Need for Biology In Engineering

- For decades Engineering has been a prominent discipline for technological innovations.
- Lot of biological applications use engineering tools.
- However, it is important to note that biology is an integral part of many engineering technologies
- This interdisciplinary branch which of combo of bio and engineering is known as bio-engineering.
- The world had already saw a need for bio-engineering during the covid pandemic.
- Many engineering miracles are inspired by nature. This is known as biomimicry.

Need for Biology In Engineering

Nature Inspired Engineering Tools

Shinkansen

KingFisher

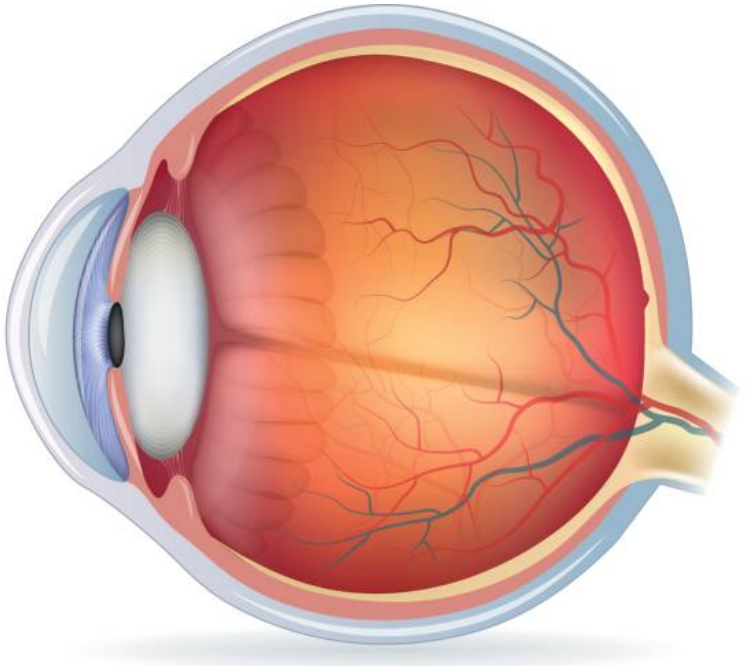
To avoid the sonic booms created by bullet trains the engine was redesigned looking at the bird. This model helped the train to enhance speed by 10% utilizing less electricity.

Need for Biology In Engineering

Nature Inspired Engineering Tools

Camera

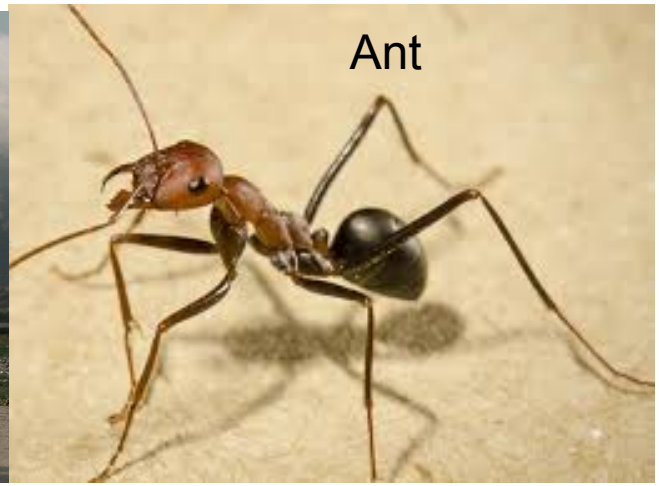
Eye



The connectivity of lens to circuits in natural systems led to invention of such artificial set-ups which are known as cameras.

