



What is NBC2 ?



# Northeast Biomanufacturing Center and Collaborative



**NBC2 is a National Science Foundation  
Advanced Technology Education Center of  
Excellence**

**Our Mission:** to coordinate local and regional efforts into a national biomanufacturing education and training system to promote, create, and sustain a qualified workforce.

***[Biomanufacturing.org](http://Biomanufacturing.org)***

# Northeast Biomanufacturing Center and Collaborative



## Goals for 2016-2019:

1. Build and foster local partnerships between industry, educational institutions and government
2. Provide professional development opportunities for CC and HS faculty and students – PiC, BIOMAN, Bootcamp
3. Develop curricular materials: textbook, lab manuals, SOPs
4. Disseminate information on biomanufacturing: career opportunities and curricular materials via workshops and website ***biomanufacturing.org***
5. Plan for sustainability of NBC2 and programs





# Website



***www.biomanufacturing.org***

← → ↻ 🏠 ⓘ biomanufacturing.org 🔍 📄 ⭐ 📄 📄

 [About NBC2](#) [Curriculum Resources](#) [NBC2 Workshops](#) [News & Other Events](#) [Careers](#) [Acknowledgements](#) 🔍





NBC2  
Workshops  
Summer 2017

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Quarterly Mailing List

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TEXTBOOKS, PROGRAM UNITS, SOPs

Curriculum  
Resources

[DOWNLOAD HERE](#)

# NBC2 Team



- **Maggie Bryans**, PI, MCCC
- **Linda Rehfuss**, Co-PI and co-Lead, Bucks
- **Matt Marshall**, Program Manager at MCCC
- **Cianna Cooper**, Program Manager at Bucks
- **Co-PIs at 4 NBC2 Hub Schools:**
  - **Jim Hewlett**, Finger Lakes CC
  - **Sengyong Lee**, Ivy Tech CC
  - **Mike Fino**, Miracosta CC
  - **Bill Woodruff**, Alamance CC

# National Regional Hubs





# Global Biomanufacturing Curriculum Textbook and Laboratory Manuals



- \* Introduction to Biomanufacturing (textbook), December 2012
- \* Biomanufacturing Laboratory Manual, July 2009
- \* *Escherichia coli* – GFP Core Production System
- \* CHO – tPA Core Production System
- \* *Pichia pastoris* – HSA Core Production System
- \* **Protein is Cash Laboratory Manual, 2017**
- \* Standard Operating Procedures & Batch Records for all laboratory exercises

Biomanufacturing Laboratory Manual (custom)

Great Bay Community, Mount Wachusett Community College and MCCC

- \* Free to download at ***biomanufacturing.org***

# Biomanufacturing.org/careers



## Find Biomanufacturing Education and Career Opportunities in your State / Region

### Careers

Learn about careers in biomanufacturing and biotechnology [here](#), and find colleges, universities, and industrial institutions that may advance your career in each state of the United States of America below.

#### South

Alabama

Arkansas

Florida

Georgia

Louisiana

Mississippi

North Carolina

Puerto Rico

South Carolina

Tennessee

#### West

Alaska

Arizona

California

Colorado

Hawaii

Idaho

Montana

Nevada

New Mexico

Oregon

Utah

Washington



# Biomanufacturing.org/careers



**Find Biomanufacturing Education  
and Career Opportunities in your State / Region**

## Regional Resources

**Biomanufacturing  
Industry**

**BioFlorida**

**UF Center of Excellence for  
Regenerative Health Biotechnology**

**North Carolina Biosciences  
Organization**

**North Carolina Biotech Center**

**Biomanufacturing  
Education**

**BioNetwork**

**Alamance Community College**

## North Carolina

### Biomanufacturing Education

Johnston Community College

BioNetwork

Bionetwork Capstone Center

BTEC - Biomanufacturing Training and Education  
Center

North Carolina State University

Guilford Technical Community College

Gaston College

Pitt Community College

Rowan-Cabarrus Community College

Wake Technical Community College

Piedmont Community College

Forsyth Technical Community College

East Carolina University

### Biomanufacturing Industry

KXTbio

ABD Serotec (Bio-rad)

