

What is biotechnology?



*While you wait for us to begin,
please answer the question in
the chat.*

Thank you!



Harford Community College BIOTECH Pathways:

Expanding Pathways from High School into the Biotechnology Workforce

BIOTECH Pathways Virtual Workshop

Spring 2021

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HARFORD
COMMUNITY COLLEGE



This project is supported by the National Science Foundation under Grant No. 2000193. Any opinions, findings, conclusions, or recommendations expressed are those of the authors and do not necessarily reflect the views of the National Science Foundation.

Agenda

- Introduction to BIOTECH Pathways Program and Team Members
- What is biotechnology?
- Careers in biotechnology
- Biotechnology programs at Harford Community College
 - S-STEM Scholarships
- Transfer and industry paths through HCC
 - Dr. Annica Wayman, Associate Dean for Shady Grove Affairs, UMBC-Shady Grove
 - Dr. Jared DeCoste, U.S. Army Combat Capabilities Development Command
- Upcoming events for high school students
- Survey and questions

BIOTECH Pathways Team



Jackie Madden

- Associate Professor, Principal Investigator

Dr. Pamela Pape-Lindstrom

- Dean of STEM, Co-Principal Investigator

Dr. Susan Walker

- Assistant Professor, Co-Principal Investigator

Breonna Martin

- Assistant Professor, Senior Personnel

Dr. Sondra LoRe

- Manager National Institute for STEM Evaluation and Research, External Evaluator

Nicole Jones

- Evaluation Specialist, National Institute for STEM Evaluation and Research, External Evaluator

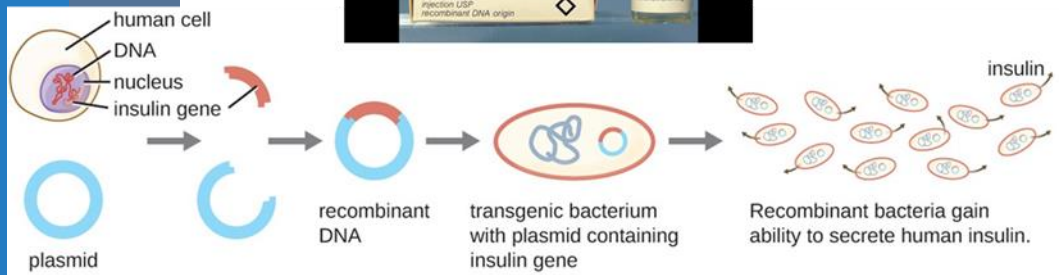
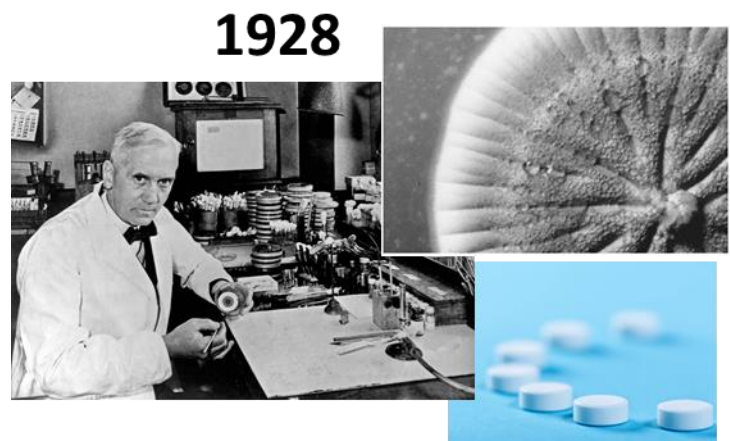


Supported by a \$493,912 grant from the National Science Foundation



What is biotechnology?

1919 "Biotechnology"



1999



2003



2021



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What can I do
with a career in
biotechnology?



Molecular Biology and Genomics Technicians

- Work with DNA, RNA, cells, and proteins
- Job duties might include
 - DNA/RNA extraction, purification, and modification
 - Polymerase chain reaction (PCR) for making copies of DNA
 - Recombinant DNA technology
 - Transformation (inserting new genes into bacteria so they can make protein products for us!)