Need for Biology In Engineering

Nature Inspired Engineering Tools



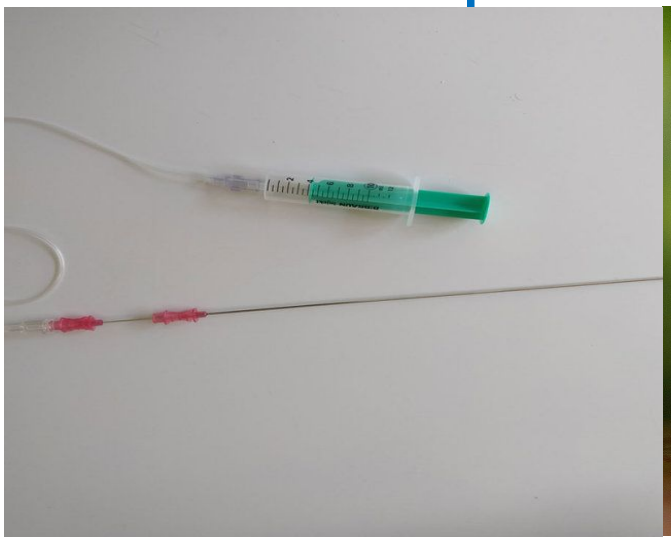
Need for Biology In Engineering

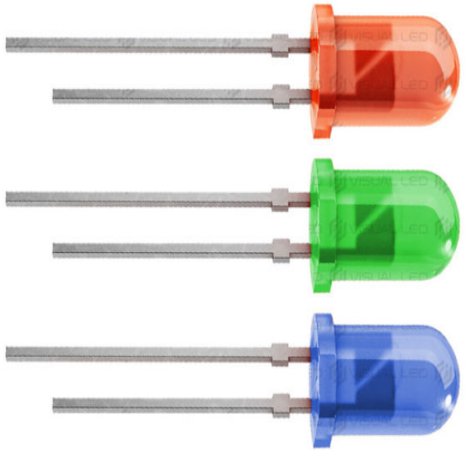
Nature Inspired Engineering Tools

Drone

Need for Biology In Engineering

Nature Inspired Engineering Tools





Proboscis of Mosquitoes lead to development of 3 pronged surgical needles.

Fireflies projections let to establishment of symmetrical projections which improved LED outputs by 90%.

Need for Biology In Engineering

Engineering Tools In Biology

Magnetic Resonance Imaging
- Physiologists biological function
- Chemists new imaging agents
- Psychologists mental function
- Physicians medical implications

CT- SCAN
- Physiologists biological function
- Chemists Contrast chemical agents
- Physicians medical implications

