

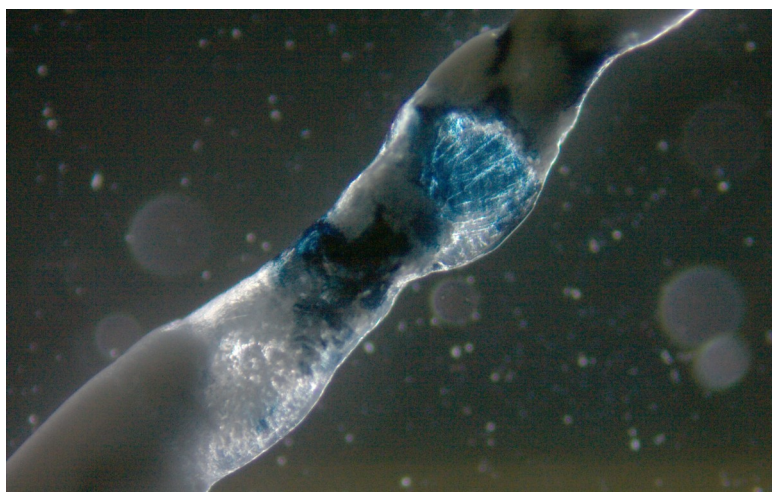


THE FUTURE IS ...

N.E.A.R.

NANOTECHNOLOGY EDUCATION AND RESEARCH

www.thefutureisnear.org



The Future is N.E.A.R. program offers the students of the North Penn High School Engineering Academy an opportunity to gain 21st century Science, Technology, Engineering and Mathematics skills that will help prepare them to become successful leaders in an ever-advancing technological society. The program introduces the fundamentals of nanotechnology, engineering research, and the application of knowledge to high school students while cultivating their interest in engineering, problem solving, and life-long learning.

This year, their research has offered the senior students many opportunities to design solutions to global issues by capitalizing from the benefits of nanotechnology.

WEDNESDAY, JUNE 3RD, 2015

**NORTH PENN HIGH SCHOOL AUDION
SEVEN O'CLOCK P.M.**

2014-2015 RESEARCH TEAMS

2014 - 2015 Engineering Design and Development Nanotechnology & Engineering Research Teams

Welcome to the 10th annual North Penn High School Engineering Academy Nanotechnology and Engineering research presentation!

The evening will begin in the audion with introductions from each of the teams listed below to bring you up to date with the research endeavors they have been performing throughout the school year.

Join us in the auxiliary gymnasium following the audion presentations for light refreshments, poster presentations, interactive demonstrations of the students' research, demonstrations of the electrospinning and polymer preparation processes and the experimental characterization equipment that was acquired from an extremely generous grant from the Dow Chemical Company.



BCC Biotech

Cameron Benchouk
Connie Conboy
Justin Craig



BCS Technologies

EJ Bevenour
Nicholas Pleim



DeltaTech Solutions

Jacob Boyce
Jack Pedicone
Chris Sibel



Electrifiber

Joe DiFeo
Alex Noce
Connor Sloan



Valence Technologies

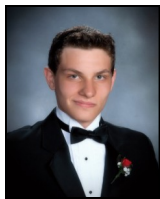
Brandon Berlin
Rahul Pendurthi
Alex Pham

Cover Image:

Student research team: Electrifier
Zeiss Primo Star Image
PAN/PEDOT-PSS Wet spun conductive fiber

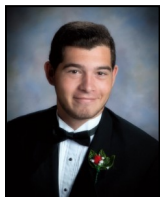
Be sure to also check out the Hitachi TM3030 Scanning Electron Microscope that Angstrom Scientific has set up in the gymnasium!

STUDENT BIOGRAPHIES
FUTURE PLANS AND GOALS



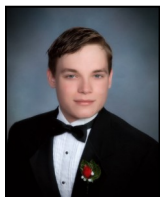
Cameron Samuel Benchouk BCC Biotech

In the fall, Cameron will be attending a 3-2 program at Lock Haven University and Penn State Abington to continue his education. He will be majoring in Pre-Engineering at Lock Haven and Materials Science at Penn State.



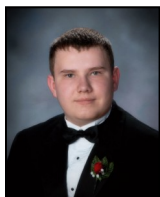
Brandon Tyler Berlin Valence Technologies

In the fall, Brandon will attend Montgomery County Community College where he intends to transfer and pursue an engineering degree from the University of Pittsburgh. He plays for the North Penn Men's Volleyball and Montgomery Township Travel Soccer Teams. Completing all five academy courses, Brandon has received nine college credits from the Rochester Institute of Technology.