Cell Culture Technician

- Grow living cells in culture flasks, bioreactors, or plates
- Job duties might include:
 - Media preparation
 - Molecular biology protocols
 - Microscopy to count cells or examine cell structure



Agricultural Technicians

- Supply farmers with tools to improve yield or quality of agricultural products
- Job duties might include:
 - Collect and prepare animal or crop samples for lab analysis
 - Lab or field testing for pest or weed control, fertilization, & environmental data
 - Disease detection or selective breeding programs for crops or animals



Biomanufacturing Careers

- Application of biotechnology to industrial manufacturing
- Products include
 - Biopharmaceuticals
 - Industrial enzymes
 - Human tissues and replacement organs
 - Biofuels
 - “Green” chemicals and products
- Potential jobs include
 - Biomanufacturing technician
 - Quality control (QC) technician
 - Quality assurance (QA) technician
 - Instrumentation calibration technician



How much can I earn?

Associate Degree with <1 year experience in Baltimore, MD

Entry Research Assistant - Biotech



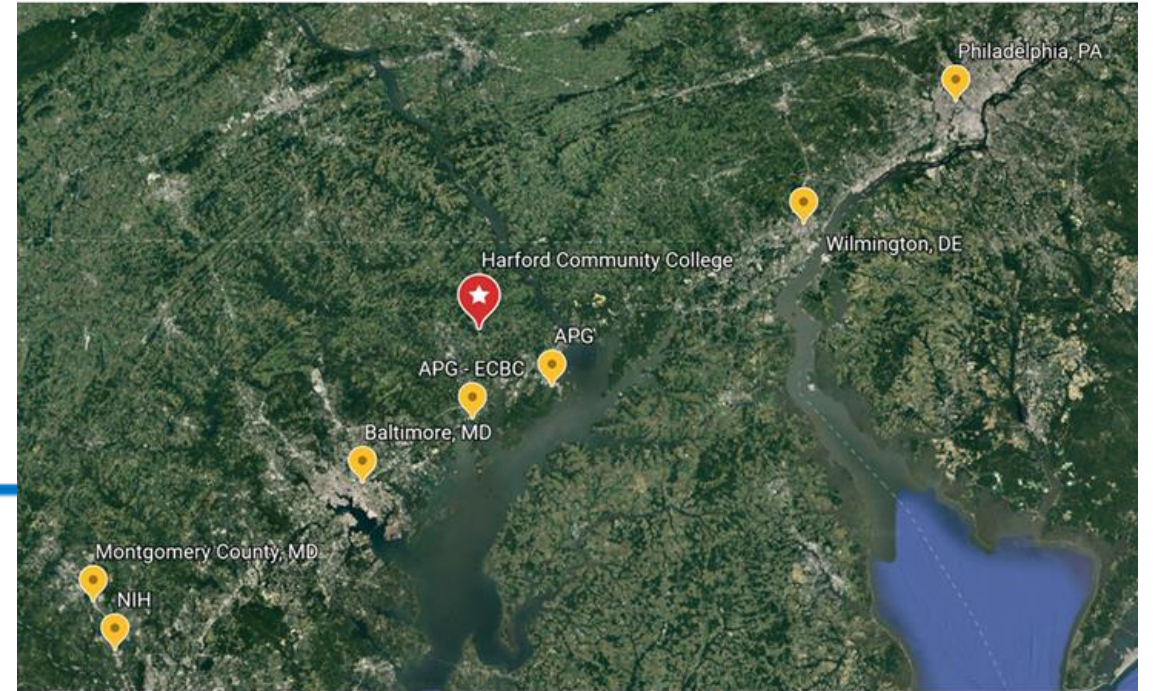
Research and Development Associate I



Why HCC?

BioHealth Capital Region

- 800+ life science companies
- 70+ federal labs
- Top universities
- Currently ranked 4th in top biopharma clusters in US
- Goal: Become a top 3 biohealth cluster by 2023



NOVAVAX



MD Biotech
Industry
Responds to
COVID-19
Pandemic

Alumna success: HCC to the DEVCOM Army Research Lab

Author: Sandra Porter

Tuesday, April 6 2021

Filed under: [alumni](#) | [Harford alumni](#)

Contributor Affiliations: [Harford Community College](#)



Summer's career path: Biology major > Undergraduate research > internship project "DNA barcoding a College Campus Arboretum" > 3D printing courses > Boys and Girls Club job tutoring students > internship at U.S Army Combat Capabilities Development Command (DEVCOM) > full-time position at Aberdeen Proving Ground as a Research Fellow with the DEVCOM Army Research Laboratory.

