THE FUTURE IS ...

N.E.A.R.

NANOTECHNOLOGY EDUCATION AND RESEARCH

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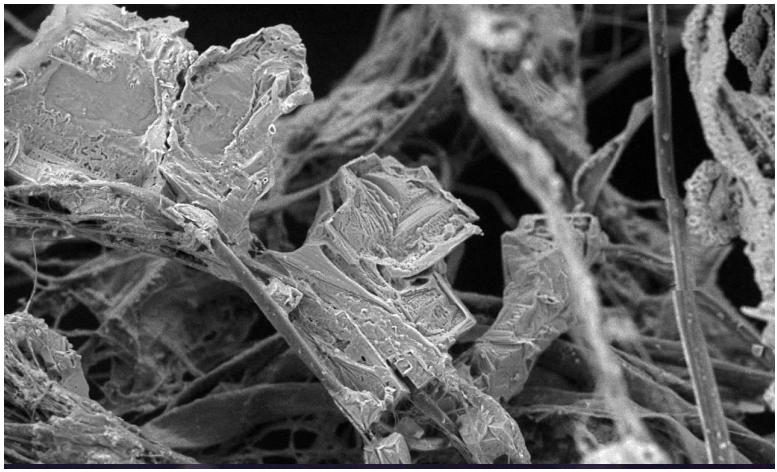
Technology&Engineering Discover your Future

PLTW nERL



Completing its 20th year, The Future is N.E.A.R. program (Nanotechnology Education and Research) at North Penn is a custom designed STEM education experience engaging senior Engineering Academy students in the exciting world of nanotechnology, experimental design, and engineering research.

Students work in design teams to research and develop solutions to global challenges by capitalizing from the fundamentals of materials science, engineering, and nanotechnology while utilizing a combination of their own creativity coupled with some of the latest published research available.

The N.E.A.R. program is woven into the Engineering Design and Development course of the Project Lead the Way program here at North Penn. It offers our students an opportunity to gain essential 21st century skills that prepare them to become successful leaders!

THURSDAY, MAY 29TH, 2025

NORTH PENN HIGH SCHOOL AUDITORIUM

SEVEN O'CLOCK P.M.

2024 - 2025 Engineering Design and Development
Nanotechnology & Engineering Research Teams

Welcome to the 20th Annual North Penn High School Engineering Academy Nanotechnology and Engineering Symposium!

The evening will begin at 7:00pm in the auditorium with introductions to research from each of the teams. The students will bring you up to date with the research endeavors they have been performing throughout this school year. Following their presentations, the evening will continue in the auditorium where the students will offer poster presentations, interactive demonstrations of their research, and much more...

ClimaFlow
Ryan O'Donnell
Vikesh Patel
Adam Wauls

ArachneTECH
Rayat Karim
Carter Laubach
Christian Snell

QuantumLUX
Shafic Henaidy
Isabella Kee
Munem Nihal Khan

HydroCell
Nathan Au
Benjamin Dawson
Logan O'Mara

EcoHarvest
Carter Briggs
Aiden Gardner
Patrick Moore
CJ Tobiaz

AccuNode
Dax Perry
Jamir Watkins
Ayush Yavagal

MRN CarbonTech
Rafauel Armanious
Nathan Luca Pagnoni
Matthew John Pimpinella

Sigma Storage
Evan Rosica
Landon Welch

ReliaBright
Owen Cary
Ved Vyas

PiezoGear
Matthew Cole
Markus Erich Glaeser
Md Isbat Kabir Jehan
Nathan Eric Wohlberg

2024 - 2025 Engineering Design and Development
Nanotechnology & Engineering Research Teams

Rafauel Armanious MRN Carbon Tech

Rafauel, a Gates Finalist, will be attending Pennsylvania State University at University Park to study Chemical Engineering. Building on five North Penn Engineering Academy courses, he is a dedicated leader as Secretary of the Investment Club, Badminton Advisory Board Member, and an active member of NHS, Science Olympiad, Chemistry Club, FBLA, and Mu Alpha Theta. Rafauel is passionate about using STEM to solve real-world challenges and make the world a better place.

Nathan Au HydroCell

Nathan will attend Montgomery County Community College to major in mechanical engineering. He has completed five courses at the North Penn Engineering Academy where he developed more hands-on experience and sharpened his technical skills. He is fascinated by the mechanical and electrical fields, especially with the evolution of technology.