Selexys Pharmaceuticals

PPD

Fujifilm- Diosynth

Pantheon

Novozymes

Mimetics

Celgene

bioMérieux

**BioAgilytix**

Bayer

Avista Pharma

Argos Therapeutics

# Biomanufacturing.org/careers



**Find Biomanufacturing Education  
and Career Opportunities in your State / Region**

**BioAgilytix** 

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RESULTS

  
TEAM

  
COMPANY

  
RESOURCES

## LARGE MOLECULE BIOANALYSIS DONE DIFFERENTLY

**TO HELP YOU ACHIEVE MORE.**

BioAgilytix has evolved the model for partnership in large molecule bioanalysis to benefit our customers and the patients they serve.



SPEAK TO A SCIENTIST 



# Find Links to other Biotech & Biomanufacturing Online Resources e.g. Bio-Link

## Biotech Careers



Educating the Biotechnology Workforce

Search

[Home](#) [Log in](#)

[Articles](#) [Careers](#) [Internships](#) [Job Areas](#) [Photos](#) [Resources](#) [Videos](#)

### Explore Careers

#### By Education

Associates degree ▾

Go

#### By Job Area

Biomanufacturing ▾

Go

#### By Starting Salary

\$30,000-\$40,000 ▾

Go

### Biomanufacturing



Biomanufacturing produces a wide range of biobased products in the emerging global bioeconomy. Modifying living organisms to manufacture useful products includes genetic engineering as well as advanced cell and tissue culture technologies. Biomanufacturing requires knowledge and methods from many scientific spheres including chemical and bioprocess engineering. Resulting products range from biopharmaceuticals to medical devices to energy fuels, chemicals, materials, and consumer goods. The application of biotechnology to industrial processes is not only transforming how we manufacture products it's also producing new products – such as pollution-eating microbes - we couldn't have imagined in years past.

Every job in a biomanufacturing enterprise must combine into a unified effort that builds quality into each stage of making the product. Everyone involved shares the goal of achieving the highest quality product on a consistent basis. Commonly held skill standards and protocols establish and maintain this state of thorough control. For

### Job Areas

[Agricultural biotechnology](#)

[Animal biotechnology](#)

[Aquaculture Biofuels](#)

[Biomanufacturing](#)

[Biomaterials](#)

[Biopharmaceuticals](#)

[Bioprocessing](#)

[Biotechnology Cell culture](#)

[Conservation biology Cosmetics](#)

[Documentation Drug discovery](#)

[Education Environmental](#)

[monitoring Food Safety Forensics](#)

[Genomics Immunochemistry Lab Safety](#)

[Marine biotechnology Media and Solution](#)

[preparation Medical devices Medical](#)

[diagnostics Molecular biology](#)

[Nutraceuticals Plant biotechnology Protein](#)

[purification Quality control Vaccines](#)

[Water quality](#)

### Biotech careers

[Animal Technician](#)

[Biofuel Technicians](#)

[Cell Culture Technician](#)

[Clinical Research Associate](#)

[Documentation Specialist](#)





# NBC2

*Faces of Success*



# Katrice Jalbert

Job Title: Deviation Writer Level II  
Company: Lonza Biopharmaceuticals

## Education Pathway:

- H.S. Degree in Biotechnology
- Associates Degree in Biotechnology & Biomanufacturing at Great Bay Community College, Portsmouth, NH
- Apprenticeship with Lonza Biopharmaceuticals led to her hiring