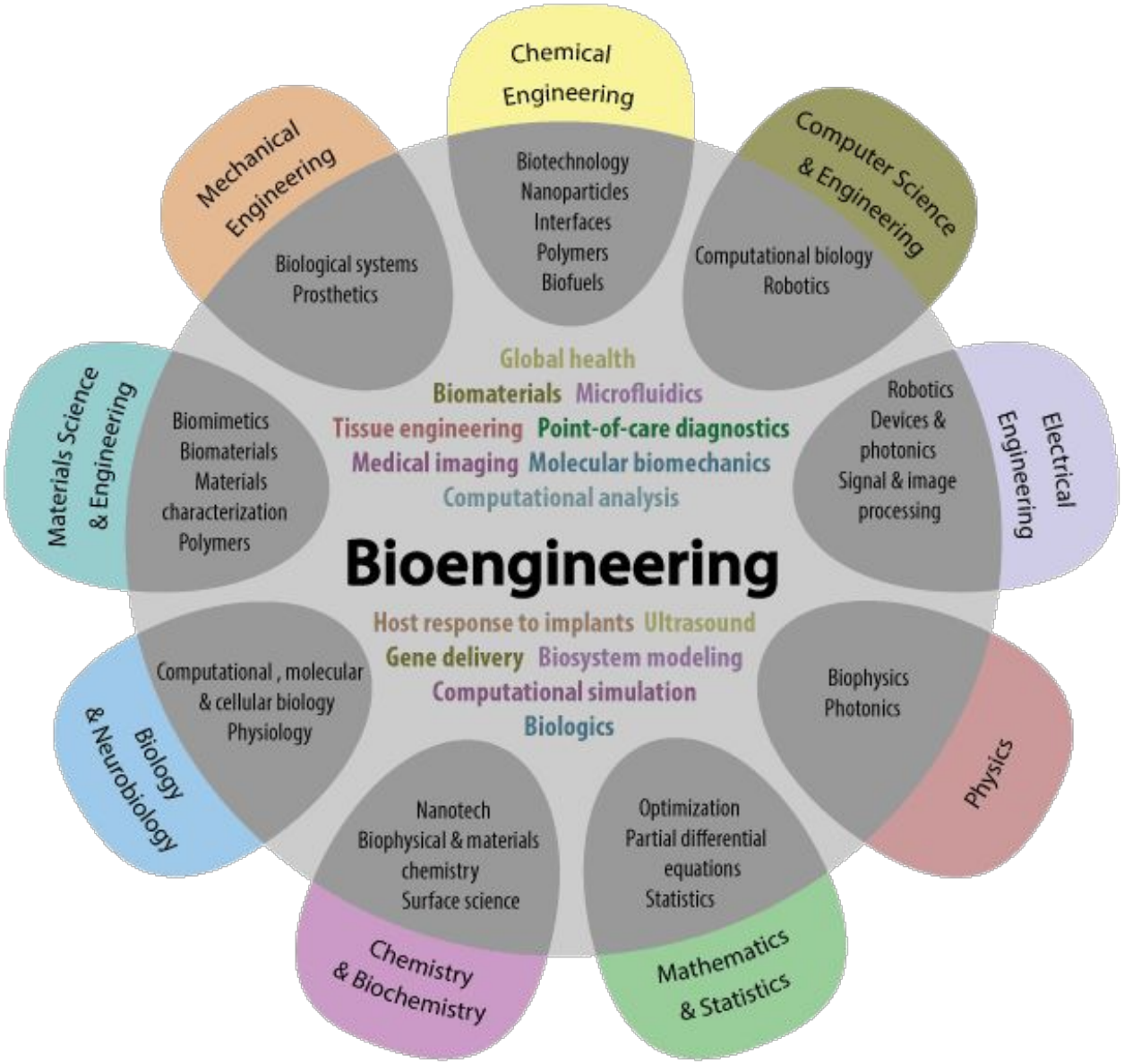
Need for Biology In Engineering

Engineering Tools In Biology

Smartwatches
- Heart rate monitor
- Sleep trackers
- SpO2 Trackers
- Activity logs, etc.

Glucose Monitors
- Checks sugar levels
- Crucial for diabetes

Need for Biology In Engineering



https://bioe.uw.edu/academic-programs/about-bioengineering/

Need for Biology In Engineering

Assistive Bioengineering: A technology that is developed to help organisms but DOES NOT change them.

- Eyeglasses
- Wheelchairs
- Antibiotics

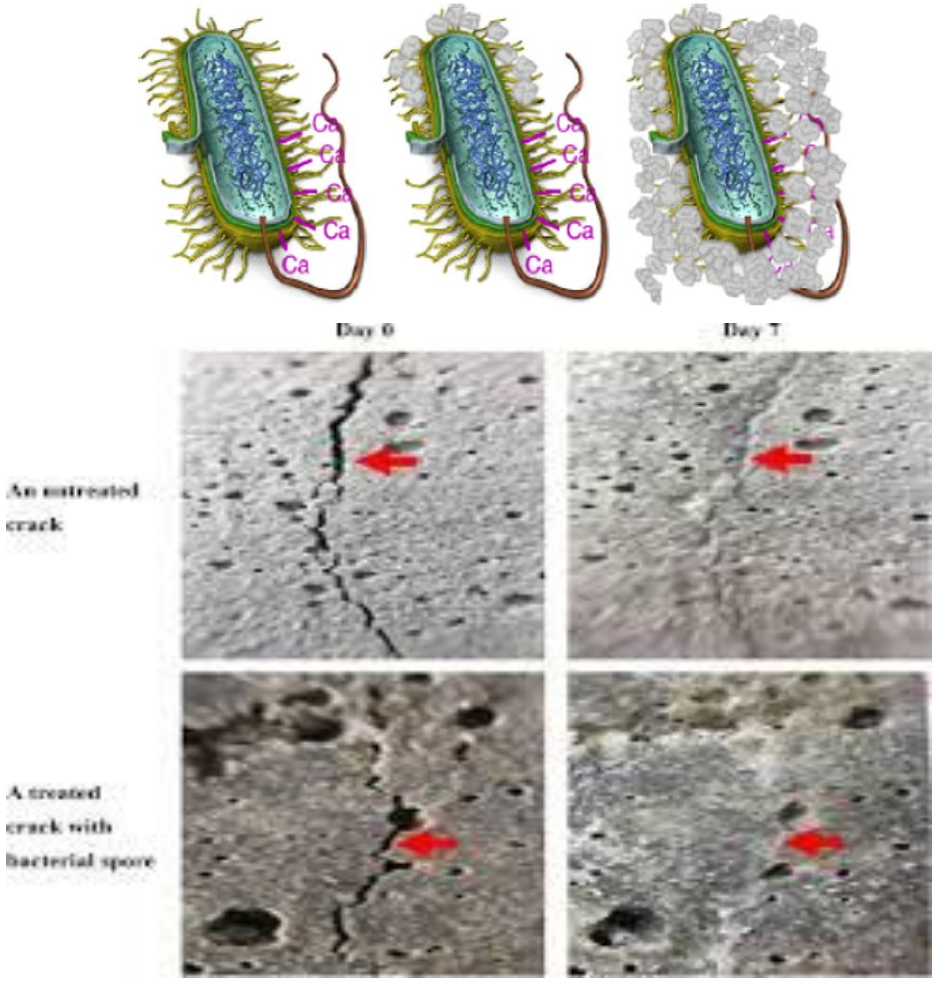
Adaptive Bioengineering: A technology developed to help living organisms and DOES change them.

