



Biomedical Engineering Program (BMEG)

Definition: application of the principles and problem-solving techniques of engineering to biology and medicine.

Focus: on the advances that improve human health and health care at all levels.

Department of Chemical and Biomedical Engineering
Statler College of Engineering

BMEG undergraduate program

Program started in 2014; 1st graduating class 2017

Seeks ABET accreditation: Fall 2018

Faculty:

-9 Directly Affiliated Faculty

Facilities:

- Undergraduate Program/
Faculty: ~ 7,000 sqf (office
space)

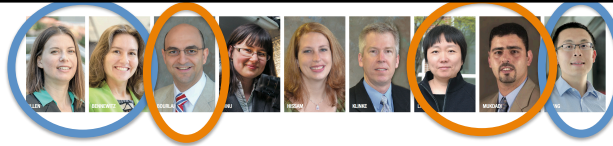
Student Population:

- Seniors 26, Juniors 27, Sophomore 39
- 4 Outstanding Seniors
- 2 Order of Augusta

- Undergrad Labs: ~ 2,000 sqf



Our Faculty



Our Undergraduate Curriculum

- Provides training that is quantitative, emphasizes problem-solving and design, and treats phenomena from the molecular to the systems level.
- Required courses in mathematics, engineering, and science establish a strong foundation for biomedical engineering major courses.
- Hands on activities highly integrated across the curriculum experience.
- **Senior design experience** with a clinical and translational component.



Example: Senior design project

Breathing Pattern Analysis for Clinical Conditions Identification

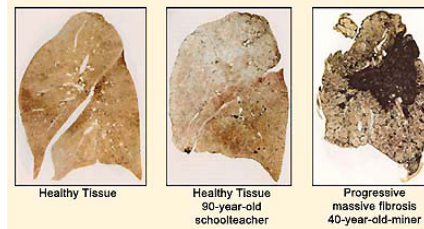
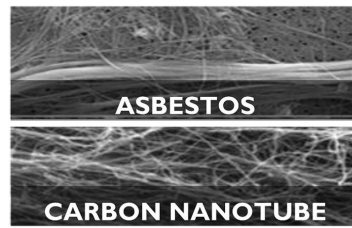
Advisor: Dr. Robin Hissam

Anna Gilpin, Caleb Abraham, Cassidy Bland, Stylianos Mastoras, Nanda Siva

Client: Dr. Jeff Reynolds, National Institute for Occupational Safety and Health (NIOSH)/ Federal mandate: to test and certify all respirators used in workplace.

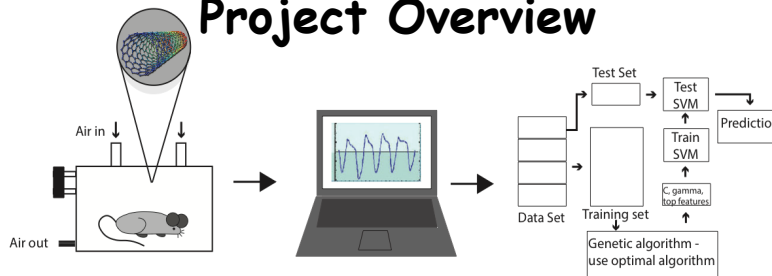
Introduction

- Carbon nanotubes (CNTs) are currently being used in applications ranging from electronics to medicine
- Human exposure to CNTs is a growing concern
- Inhalation of CNTs could possibly induce pulmonary fibrosis

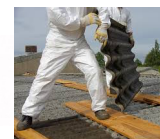
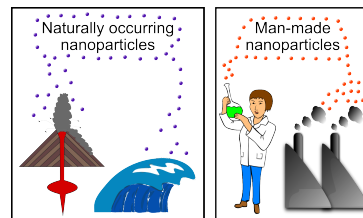