Edward James Bevenour, Jr. BCS Technologies

Outside of school, E.J. Bevenour enjoys working on computers whether it is building his server or fixing friends and families computers. E.J. currently has a patent pending for "Integrated Touch Desk System" and is planning to attend Kutztown University for Information Technology. He also volunteers his time in the North Wales Library and Nash Elementary.



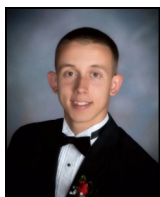
Jacob Palmer Boyce DeltaTech Solutions

Jacob has gone through and completed all five of the Engineering Academy courses. In the fall, Jacob plans to attend Penn State University at the Abington campus and then transfer to the main campus after two years. He plans to major and graduate with a degree in Electrical Engineering.



Connie Mae Conboy BCC Biotech

Connie will be attending Pennsylvania State University at the Abington campus for biomedical engineering. She will be transferring to the main campus after three semesters. Connie was interested in science early but her older brother inspired her to pursue science in engineering. She plans to explore biomechanics and working with prosthetics for people with cancer and traumatic injuries.



Justin Robert Craig BCC Biotech

Justin Craig will be attending welding school. Justin enjoys working with his hands. He completed all five courses of the Engineering Academy. In his free time he enjoys fishing, hunting and spending time with friends. Justin plans to learn commercial diving in the near future to become an underwater welder.

STUDENT BIOGRAPHIES

FUTURE PLANS AND GOALS



Joseph Paul DiFeo Electrifier

Joe has been interested in building things from a young age. This has shown throughout his years in the Tech Ed program at North Penn. He has been involved in the North Penn Model Aviation Club for two years and has also been involved in Montco's Quadforge project for 3 years. Joe plans to attend Montco for two years then transferring to Drexel for mechanical or computer engineering.



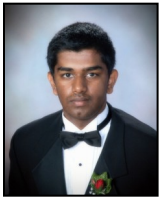
Alexander Noce Electrifier

Alex will be attending Drexel University this fall with intentions on majoring in Computer Engineering. He is the secretary of the E.P.I.C.S. club after being involved for three years and is the officer of engineering events in Science Olympiad after being a member for two years. He is excited to apply the knowledge he has learned in the Engineering Academy to his future education.



Jack Pedicone DeltaTech Solutions

Jack had shown an interest in engineering, even before joining the North Penn Engineering Academy, through his friends and family members. Along with taking the engineering courses offered, he also spent time as a member of the E.P.I.C.S. Club. He plans to attend Rowan University with a major in Electrical and Computer Engineering.



Rahul Pendurthi Valence Technologies

Rahul is working on a research area in finding better photocatalytic materials using various nanofabrication techniques to create an efficient solar cell. This experience will serve as good start to Rahul, as he will be attending Penn State Main Campus in the fall to study Engineering Science with a minor in nanotechnology. He plans to continue his research career at Penn state in nanomaterials and pursue a PhD in Engineering Science.

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Students Visit Laurel® Technologies



NPHS engineering academy research students visit Laurel Technologies Corporation in North Wales, PA to learn about the spin coating process and to tour their manufacturing and engineering facilities. Thank you!

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BCC Biotech begins antibacterial fabric research



NPHS engineering academy students in research team BCC Biotech are working on the development of chitosan nanofibers and bioabsorbable polymers. Their research this year is focusing upon the development of antibacterial fabrics that also have bioabsorbable features.

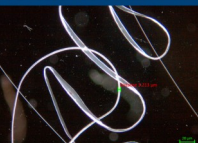
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Valence Technologies: Designing the Future



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DeltaTech Solutions: Students successfully electrospin PCL

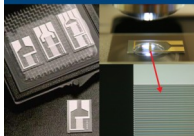


Students in the DeltaTech Solutions research team, Jacob Boyce, Jack Pedicone and Chris Sibal were able to successfully melt-electrospin PCL (polycaprolactone) for the first time at North Penn High School today. Polycaprolactone is a biodegradable polymer used in the biomedical field, 3D printing industry and many others. DeltaTech's fibers were analyzed utilizing our new Zeiss Primo Star microscope! Check back soon for images of the students' research endeavor!