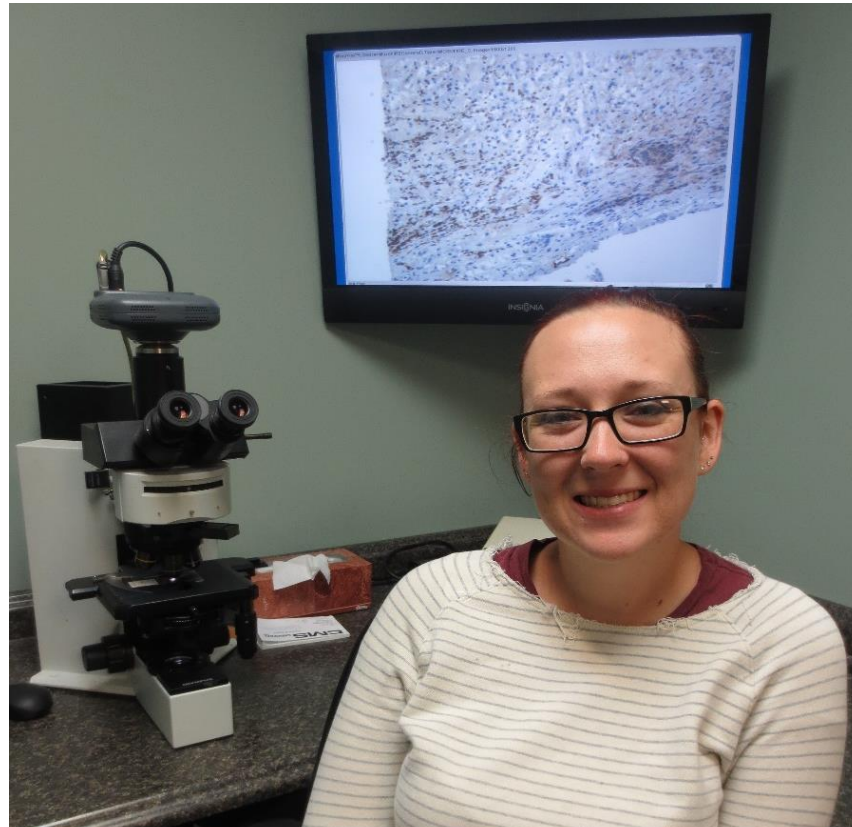
# Liz Neuman

Job Title: Research Assistant

Company: Qualtek Molecular Laboratories

## Education Pathway:

- Associates Degree in Biotechnology & Biomanufacturing at MCCC in Blue Bell, PA
- Bachelor's Degree in Microbiology and Biotechnology at Delaware Valley College





# Karin Klauder

Job Title: Quality Control Chemist  
Company: GEO Specialty Chemicals

## Education Pathway:

- **Associates Degree in Biotechnology & Biomanufacturing at MCCC in Blue Bell, PA**



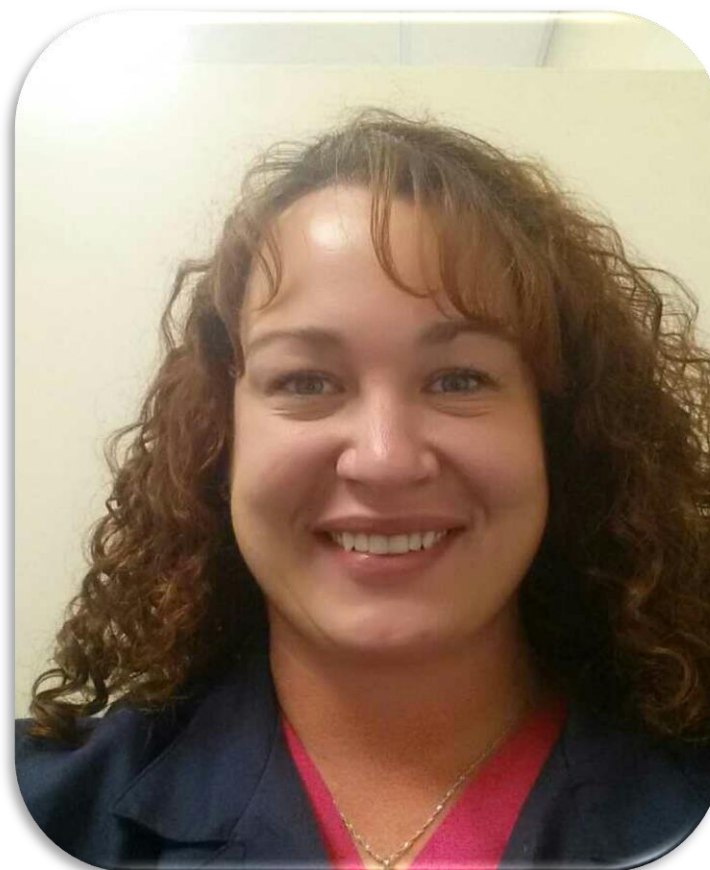
# Kristine Lewis

Job Title: Quality Control Analytical Chemistry Stability  
Assistant

Company: Cook Pharmica LLC

## Education Pathway:

- **Associates in Biotechnology from Ivy Tech Community College Bloomington**
- **Bachelor's in Biotechnology from Indiana University**
- **Master's in Biotechnology and Regulatory Affairs online program at John Hopkins University,**