- Lasik Eye Surgery
- Knee replacement
- New strains of crop in agriculture

Need for Biology In Engineering

CIVIL

- create a more natural home environment.
- Development of sustainable building practices which involves Biological Materials.
- For Example: Self healing cracks. A type of self-healing concrete can be achieved by using microbial agents (*Bacillus sphaericus*) that induce calcium carbonate precipitation inside a concrete crack



https://doi.org/10.1038/s41598-019-49002-6

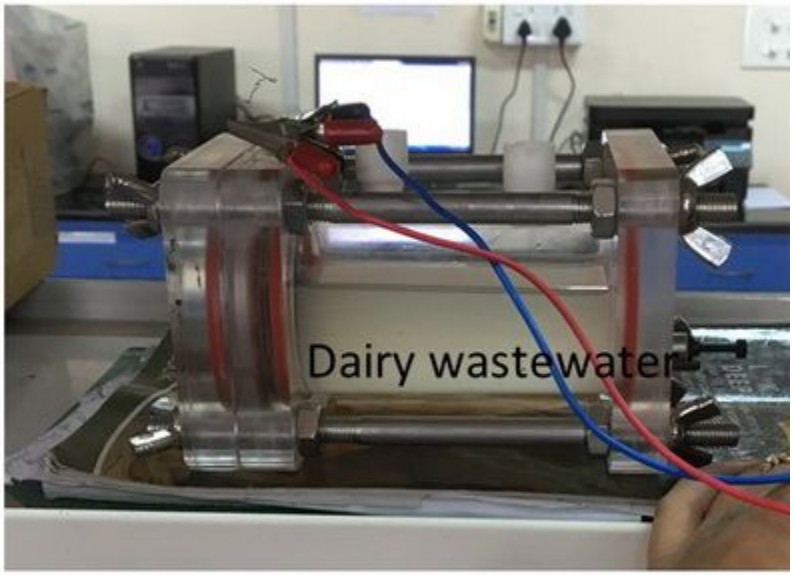
Need for Biology In Engineering

Electrical

- Certain bacterial (*Shewanella* and *Geobacter)* do consume and produce electrons at different energy potentials.
- Eg: Microbial Fuel Cells.

Comparison between synthetic and dairy wastewater in a Single Chamber Microbial Fuel cell

The output Voltage from synthetic wastewater is 485 mV.