Carter Briggs EcoHarvest

Carter will be attending Rochester Institute Technology to study Industrial Engineering. He has completed 4 courses in the Engineering Academy as well as the elective electronics and advanced electronics courses. He was a member of the tennis team for 3 years and volunteers at his local elementary school chess club. He hopes to further his knowledge in the coming years to one day become an engineer in order to make the world a better place.

Owen Cary ReliaBright

Owen will be attending Pennsylvania State University to study Aerospace Engineering. His curiosity about how things work began at a young age through building with Legos and grew into a fascination with engineering as he started dismantling larger devices like dishwashers and computers. Owen completed five courses in the North Penn Engineering Academy, where he further developed his technical skills and hands-on experience.

Matthew Cole PiezoGear

Matthew will be attending Pennsylvania State University to study Mechanical Engineering. He has completed four courses within the North Penn Engineering Academy. He has always been interested in engineering and the world around him.

Benjamin Dawson HydroCell

Ben will be attending Rochester Institute of Technology in the College of Engineering to study Mechatronics Engineering Technology. He has completed five courses in the North Penn Engineering Academy. He has always been fascinated in taking things apart to see how things work.

2024 - 2025 Engineering Design and Development
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Aiden Gardner EcoHarvest

Aiden plans to attend Penn State Abington through the 2+2 program for Civil Engineering, eventually transferring to University Park. He's well-prepared, having already taken four engineering classes in the North Penn High School Engineering Department. His passion and dedication make him ready for the challenges ahead in college.

Markus Erich Glaeser PiezoGear

Markus Glaeser is an incoming Chemical Engineering student at Penn State with a passion for innovation. A former Science Olympiad build manager and national competitor, Markus has explored areas from wind power optimization to smart textiles. His work in experimental polymer processing and motor control systems reflects a strong interest in materials science and hands-on engineering. Markus brings a problem-solving mindset, CAD experience, and a commitment to interdisciplinary learning to the Penn State engineering community.

Shafic Henaidy Quantum Lux

Shafic Henaidy will be attending Temple University to study Civil Engineering. With four courses from North Penn's Engineering Academy, he enters the field with a strong foundation and passion for innovation. His approach combines technical skills with genuine enthusiasm, reflecting a deep commitment to building a better future. Shafic's journey is defined by purpose, creativity, and a drive to push boundaries and make a lasting impact.

Md Isbat Kabir Jehan PiezoGear

Md Jehan, an incoming Materials Science and Engineering major at Penn State University Park, blends creativity, critical thinking, and real-world problem-solving skills shaped by his engineering academy experience. As President of the Bengali Cultural Club and MIST Ambassador of the Muslim Student Association, he leads with heart. Fueled by a love for music and basketball, he's driven to use his passions and knowledge to create a better, more connected world.

Rayat Karim ArachneTECH

Rayat will be attending Embry-Riddle Aeronautical University (Honors College) to pursue Aerospace Engineering. He has a fascination for space and plans to work on technologies that further human exploration off-world. He is currently vice-president for NP Astro Club and treasurer for NP Model Aviation Club. His passion for creative thinking and problem solving is reflected not just in the work he does for engineering, but also other passions like writing, producing, and acting in NPTV's "Dude Report".

Isabella Kee QuantumLux

Isabella will be attending Wilkes University to study Biomedical Engineering and play for the women's collegiate soccer team. She has completed four courses in the North Penn Engineering Academy. Throughout her four years, she was part of the North Penn Girls Soccer team and threw discus and javelin for North Penn Girls Track and Field. Since Isabella was young, she always knew she wanted to be an engineer and QuantumLux is the first stepping stone for the rest of her career.

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Munem Nihal Khan QuantumLux

Munem Khan will be attending Drexel University to study Chemical Engineering. He is a visionary in the making who's grounded in engineering, faith, and culture. With five courses from North Penn's Engineering Academy, he brings heart to every formula. His journey is one of purpose, creativity, and dreaming beyond the ordinary.

Carter Laubach ArachneTech

Carter will be attending RIT next year in the College of Science to study Imaging Science. He has a strong interest in electronics and engineering, with experience designing drones, smart homes, and 3D printers. He is currently the president of Model Aviation Club, and directs Lighting for the Theatre shows. His work reflects a deep commitment to problem-solving, innovation, and applying technology to create efficient, practical solutions.

Patrick Moore EcoHarvest

Patrick is going directly into the workforce after High School. With interests in auto repair, electricity, and HVAC, Patrick looks forward to the future ahead. He has taken every class that the engineering academy has to offer at NPHS. He enjoys tinkering with different components and research. Patrick has thoroughly enjoyed every aspect of the engineering academy and is excited to apply these skills to real world applications.