Credentials earned: A.S. in Biology from Harford Community College, Professional Certificate in Additive Manufacturing for Innovative Design and Production from the Massachusetts Institute of Technology (MIT).

Article and photo contributed by [Harford Community College](#)

"Everyone thrives most in his or her own unique environment." - Marilu Henner

What Marilu Henner once said could not be any truer for Harford alumna Summer Bottomlev '19. She created a unique environment for herself at home, at Harford and in her

How can HCC's biotech programs help me reach my goals?

New AAS Degree in Biotechnology

Proposed AAS in Biotechnology Course Sequence			
Course (Fall Year 1)	Credits	Course (Spring Year 1)	Credits
ENG 101 English	3	Gen Ed Behavioral/Social Science**	3
BIO 120 General Biology I	4	MATH 216 Statistics/DSCI 102 Introductory Statistics with Programming*	4
BIO 128 Intro to Biotechnology	4	BIO 211 Microbial Biotechnology	4
CHEM 111 General Chemistry I	4	CHEM 112 General Chemistry II	4
Total	15	Total	15
Course (Fall Year 2)	Credits	Course (Spring Year 2)	Credits
BIO 208 Genetics	4	Program Electives (Total 6 credits)	6
BIO 212 Principles of Biomanufacturing	4	BIO 214 Molecular Techniques	4
BIO 213 Cell Culture Techniques	4	BIO 215 Immunology and Immunological Methods	4
Gen Ed Arts/Humanities**	3	PE	1
Total	15	Total	15
Total Credits = 60			
Program Notes:			
*Students may not receive credit for both DSCI 102 and MATH 216. Students may take MATH 109 Precalculus or MATH 203 to satisfy the math requirement for the program.			
**Students must complete one course that meets the diversity requirement for graduation.			



Revised Biotechnology Certificate

Proposed Biotechnology Certificate Course Sequence			
Course (Fall Year 1)	Credits	Course (Spring Year 1)	Credits
BIO 120 General Biology I	4	BIO 211 Microbial Biotechnology	4
BIO 128 Introduction to Biotechnology	4	CHEM 111 General Chemistry I	4
Total	8	Total	8
Course (Fall Year 2)	Credits	Course (Spring Year 2)	Credits
BIO 212 Principles of Biomanufacturing	4	BIO 214 Molecular Techniques	4
BIO 213 Cell Culture Techniques	4	BIO 215 Immunology and Immunological Methods	4
Total	8	Total	8
Total Credits = 32			



National Science Foundation – Scholarship in STEM (S-STEM)