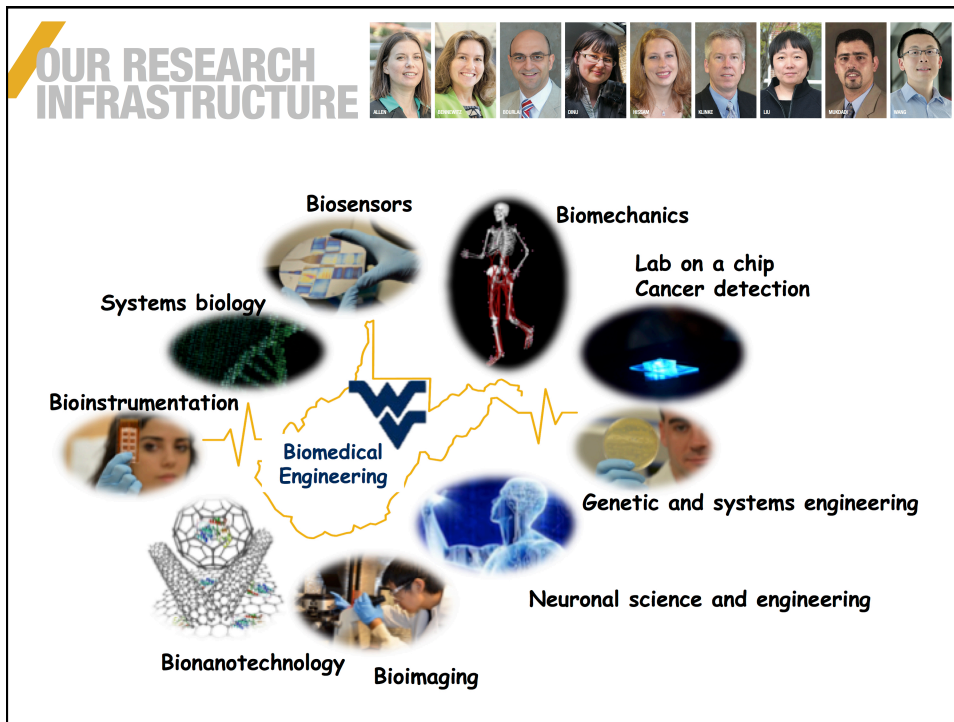
- **Goal of the capstone project:** To develop a non-invasive classifier that can provide early detection of fibrosis as a result of CNT exposure in the workplace.

Project Overview



- Determined a total of 27 key plethysmograph features to characterize breathing patterns;
- Used an algorithm that implements classification and as referred to the mathematical function implemented by a classification algorithm that maps input data to a category;
- Using the classifier, subjects with fibrosis were identified with a prediction accuracy of 73.5%





Need for growth: a graduate program in BMEG

Faculty:

- 9 Directly Affiliated Faculty

Facilities:

- Additional Research Resources: ~ 8,000 sqf (wet and dry labs, as well as graduate student offices) in AERB



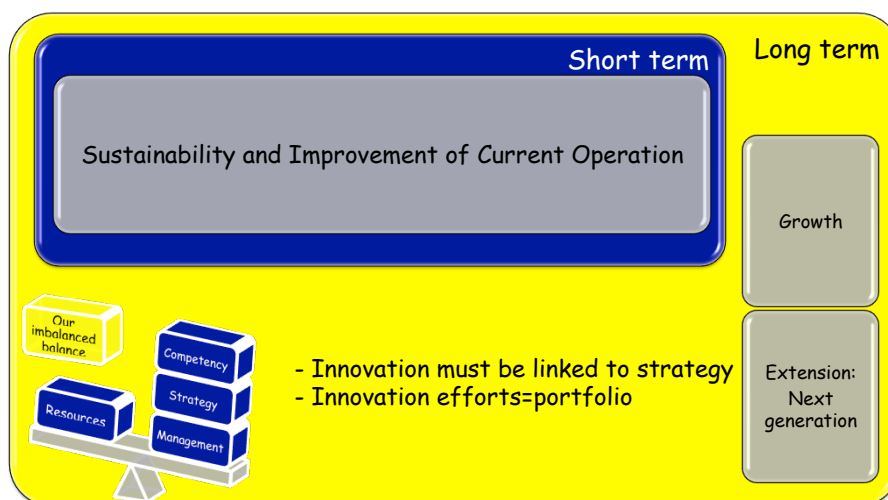
Program developed and approved by BOG on April 20
- Highly flexible curriculum: research driven