Ryan O'Donnell ClimaFlow

Stemming from his curiosity about how things work from a young age, Ryan will be continuing his studies in Chemical Engineering at the University of Tennessee, Knoxville. He has completed four courses in the North Penn Engineering Academy and was named Captain of both the Water Polo Team and the Swim Team. He looks forward to using the knowledge and skills he has picked up over the years for his future endeavors.

Logan O'Mara HydroCell

Logan will be attending Penn State to study Materials Science. He has completed five courses in the North Penn Engineering Academy. Logan has always had a passion for learning about the inner workings of many toys and anything he finds interesting in his life. This has led Logan to greatly enjoy the various programs as he went through in North Penn.

Nathan Luca Pagnoni MRN CarbonTech

Nathan will be attending Pennsylvania State University at University Park to study Mechanical Engineering. He completed four courses within the North Penn Engineering Academy. He has a strong interest in mechanics, robotics, sports, and history. He is an Eagle Scout, a founding cabinet member for the new Volleyball Club, and an active member of other organizations, such as the EPICS Club and the National Honor Society.

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Vikesh Patel ClimaFlow

From adopting Buzz Lightyear's character to the development of expressing creativity through LEGOs, aerospace engineering has always called out to Vikesh. Along with learning advanced skills through the Engineering Academy, he has many outside club involvements such as the National Honor Society and both the Swimming and Water Polo teams which have further developed his character. Through the University of Maryland, studying Aerospace Engineering, Vikesh aims "to go to infinity and beyond!"

Dax Perry AccuNode

Dax Perry will be attending Penn State University Park as a member of the engineering program. An avid creator in digital arts including several animations, he possesses strong visual and design skills. He shows his adept creativity through his unique and ingenuitive ideals.

Matthew John Pimpinella MRN CarbonTech

Matthew will be attending Temple University for Civil Engineering. He has completed five courses within the North Penn Engineering Academy. He has always been interested in engineering and the world around him. He loves to spend time with his family and enjoy the outdoors while camping.

Evan Rosica Σ Storage

Evan will be attending Penn State University to study Computer Engineering. He has completed four courses in the North Penn Engineering Academy. Evan has always had a passion for computers, building his own at home and joining the Computer Science Honors Society where he volunteers his time taking apart and repairing students' broken Chromebooks.

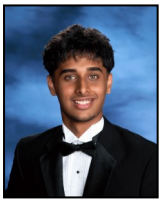
Christian Snell ArachneTECH

Christian will be attending Montgomery County Community College to major in mechanical engineering. He has completed five courses in the North Penn Engineering Academy. He is an Eagle Scout and a volunteering leader for local First Lego Robotics teams. He has a fascination with 3D printing, mechanical design of advanced robotic devices and quantum mechanics. He has painted a mural at the high school roughly 300 sq ft and creates posters for fun.

CJ Tobiaz EcoHarvest

Cj is in the process of determining his plans after graduation. He enjoys hands-on activities and has a strong interest in working on components within systems. Throughout his school years, Cj has engaged in projects that allow him to tinker and innovate, whether it's through the engineering program at North Penn, or his cars at home. As he looks ahead, he remains open to exploring various career paths that align with his skills and passions.

2024- 2025 Engineering Design and Development
Nanotechnology & Engineering Research Teams



Ved Vyas ReliaBright

Ved Vyas is a dreamer, a creator, and a student of Electrical Engineering at Pennsylvania State University. With five courses from North Penn's Engineering Academy, he blends heart and science. Music, art, and electronics fuel his world. His work speaks of innovation; of solving problems not just with logic, but with soul, imagination, and purpose.

Jamir Watkins AccuNode

Jamir Watkins will be attending Penn State to study. He was a long-lasting and influential member of the animation club. He uses his love of art to exercise his visionary ideas within his engineering projects. He likes working with hands-on activities and solving complex problems. He is deeply interested in doing high level research in the field of engineering and nanotechnology and has plans to contribute to several research endeavors.

Adam Wauls ClimaFlow

Although undecided about his major at West Chester University, Adam has always held a deep interest in the way that things work. Following 4 years of Water Polo and Swimming at North Penn, he has grown a love for the grind and an obsession with fitness. Interested in chemistry and engineering, he is driven by a desire to make the world a better place. When not working on academics, Adam can be found working out or striping drives on the golf course.