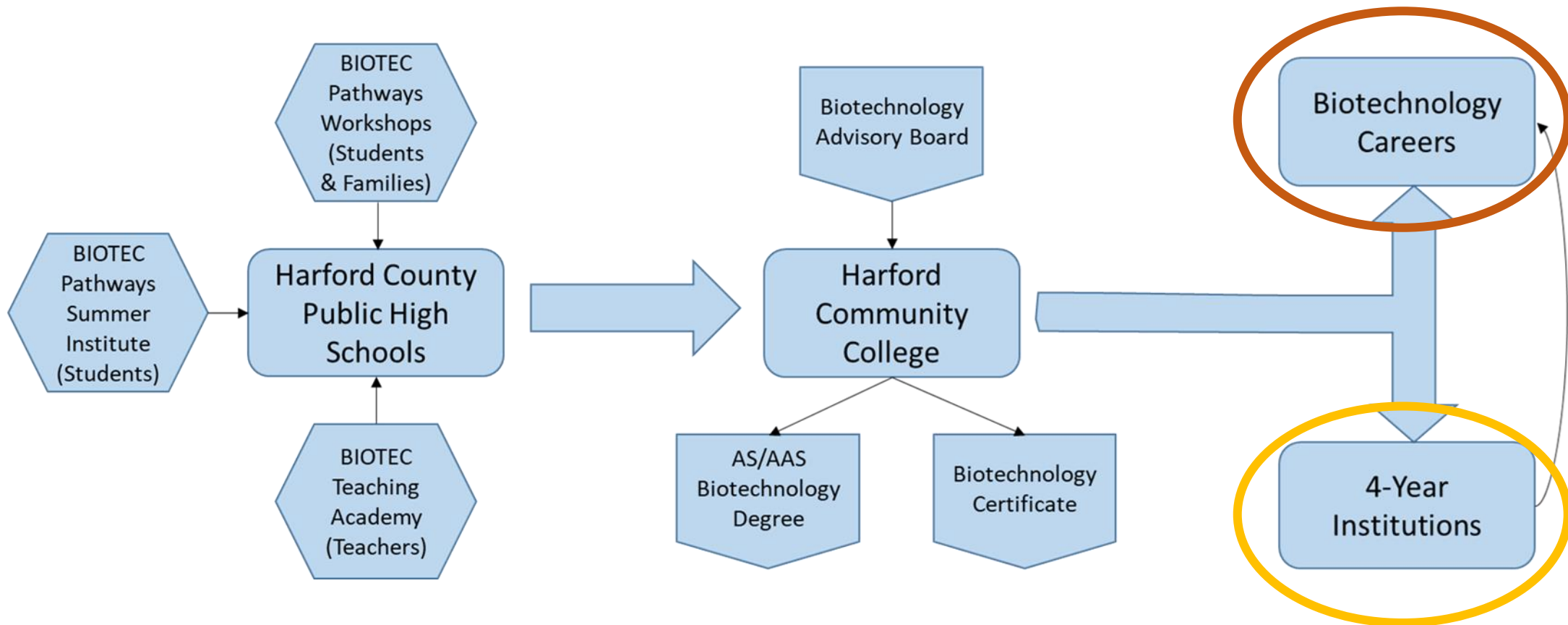


- \$648,953 NSF Award –2017-2022
- Goal is to increase STEM pipeline
- Financial & academic support for STEM students with unmet financial need
- Full-time, declared STEM major
- Scholarship award up to \$10,000 annually
- \$2000 stipend for research

- Biology
- Engineering
- Chemistry
- Environmental Science
- Mathematics
- Physics
- Computer Science
- Computer Information Systems
- Information Assurance & Cybersecurity



Transfer and Industry Paths



Translational Life Science Technology Bachelor of Science Degree

Annica Wayman, Ph.D.

Associate Dean for Shady Grove Affairs, CNMS

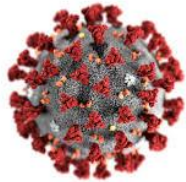


Translational Life Science Technology (TLST) Bachelor of Science Program

The TLST program educate students on the biotechnology discovery and development process



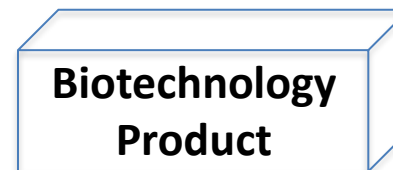
Translation of TNF α discovery
to Humira self-injection pen



Translation of COVID-19 discovery
to better Dx and treatment

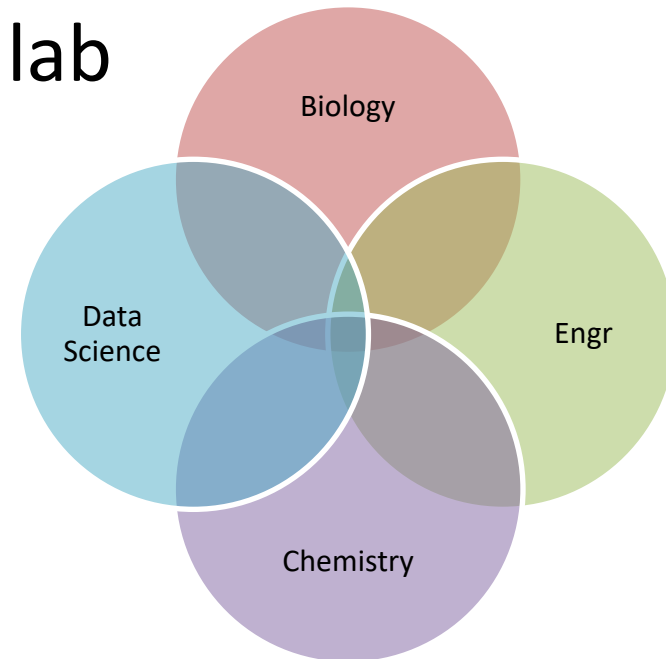


Translational Science
(ie: Development process for Pharmaceuticals,
Ag Products and other Biotech products)