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What are IME's? Interdigitated Microsensor Electrodes



Interdigitated Microsensor Electrodes (IMEs) are a family of devices developed by ABTECH Scientific, Inc. in Richmond, Virginia. They are designed to aid in the optical and electrical characteristics of thin films, coatings and polymer nanofibers. Students in the engineering academy will be utilizing these devices to help them characterize the conductive and superconductive nanofibers they are producing in class. The images to the left were taken with our Zeiss microscope and show that the spacing between the electrodes are 5 μm! Images and results will be coming soon!



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Dow - Dow Volunteer Event



STUDENT BIOGRAPHIES

FUTURE PLANS AND GOALS



Lam Ngoc Pham Valence Technologies

Lam will be studying Materials Science and Engineering at Penn State Abington in the fall. Lam is a member of the North Penn track and field team and a dance member of the Korean American Culture Society. He plans to pursue a PhD in Materials Science and continue his research to improve solar energy harvesting.



Nicholas Franz Pleim BCS Technologies

Nicholas has always been fascinated by science and engineering. From disassembling the VCR to watching “The Universe,” he has pursued a further understanding of the world around him. He is a member in the Model Aviation Club, building remote controlled planes and autonomous quadrotors. He will be attending Pennsylvania State University for Materials Science and Engineering.



Christopher Earl Sibel DeltaTech Solutions

Christopher is the vice president of both the North Penn Auto Club and the E.P.I.C.S. club. He also participated in Academic Decathlon, coming 3rd in the State for the Varsity division. He will be applying the knowledge he learned in the engineering academy while attending Florida Institute of Technology in the fall for Mechanical Engineering.



Connor Douglas Sloan Electrifier

Connor plans on attending the University of Delaware next year with intentions of majoring in mechanical engineering. After college, Connor has aspirations of working for a major engineering firm. Connor is also a captain of the North Penn Men’s Volleyball team and plans on continuing to play throughout college. Other interests include snowboarding, music, and basketball.

ool Engineering Academy Engineering Research



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ns and 3D prints custom chuck for spin coater

NPHS engineering academy students Brandon Berlin, Rahul Pendurthi and Alex Pham in research team Valence Technologies are developing a custom spin coater from a low-cost mini-centrifuge.

The team designed a chuck, or adapter in Autodesk Inventor to mount their Fluorine doped Tin Oxide glass slides to their low-cost mini centrifuge and then utilized one of the 3D printers available in the engineering academy to print their custom chuck. The device is capable of spin speeds of 12,000 rpm; however, their initial spin speeds will be run at only 5,000 RPM.

The team plans to utilize their device to create a novel photovoltaic layer for more efficient solar cells.

We have “Macro” scale vision: Zeiss Primo Star with Zeiss ERC-55

A Zeiss Primo Star microscope was delivered and installed today by Thomas Pagan of Hitach Instruments.

Thanks to a generous donation from Dow, the students of the North Penn High School Engineering Academy now have the ability to characterize much of their research with a high quality, research grade microscope from Zeiss!

Check back soon for images of the students’ research endeavors!



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BCS Technologies:

Students begin testing their custom machined electrospinning apparatus!

EJ Bevenour and Nicholas Pleim are currently testing an apparatus they designed in Autodesk Inventor to collect aligned nanofibers for high temperature superconductive polymers which they plan to electrospin next week.

The disc is designed to spin at 1200rpm while holding eight scanning electron microscope mounts and four singleapphire substrates.

The students plan to electrospin YBCO (yttrium barium copper oxide) nanofibers to the disc and test their conductivity utilizing liquid nitrogen, a Keithley 2450 Source Meter, Interdigitated Microsensor Electrodes and a Signature Four Point Probe.

The disc and the materials were donated and machined by Edward Stachowicz at EDS in Philadelphia. Thank you so much Mr. Stachowicz!!!!

ool Engineering Academy Engineering Research



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Engineers Visit NPHS!

On Thursday, March 19th, five engineers from The Dow Chemical Company visited the Future is NEAR program to learn about the research endeavors the students are performing this year.

The students presented their research, including the successes and challenges they have had so far this year. The engineers offered invaluable insight, ideas and suggestions to help them prepare the designs of their next set of experiments. Thank you so much!

Check back soon for more information soon!

Team Electrifier:

Students electrospin, wetspin and spincoat Polycarylonitrile and copper composite nanofibers!

Fibers were analyzed with the our new Zeiss microscope. Next will be electrical characterization with our new Keithley 2450 SMU!

Philly Materials Day

Science & Engineering Fun for All Ages

Saturday Feb. 27, 2015 10am-4pm FREE & OPEN TO THE PUBLIC

The Future is NEAR logo is visible in the background.