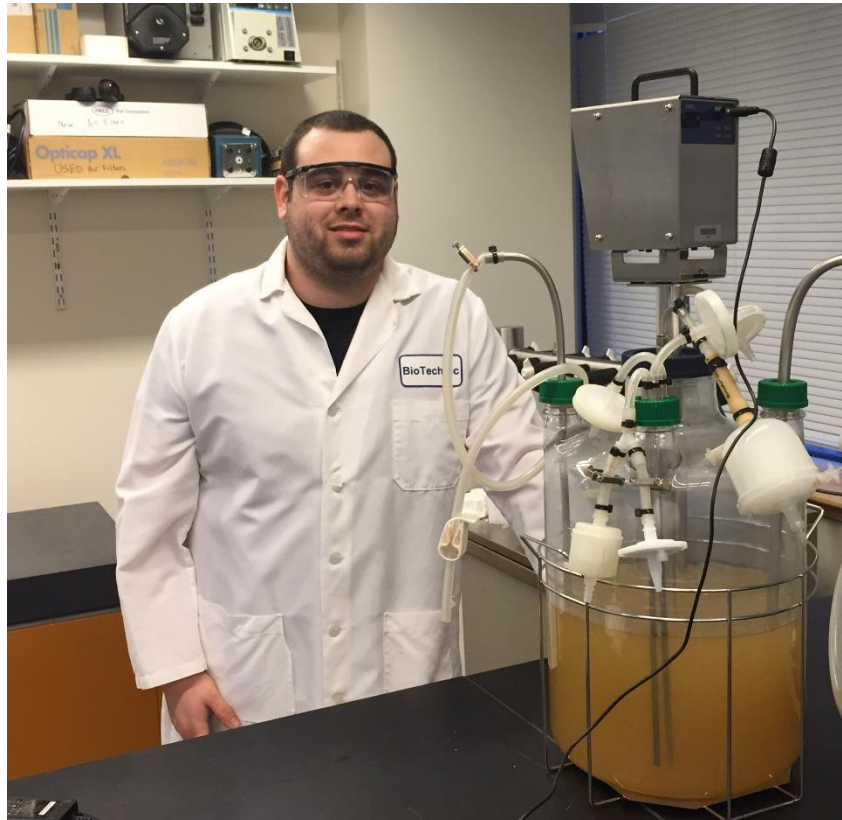
# Kevin Brown

Job Title: Research Associate

Company: Biotechnic Products LTD

## Education Pathway:

- **Biotechnology Academy High School Program**
- **Biomanufacturing certificate at MWCC**
- **Internship at Biotechnic Products LTD**





# David Haddadd

Job Title: Lab Assistant

Company: Millennium (Takeda)

## Education Pathway:

- High School Biotechnology
- Associates in Biotechnology and Biomanufacturing at NHCTC
- Apprenticeship at Millennum
- Bachelor's Degree at Harvard
- Master's Degree in Biotechnology at Harvard