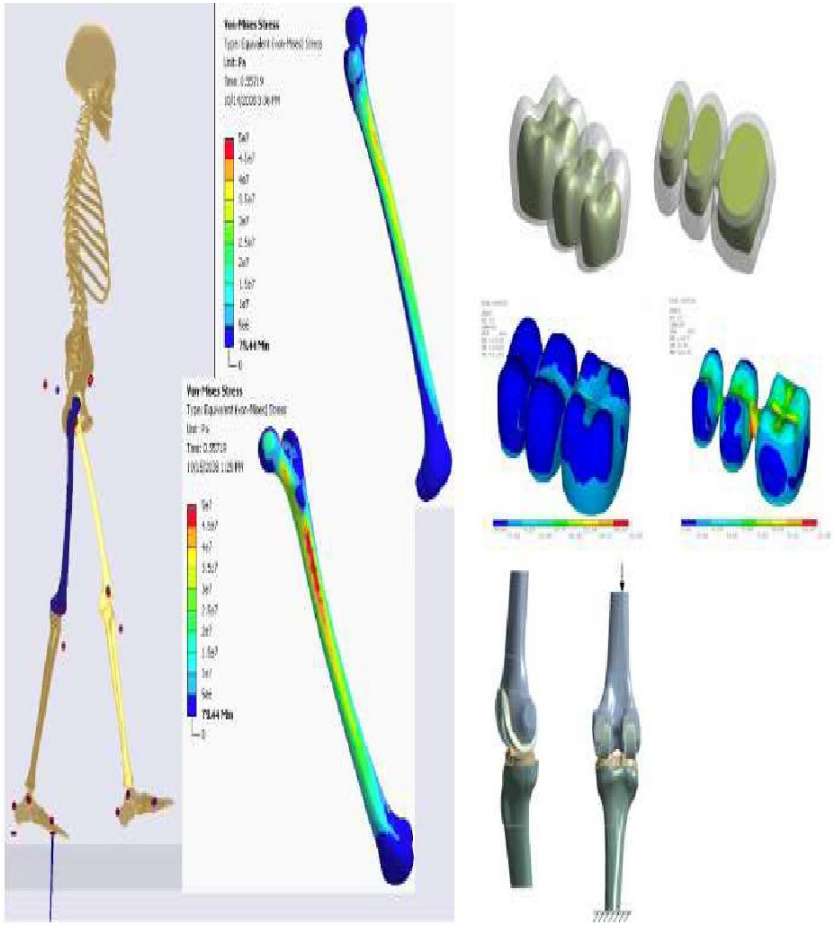
The output Voltage from synthetic wastewater is 561 mV.

https://doi.org/10.5599/jese.1030

Need for Biology In Engineering

Mechanical

- Development of Designs as studied earlier.
- Importance of fluid flow and surface mechanics of cells play pivotal role in developing fluid mechanics and mechanotransductions.
- Eg: Nanofluids for Biological use (drug and gene delivery, bio detection of pathogens, detection of proteins, probing of DNA structure and tissue engineering)
- Eg: Development of Prosthetics