Landon Welch Σ Storage

Landon will be joining the United States Marine Corps to gain the necessary qualifications to pursue a career in Electricity. He has completed four courses in the North Penn Engineering Academy.

Nathan Eric Wohlberg PiezoGear

Nathan will be attending the Automotive Training Center in Warminster taking their Automotive and High-Performance Technology course. He took a strong liking to the Computer Integrated Manufacturing course where he pushed the class's knowledge on CNC manufacturing. Nathan has learned many skills throughout his time in the NPHS engineering academy, including problem solving which will benefit his future endeavors.

Ayush Yavagal AccuNode

Ayush plans to attend Penn State University Park to major in computer science. He uses his skills in programming and logistical understanding to provide an algorithmical viewpoint to each problem he tackles. He serves a crucial role in supporting and enriching the ideas of others while forming unique solutions himself. He plans to explore new options in his career path post-college and continue to search for a way to properly exercise his skills.

Thank You
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Inspire STEM Education Outreach Program

THANK YOU FOR GIVING VISION TO OUR RESEARCH ENDEAVORS OVER THE YEARS!!!

Lori Harvey | Senior Manager, STEM Education Outreach Hitachi High-Tech America

Summer Hamilton | Hitachi Inspire STEM Education Outreach Coordinator II

To learn more, please visit their website at:
www.InspireSTEMeducation.us

"A vision without resources is just a hallucination..."
Dr. Joseph DeSimone, 2008 Lemelson –MIT Prize Recipient

2024-2025 NPHS Nanotechnology & Engineering Research Lab Endeavors

nERL

Materials Science	Energy	Environment	Energy	Materials Science
ArachneTECH	EcoHarvest	HydroCell	QuantumLux	ReliaBright
Rayat Karim Carter Laubach Christian Snell	Carter Briggs Aiden Gardner Patrick Moore CJ Tobiaz	Nathan Au Benjamin Dawson Benjamin Diehl Logan O'Mara	Shafic Henaidy Isabella Kee Munem Khan	Owen Cary Ved Vyas

Materials Science	Environment	Environment	Energy	Energy
AccuNode	ClimaFlow	MRN CarbonTech	PiezoGear	∑ Storage
Dax Perry Jamir Watkins Ayush Yavagal	Ryan O'Donnell Vikesh Patel Adam Wauls	Rafauel Armanious Nathan Pagnoni Matthew Pimpinella	Matthew Cole Markus Glaeser Md Jehan Nathan Wohlberg	Evan Rosica Landon Welch

NORTH PENN HIGH SCHOOL ENGINEERING ACADEMY | NANOTECHNOLOGY & ENGINEERING RESEARCH LAB | H-003

Thank You
North Penn Educational Foundation and North Penn Curriculum Department

THANK YOU NORTH PENN EDUCATIONAL FOUNDATION FOR YOUR SUPPORT!

WE COULDN'T DO IT WITHOUT YOU!!!

The North Penn School District Educational Foundation, a 501c (3) corporation, is a collaborative effort among individuals committed to enriching the education and lives of more than 13,000 students in each of the North Penn School District's (NPSD) 18 schools, every single day.

Often referred to as "the Foundation," our mission is to motivate and inspire students and staff in the North Penn School District through innovative projects and opportunities that enhance educational experiences and resources.

To learn more about the foundation or to donate, please visit their website at:
www.npennedfoundation.org

THANK YOU NORTH PENN CURRICULUM DEPARTMENT FOR YOUR SUPPORT!

WE COULDN'T DO IT WITHOUT YOU!!!

ACKNOWLEDGEMENTS

We would like to thank the following individuals, companies, and organizations for their invaluable support:

North Penn School District

Mr. Kyle Hassler, North Penn High School Principal
Mrs. Donna Dome, Curriculum Supervisor
Tobe Hilbert and the North Penn Facilities personnel
Bob Gillmer, Craig Weierman, and Thomas Cover, North Penn Communications Media
Mark Keagy, Science Department
Denise Leach, Maggie deMarteleire, Patti Sell
NPHS Art Department
NPHS Technology, Engineering, and Computer Science Department

Drexel University, Philadelphia, PA

Dr. Frank Ko
Dr. Caroline Schauer
Dr. Edward Basgall
Dr. Kapil Dandekhar
Mrs. Joanne Ferroni

