful public-private partnership that serves a diverse set of clients in bioindustrial manufacturing.

Through our contractual research services, NCERC has played an instrumental role in commercializing more than eighty products that are now used in the commercial marketplace. These technologies have generated more than 5000 direct jobs and tens of thousands of indirect jobs, and are generating more than \$7 billion of revenue on an annual basis.

In addition to its research and development services, NCERC leverages its experienced staff and unique facility to provide a variety of workforce training and education initiatives to train the next generation of bioeconomy professionals. Since 2014, 100% of all persons who have received hands on applied learning at NCERC, have went direct from their training experience into full time private sector employment.

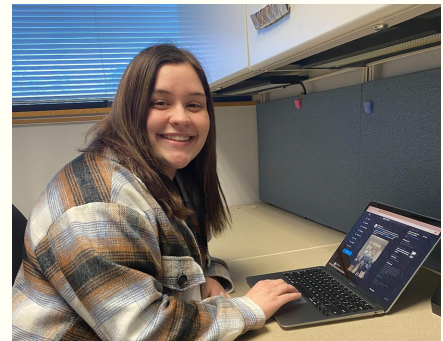
Workforce Training & Education

Since opening our doors nearly 20 years ago, NCERC has hosted hundreds of students on their ways to careers in the bioeconomy and processing industries. With an incredible success rate, countless NCERC “alumni” are now serving companies in the private sector, academia, and in government laboratories.

NCERC is fortunate to attract students from SIUE, nearby community colleges, and universities from across the country who come to the facility to gain hands-on experience by working on projects in high-priority areas of research. In addition to employment for students, NCERC's workforce training program includes unique opportunities for recent graduates with degrees in STEAM (Science, Technology, Engineering, Agriculture, Math) through the Visiting Research Fellowship program and the Postdoctoral Research Fellow program.

During the 2021-2022 Academic Year, NCERC hosted 7 Interns, 5 Graduate Assistants, 2 Visiting Research Fellows, and 1 Postdoctoral Research Fellow.

In addition to providing educational opportunities for students in higher education, NCERC provides incredible resources for K12 teachers and students. The "Careers in Biotechnology" Job Shadow Program was launched in 2022 as a way to expose high school students to exciting careers in a growing field.

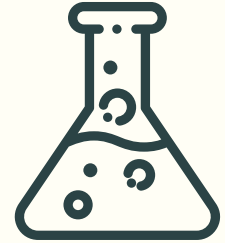


All about Biotechnology

Bioindustrial manufacturing uses biological systems—including microbes such as bacteria, yeast, and algae—to create new materials or sustainable alternatives to existing petroleum-based materials. Because bioindustrial manufacturing typically uses feedstocks such as corn, soy, and sugar beets, American farmers will benefit from the new markets created by these technologies, and rural communities will benefit from the manufacturing jobs creating the associated products.



The bioeconomy could have an economic impact of up to \$4 trillion annually within the next 10–20 years. Bioindustrial manufacturing has the potential to impact all sectors of the economy and all areas of society, helping the U.S. become more self-sufficient and sophisticated in manufacturing.



Benefits of Bioindustrial Manufacturing

- Enhances national security by creating more robust and resilient domestic supply chains
- Establishes the U.S. as a self-sufficient and global manufacturing leader
- Creates more environmentally sustainable products with less reliance on petrochemicals
- Aids in disaster recovery efforts by mitigating shortages of important products
- Produces materials with physical and chemical properties not currently available
- Builds a diverse and globally competitive STEM workforce
- Supports American farmers and enhances rural development

What can be created with bioindustrial manufacturing?

- Bio-based cement, from Biomason
- Bio-based fire-resistant composite materials, from Cambium
- Bio-butanediol (BDO) used to make compostable tote bags, coffee capsules, and food packaging, from Geno
- Carbon-negative chemicals that can be used for water treatments, concrete, fertilizers, detergents, and more, from Solugen
- Plant-based nylon for use in leggings, a partnership from Lululemon and Genomatica
- Protein made from anaerobically fermented microbes that can be used to create cheeses, milks, protein bars, ice cream, and more, from Superbrewed Food
- Squalane, a plant-based skincare ingredient that is bioidentical to Squalene, a product traditionally derived from shark livers, from Amyris
- Synthetic spider silk, one of the strongest natural materials in the world, from Technology Holding
- Urethane foam for backcountry alpine skis, from Checkerspot

To learn more about bioindustrial manufacturing, visit [BioMADE.org](https://www.biomade.org)!