TLST Program Features

- Practical teaching of how biology and chemistry are applied to making pharmaceutical drugs
- Hands-on learning with many lab classes
- Interdisciplinary
- Required internship
- Fully launched in **Fall 2019**



Sampling of TLST Classes

- Applied cell biology
- Biochemistry & Molecular Biology
- Biochemical engineering
- Biomanufacturing
- Biostatistics
- Bioinformatics
- Epidemiology
- Cancer biotechnology



Sampling of TLST Internships



Biomedical Sciences and Engineering Education (BSE) Facility



Types of Post-Graduate Opportunities with TLST Degree

- Biotechnology/Pharma Industry
 - R&D
 - Quality Systems
 - Manufacturing
 - Sales & Technical Support
 - Other Cross-cutting areas
- Healthcare Industry
- Government
 - NIH
 - FDA
 - NIST
- University
 - Translational science graduate programs and research consortiums
 - Other life science and biotechnology related graduate programs





Questions?

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Email: awayman@umbc.edu

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Twitter: [@Annica_Sci4Dev](https://twitter.com/Annica_Sci4Dev)

Benefits of BIOTECH Pathways



Employability!

Develop skills identified by industry partners

Research experience!



Paid Internships!

- Adaptive Phage Therapeutics
- Institute of Marine and Environmental Technology
- Integrated Pharma Services
- U.S. Army Medical Research Institute of Chemical Defense
- U.S. Army Combat Capabilities Development Command

Educational Partnership Agreement

between the U.S. Army Combat Capabilities Development Command Chemical Biological Center and HCC for a Biomanufacturing Cooperative Educational Program

- Dr. Peter Emanuel
- Dr. Jared DeCoste

Upcoming Events

- **BIOTECH Pathways Virtual Workshops – spread the word!**
 - Tuesday, April 20, 2021, 7 pm
 - Wednesday, May 5, 2021, 7 pm
 - Register at <https://tiny.cc/BIOTECH-HCC>
- **STEM Exploration Session (*virtual*)**
 - Tuesday, April 27, 2021, 5 pm
 - Register at <https://www.harford.edu/>
- **BIOTECH Pathways Hands-On Workshop**
 - Monday, May 17, 2021 – more info coming soon!

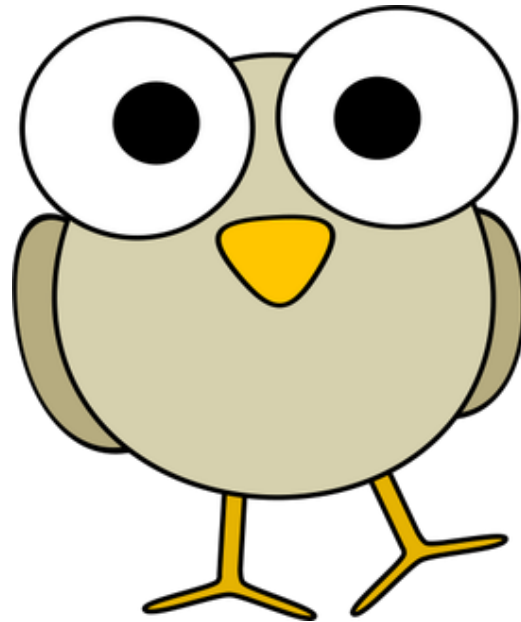
Thanks to Advisory Board Members!

- Mr. John Casner, Northeastern MD Technology Council
- Dr. James Dillman, U.S. Army Medical Research Institute of Chemical Defense
- Dr. Peter Emanuel, U.S. Army Combat Capabilities Development Command
- Dr. Linnea Fletcher, Austin Community College and InnovATE BIO
- Dr. Mina Izadjoo, Integrated Pharma Services
- Dr. Nina Lamba, Institute of Marine and Environmental Technology
- Dr. Amrita Madabushi, National Institute on Aging
- Mr. Greg Merril, Adaptive Phage Therapeutics
- Mr. Andrew Renzulli, HCPS
- Dr. Annica Wayman, UMBC-Shady Grove



Survey and Questions

- Please help us improve our program! Complete the survey at <https://tiny.utk.edu/biotech>
- Contact: Jackie Madden, jmadden@harford.edu



References

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