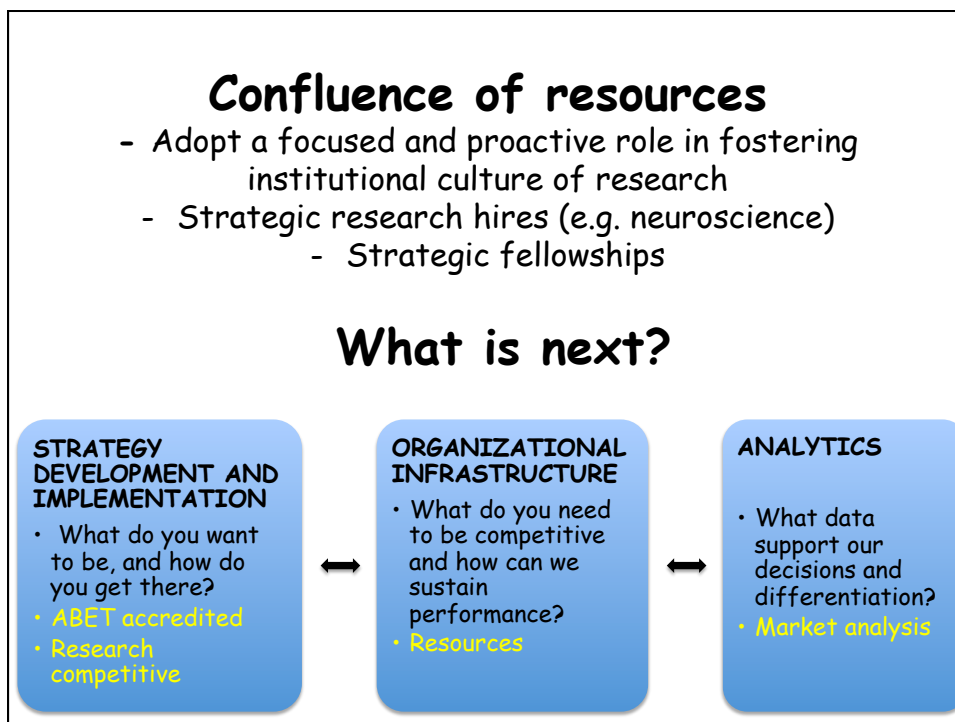
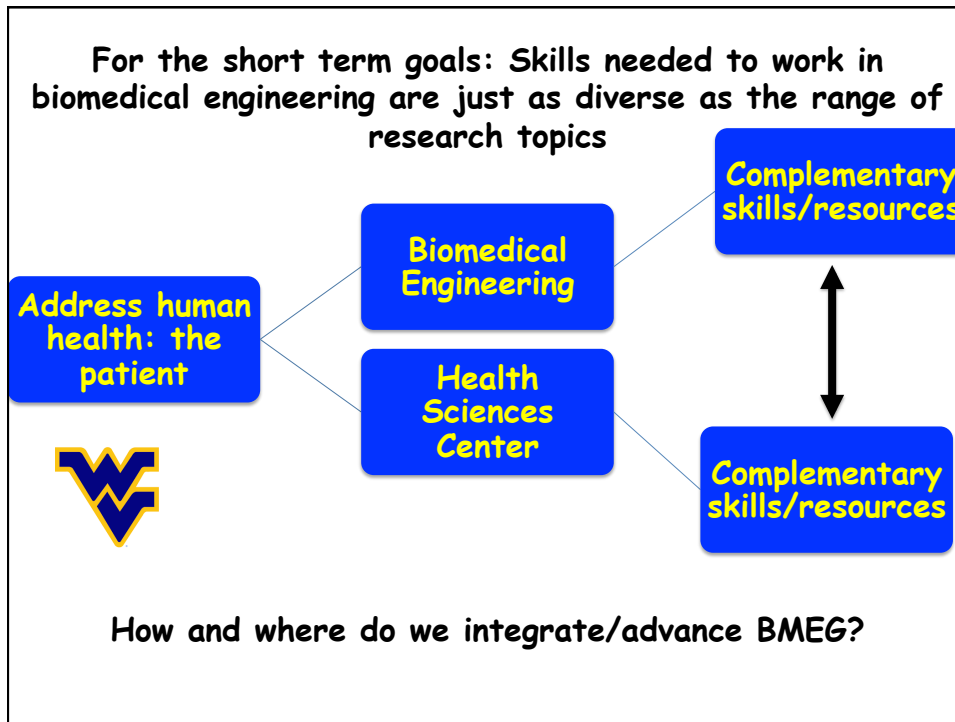
Graduate Student Population:

- Grad students to start in Fall 2018: expected 1st year: 6 PhDs
- Total "BMEG" grad students: 12 PhDs



Our mission: Sustain and innovate





Biomedical Engineering

Strengths:

- Neuroscience/ Neuromechanics
- Systems Biology
- Biosensors
- BioNanomaterials
- Lab on chip
- Biosensors
- Nanotoxicology

Interests:

- Evaluate neural, muscular, and biomechanical signals to understand, diagnose, and improve health outcomes of individuals with cognitive, neural, and/or movement deficits
- Design self-sustainable platforms for decontamination of chemical and biological warfare agents
- Develop molecular and cellular biosensors for healthcare and military deployment
- Evaluate and implement real-time strategies for nanotoxicity assessment

Differentiators:

- One of the 20 R1 land-grant universities (out of 76) with medical school and engineering campuses in close proximity
- NSF CAREER awardees, active NSF and NIH grants, previous DTRA support
- Outstanding Research, Conference Award (Team Effort), DTRA
- Active partner in NIOSH for NIH and CDC funded research (>\$5M/ 5 years)
- NSF/ NIH/ WVU Combined biomedical infrastructure investment (>\$10M/ 5 years)

Typical Brain

Autistic Brain

System

Cells

Molecule

Real-time sensitive detection of nanomaterials/ nanocomposites, and chemical and biological warfare agents

Here, going first is in our blood. It's in our sweat. And it's in our nature. So we will go above. We will go beyond. And when everyone else goes back, Mountaineers

#GOFIRST