Ethanol Industry Overview

Ethanol, a renewable fuel, has been blended in gasoline in the U.S. for over 40 years, helping reduce vehicle emissions, improve air quality, increase our energy independence, lower consumer fuel prices, and provide value-added markets for American farmers.



Providing Consumer Options

We know Americans are looking for more competition and greater savings for the fuel that powers their vehicles. Nearly all U.S. gasoline today contains 10 percent ethanol, and the use of 15 percent ethanol blends and flex fuels like E85 is increasing. 15 percent ethanol blends (E15) are higher quality fuels that offer greater savings. The EPA has approved E15 use in more than 90 percent of the existing U.S. auto fleet, and 9 out of 10 new cars carry the manufacturer's warranty and approval for E15.

Creating Jobs and Helping Fuel the U.S. Economy

In 2021, the industry directly employed more than 73,000 American workers and supported an additional 334,220 indirect and induced jobs across the economy. Nearly one in five of those workers is a veteran of the U.S. military. The ethanol industry generated \$52.1 billion in gross domestic product and boosted household income by \$28.7 billion.

Boosting Rural Economies

Ethanol and feed co-product production provide a valuable market for corn grown in the United States. A typical dry mill ethanol plant adds nearly \$2 of additional value – or 55 percent – to every bushel of corn processed.

A Cleaner, Greener Fuel

Ethanol is responsible for removing the carbon equivalent of 12 million cars from the road each year. This has occurred while the amount of ethanol produced from a bushel has increased. Ethanol use reduces greenhouse gas emissions by 44-52 percent compared to gasoline—even when hypothetical land-use change emissions are included. By displacing hydrocarbon substances like aromatics in gasoline, ethanol also helps reduce emissions of air toxics, particulate matter, carbon monoxide, nitrous oxides, and exhaust hydrocarbons.

Driving Energy Independence

It's more affordable than traditional gasoline, reduces harmful vehicle emissions, supports American jobs, and protects America's energy independence. In 2021, ethanol helped protect America's energy independence by displacing over 500 million barrels of crude oil.

Producing Food AND Fuel

Ethanol biorefineries make more than fuel; they also generate highly nutritious animal feed like distillers grains. One-third of every bushel processed by a plant is used to make animal feed. The low cost and nutritional properties of distillers grains make it one of the most sought-after feed ingredients in the world.

To learn more about ethanol, visit EthanolRFA.org!

Careers in Biotechnology

Business & Communication: Careers in this field are ideal for those who are interested in communication technical subject matters but don't want to work in a laboratory. This path is also best designed for someone who wants to pursue an exciting career in business or communication while also contributing to sustainable solutions that help to decarbonize the industrial sector and create more environmentally-friendly alternatives to the products we use everyday.

Examples of Job Titles in this Field:

- Communication Coordinator/Manager
- Marketing Coordinator/Manager
- Project Manager
- Business Development
- Sales Representative/Manager
- Human Resources Manager/Coordinator
- Public Policy Manager
- Accountant

Degree Programs to Prepare You for this Field:

- Agribusiness
- Marketing
- Communication
- Business
- Human Resources
- Accounting
- Economics
- Political Science

Laboratory Sciences: Careers in this field are ideal for those who are interested in communication technical subject matters but don't want to work in a laboratory. This path is also best designed for someone who wants to pursue an exciting career in business or communication while also contributing to sustainable solutions that help to decarbonize the industrial sector and create more environmentally-friendly alternatives to the products we use everyday.

Examples of Job Titles in this Field:

- Laboratory Analyst
- Laboratory Associate
- Research Assistant
- Laboratory Technician
- Research Chemist
- Laboratory Project Manager
- Fermentation Scientist

Degree Programs to Prepare You for this Field:

- Chemistry
- Biological Science
- Environmental Science
- Microbiology
- Immunology
- Biochemistry
- Plant/Crop Science

Engineering & Operations: Careers in this field are ideal for those who like to think outside of the box and create solutions to complex problems. Production of bio-based chemicals, fuels, and products will grow significantly over the next several decades, providing exciting opportunities for those who like engineering, science, and math and use their expertise to design new production processes and create environmentally-friendly products.