Queen Elizabeth's Grammar School, Faversham, England

Dr. James Perkins

University of California San Diego

Dr. Yves Theriault
Dr. Michael Sailor

Hitachi High-Tech America

Lori Harvey
Summer Hamilton

Angstrom Scientific

Evan Slow
Talah Hassan

Laurell Technologies Corporation

Chris Lake
Paul Grasso


ENVIRONMENT
TEAM: MRN CarbonTech
ENERGY
TEAM: EcoHarvest
ENERGY
TEAM: Sigma Storage
MATERIALS SCIENCE
TEAM: ArachneTECH
MATERIALS SCIENCE
TEAM: AccuNode
Entrance
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2025 Nanotechnology & Engineering Symposium
Research Team Poster Sessions & Demonstrations
Hitachi TM4000PLUS Scanning Electron Microscope with Oxford EDS
Zeiss PrimoStar and Stemi 508 Microscopes with Darkfield Analysis
Keithley Source Meter
Mark 10 ESM303 Tensile Tester
Vernier Sensors
RheoSense microVISC Rheometer
Polymer Preparation
Electrospinning
Laurell Technologies Spin Coater
Food Table
IMAGE BOOK
TV
Food Table
Exit
ENVIRONMENT
TEAM: CimaFlow
TEAM: QuantumLUX
BIOENGINEERING
TEAM: PiezoGear
ENERGY
TEAM: ReliaBright
MATERIALS SCIENCE
TEAM: HydroCell
ENERGY

North Penn High School Engineering Academy

NORTH PENN TECHNOLOGY AND ENGINEERING EDUCATION DEPARTMENT

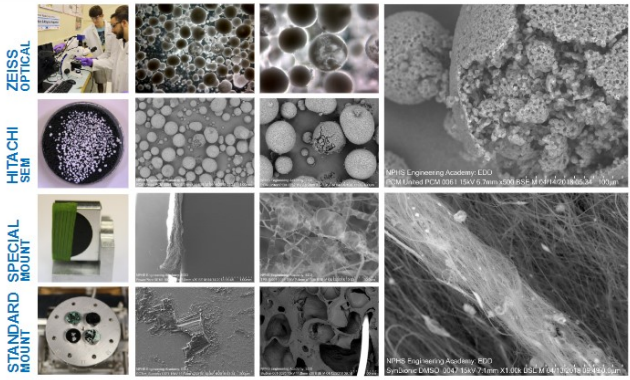
PROJECT LEAD THE WAY | ENGINEERING DESIGN AND DEVELOPMENT

THE FUTURE IS N.E.A.R. | NANOTECHNOLOGY EDUCATION AND RESEARCH

Hitachi TM4000 PLUS

Materials Characterization

Item	TM4000Plus	TM4000
Magnifications	×10 - ×100,000 (Photographic magnification*1) ×25 - ×250,000 (Monitor display magnification*2)	
Accelerating voltage	5 kV, 10 kV, 15 kV	
Image signal	Backscattered electron Secondary electron Mix(Backscattered electron+ Secondary electron)	Backscattered electron
Vacuum mode	BSE: Conductor/Standard/ Charge-up reduction SE:Standard/ Charge-up reduction Mix: Standard/ Charge-up reduction	BSE: Standard/ Chaege-up reduction
Image mode (BSE)	Normal / Shadow 1 / Shadow 2 / TOPO	
Sample stage traverse	X : 40 mm, Y : 35 mm	
Maximum sample size	80 mm (diameter), 50 mm (thickness)	
Electron gun	Pre-centered cartridge tungsten filament	
Signal detection system	High Sensitivity 4-segment BSE detector High-Sensitivity Low-Vacuum SE detector (LVD)	High Sensitivity 4-segment BSE detector
Auto image-adjustment function	Auto start, Auto focus, Auto brightness	
Image data saving	2,560 × 1,920 pixels, 1,280 × 960 pixels, 640 × 480 pixels	
Image format	BMP, TIFF, JPEG	
Data display	Micron marker, micron value, magnification, date and time, image number and comment, WD (Working Distance), accelerating voltage, vacuum mode, image signal, image mode	
Evacuation system (vacuum pump)	Turbo molecular pump: 67 L/s × 1 unit Diaphragm pump: 20 L/min × 1 unit	
Operation help functions	Raster rotation, Magnification presets (3 steps), Image shift (±50 µm @ WD6.0 mm)	
Safety functions	Over-current protection function, built-in ELCB	



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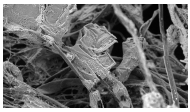

Cover Image:

ArachneTECH | NaCl Spider Silk, 250X, 01.23.2025

North Penn High School Engineering Academy
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