ACKNOWLEDGEMENTS



We would like to especially thank Mr. Burton T. Hynes, NPHS Principal, for his support of the engineering academy and the nanotechnology research program.

His support has been instrumental to the success of the students and the entire program.

Valerie Vastine-Orbell Consultant / Grant Writer

Edward Stachowicz EDS Manufacturing

North Penn High School

Bob Lanetti, Gene Serianni, North Penn Facilities
Chris Doerr, Craig Weierman, Bob Gillmer North Penn Communications Media
Nina Ferrant, Mark Keagy, Craig D'Aquanno, Science Department
Denise Leach, Patti Sell
NPHS Art Department
NPHS Technology & Engineering Department

Drexel University

Dr. Michel Barsoum
Dr. Edward Basgall
Holly Burnside
Dr. Hao Cheng
Dr. Kapil Dandekar
Joanne Ferroni
Dr. Richard Knight
Dr. Zhorro Nikolov
Dorilona Rose
Dr. Antonios Zaviliangos



University of British Columbia

Dr. Frank Ko

North Montco Technical Career Center

Dr. Lori Dodson

Dual Credit Biotechnology program



ACKNOWLEDGEMENTS

“A vision without resources is just a hallucination...”

Dr. Joseph DeSimone, 2008 Lemelson –MIT Prize Recipient



The Dow Chemical Company

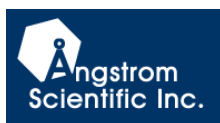
Justin Land, Spring House Community Advisory Council

Thank you so much to the Dow Chemical Company for providing the funding through their Community Advisory Council STEM grant! Their very generous donation has given vision to the students of the North Penn High School Engineering Academy and has made their endeavors come to life with the ability to characterize their findings with true research grade laboratory equipment!!



HITACHI
Inspire the Next

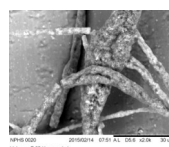
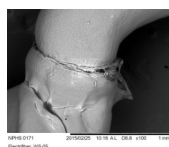
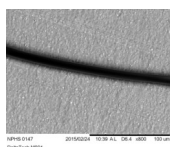
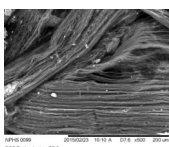
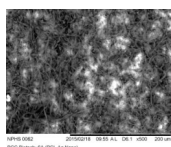
Robert Gordon,
Hitachi High Technologies
America



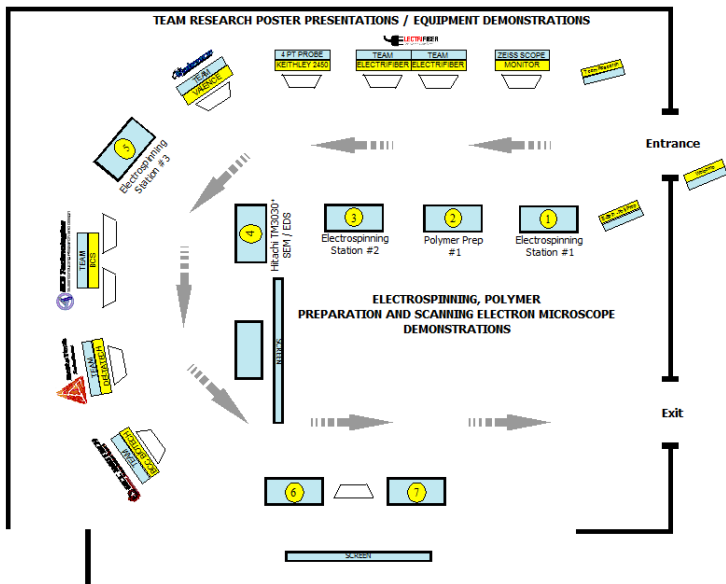
Evan Slow,
Angstrom Scientific



We would like to give a special thank you to Robert Gordon of Hitachi High Technologies and Evan Slow and Justin Rack of Angstrom Scientific for their support! Much of our success was only possible because of the generous loan of the Hitachi TM3030 Scanning Electron Microscope! Please check out their demonstration in the auxiliary gymnasium!



2014-2015 Nanotechnology Demonstration Layout



Please join us in the auxiliary gymnasium following the audio presentations for light refreshments, poster presentations, interactive demonstrations of the students' research, demonstrations of the electrospinning and polymer preparation processes and the experimental characterization equipment that was acquired from an extremely generous STEM grant from the Dow Chemical Company.

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