Examples of Job Titles in this Field:

- Operating Technician/Engineer
- Facilities Manager
- Plant Manager
- R&D Engineer
- Project Management Engineer
- Environmental, Health & Safety Engineer

Degree Programs to Prepare You for this Field:

- Electrical Engineering
- Mechanical Engineering
- Chemical Engineering
- Computer Engineering
- Industrial Engineering
- Agricultural Engineering

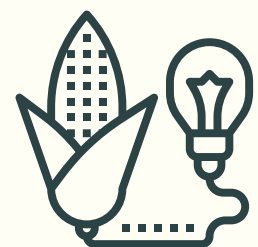
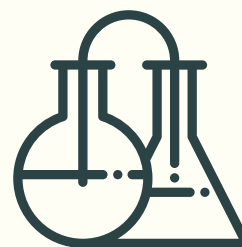
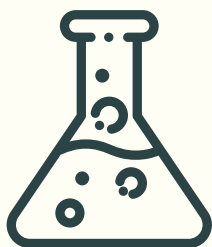
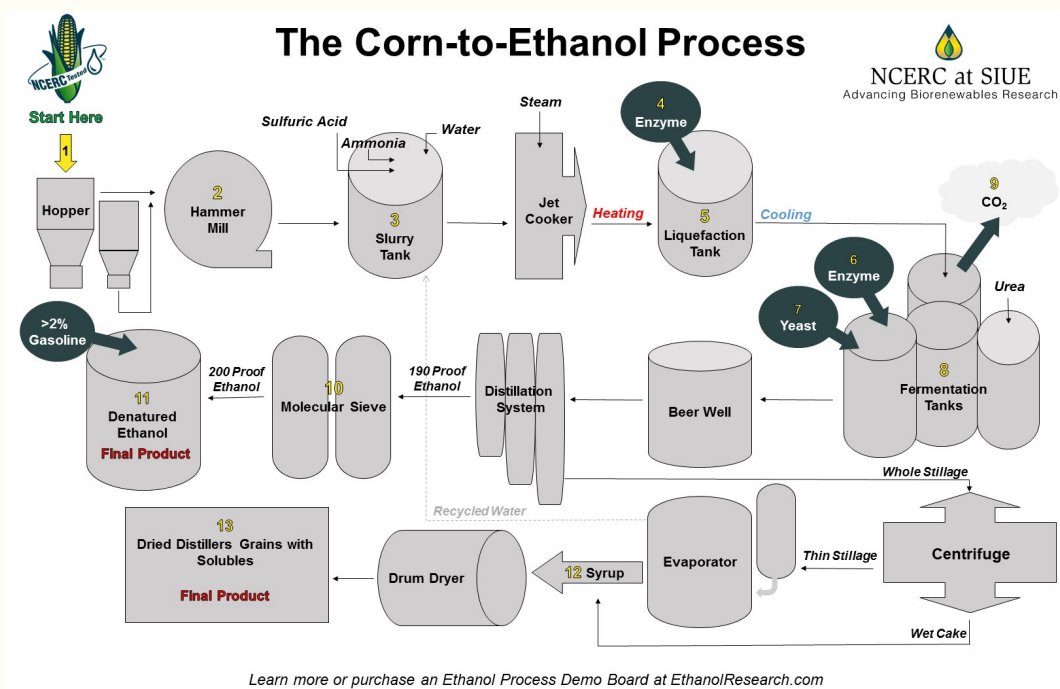
Resources for K12 Teachers & Community Organizations

In addition to providing educational opportunities for students in higher education, NCERC provides incredible resources for K12 teachers and community organizations, such as SIUE's Lifelong Learning group. NCERC's leadership staff routinely provide presentations as subject matter experts on topics like agriculture, biotechnology, and careers in those industries.



Presentations may also include interactive activities, such as performing small-scale fermentations in a plastic bag, as a way to spark interest in bioprocessing and biotechnology.

In Spring 2022, NCERC's team revamped the Corn-to-Ethanol Process Demonstration Boards, which are available for order on NCERC's website. The boards have served as a tool for teachers for several years.



A Special Thanks to the Illinois Corn Growers!

NCERC is fortunate to receive continuous support from the Illinois Corn Marketing Board.

Because of their generosity, we're able to support a healthy workforce training program and nurture the careers of ambitious students and future leaders of the bioeconomy.



ILCORN
WWW.ILCORN.ORG



NCERC at SIUE

Advancing Biorenewables Research

Contact us:

400 University Park Drive, Edwardsville, IL 62025

618-659-6737

info@ethanolresearch.com

EthanolResearch.com