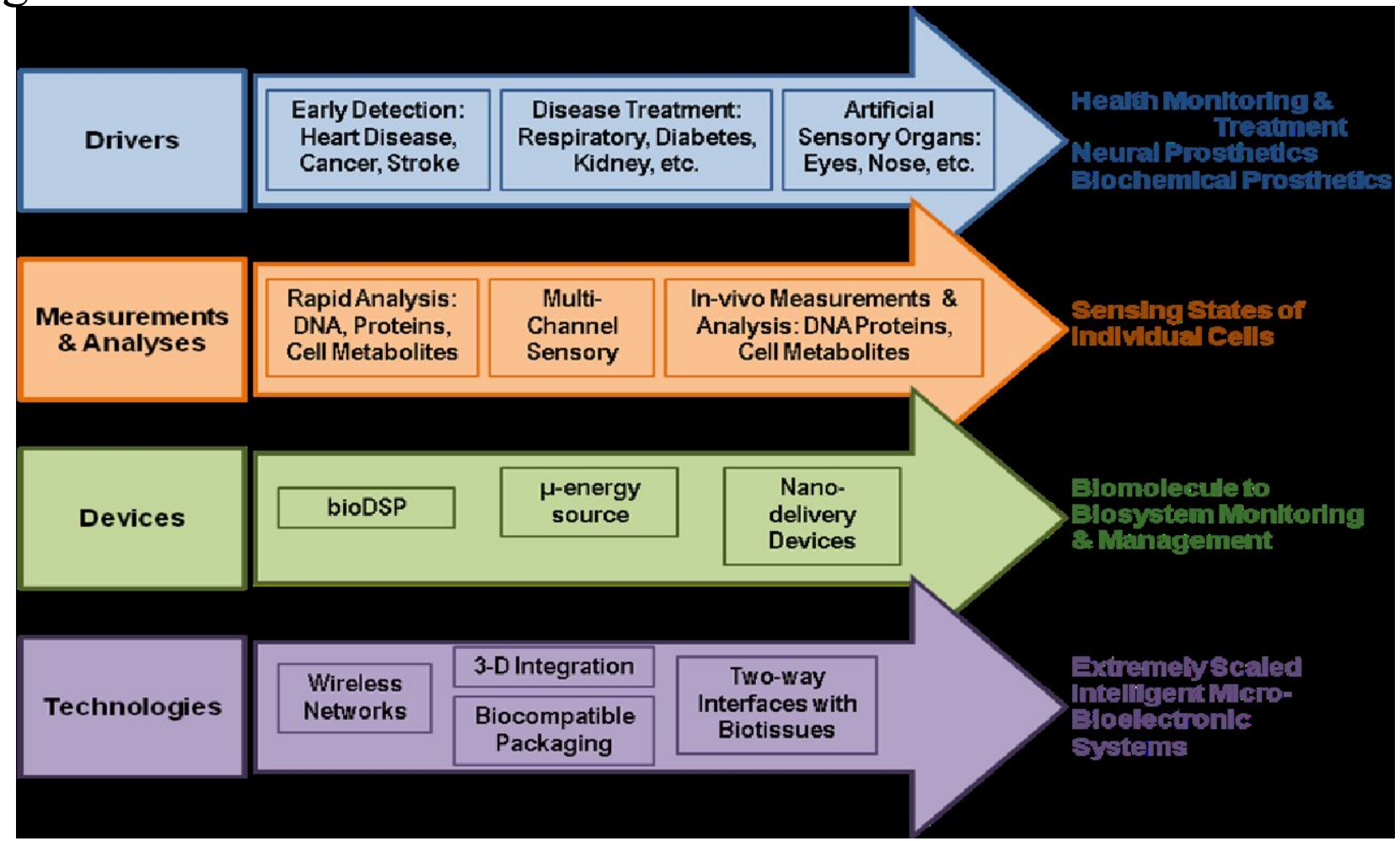


DOI: https://doi.org/10.26415/2572-004X-vol1iss3p62-75

Need for Biology In Engineering

Electronics

- A good advancement has been attained from Bio-Electronics.