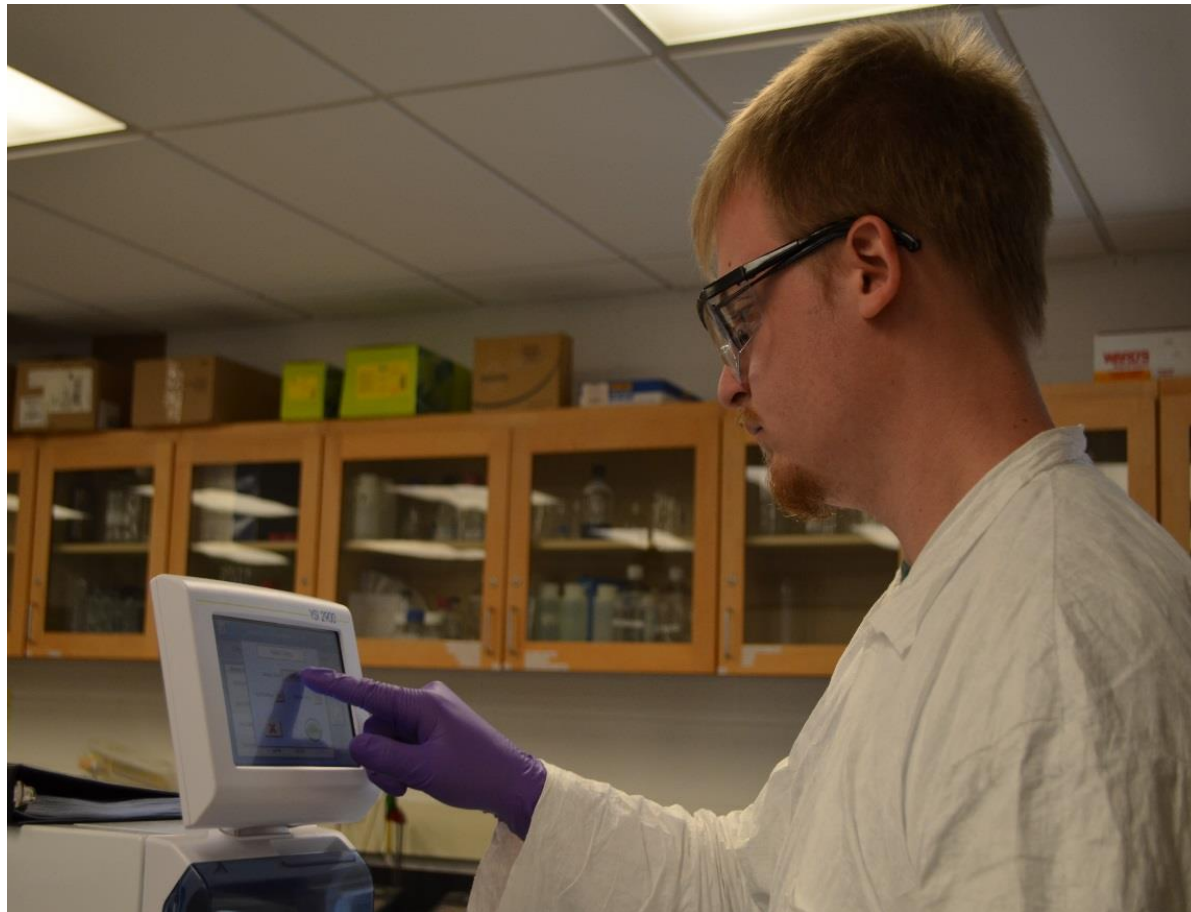
# Rick Wollover

Job Title: QC Associate

Company: KVK-Tech

## Education Pathway:

- **Associates in Biotechnology at Bucks County Community College**





NBC2

*Protein is Ca\$h HS Teacher Workshop*





# *Protein is Cash* HS teacher workshop



Central Dogma: DNA  $\longrightarrow$  RNA  $\longrightarrow$  Protein

- Discovery Research (DNA Centric)
- Process Development and Biomanufacturing (Protein Centric)

**DNA is the FLASH, Protein is the CA\$H!!!!**

# *Protein is Cash* HS teacher workshop



## Protein is Ca\$h

Agenda:

**DAY 1: Metrology** – pipette performance verification

**DAY 2: Upstream Processing** – bacterial transformation/scale up

**DAY 3: Downstream Processing** – column chromatography

**DAY 4: Quality Control Biochemistry** – SDS PAGE

**DAY 5: Biofuels** – crossover industry

**Goals: to increase knowledge of -**

- **the Biopharmaceutical Industry**
- **types of jobs and career pathways available**
- **how to introduce the main concepts of the industry into your high school lab.**



*Protein is Cash* teacher support website:

**Navigate to: *Biomanufacturing.org***

 ***NBC2 Workshops***

 ***Protein is Cash Workshops***

 ***Protein is Cash Resources***

*Protein is Cash* laboratory manual with Standard Operating Procedures (SOPs) for each experiment.