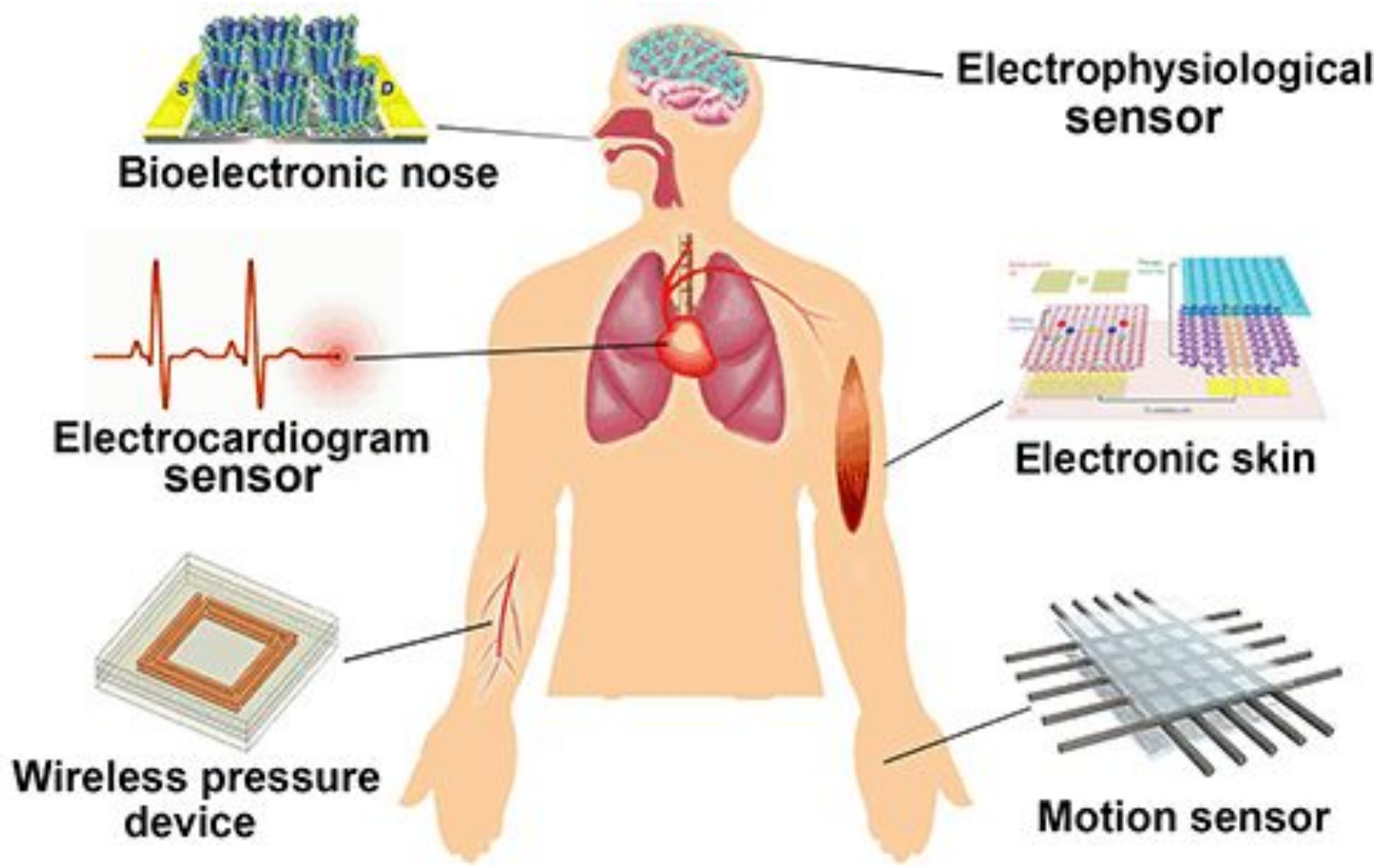


Nist.gov.in

Need for Biology In Engineering

Electronics

- BioElectronics – Smart Devices



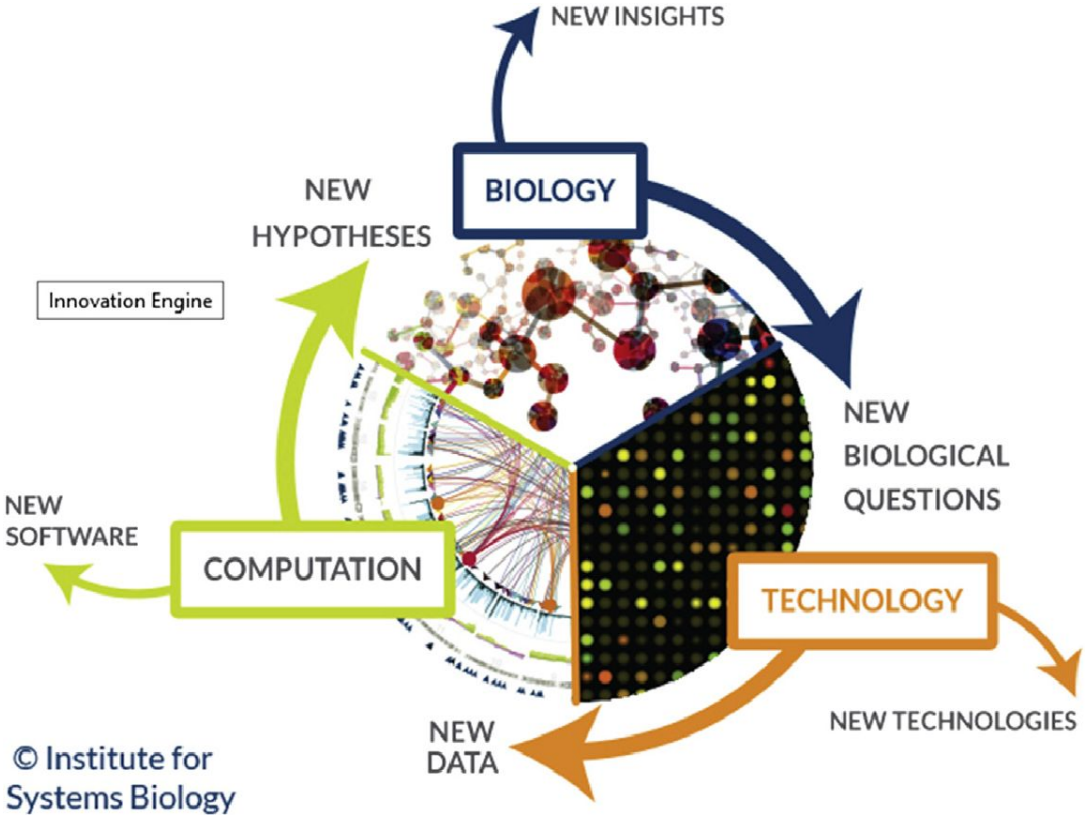
Need for Biology In Engineering

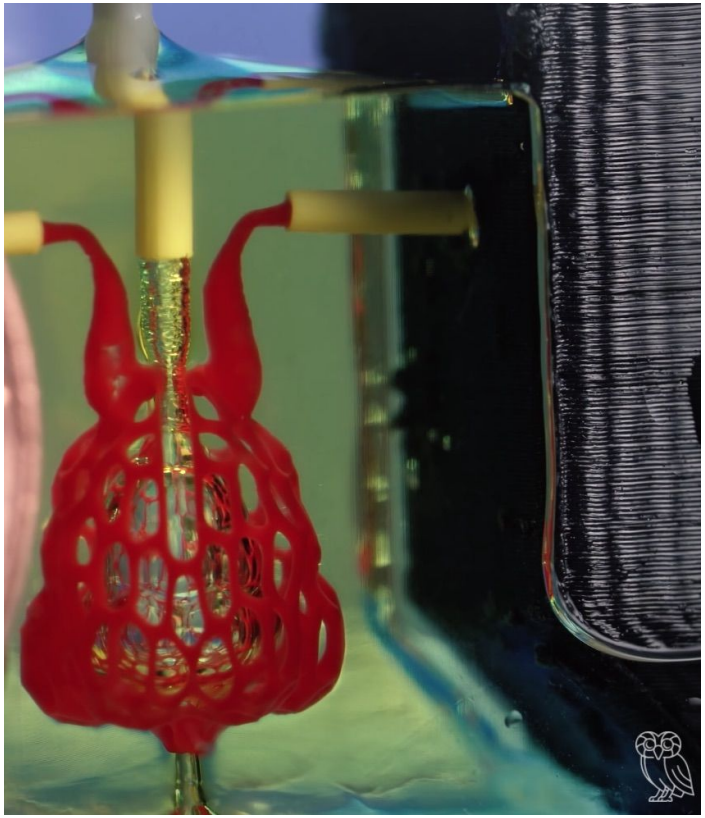
Computer Sciences

- Majority of Equipment used for research and diagnosis have software utilities.
- A lot of softwares and applications have to be developed that addresses the needs of several Biological Personnel.
- The evolution of neural networking is one of classical examples of biomimicry.
- Bio-Informatics a computational bio area focusses data analysis, mathematical modeling and computational simulations to understand biological systems and relationships.

Need for Biology In Engineering

Computer Sciences





https://doi.org/10.1016/B978-0-12-813762-8.00002-5