

General aspects of Biomedical Engineering



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Opinion

Biomedical engineering is an emerging inter disciplinary field that homogenize engineering with life sciences. The relevance of this area can be perceived our everyday lives corresponding to visiting a hospital, sustaining a medical treatment or even while purchasing health products such as an automated blood pressure monitor device. Over the past few years we have acquainted a great technological augmentation in health care owing to a communal work of engineers, mathematicians, physicians, computer scientists and many other affluent white-collars. Biomedical engineers manoeuvre engineering concepts and technology for evolution of instrumentation, diagnostics and therapeutic devices, artificial organs and other variant medical devices desired in health care and in hospitals.

Its main role has been to examine précised portion of biology and medicine to establish areas in which advanced technology might be expedient.

Biomedical engineering principles employ in different fields such as-

- a) Electrical and electronics domain -Instrumentation and bio amplifiers
- b) Mechanical domain - Artificial limbs, prostheses
- c) Physical domain- Diagnostic imaging and therapeutic devices
- d) Chemical domain- Biosensors and chemical analyzer's
- e) Optical domain- Fiber optics, optical measurements
- f) Computer science- Computational medicine, signal and image analysis, Information systems
- g) Material science- Implanted devices and artificial tissues

Biomedical engineers endeavor to understand, transmute or restraint the biological systems through applications of engineering system analysis, physiologic modeling, simulation and regulation. Their main aim is to design and manufacture products that can

monitor physiological functions or display anatomic details and also detection, measurement and monitoring of physiologic signals through biosensors,biomedical instrumentation and medical imaging.

Assisting in diagnosis and treatment of patients by computer analysis of patient-related data is a vital part of biomedical engineering industry.

- a) A few important milestones in the advancement of medical instruments are-
- b) Thermometer: 1603- Galileo; 1625- body temperature management.
- c) Optical lens: 1666- newton; 1850- ophthalmoscope, Helmholtz.
- d) Stethoscope: 1819,hollow tube; 1851, binaural stethoscope.
- e) Hypodermic syringe: 1853, wood.
- f) X-Ray: 1895, roentgen; 1896, in diagnosis and therapy.
- g) Radioactivity: 1896, curie; 1903, in therapy.
- h) Electrocardiograph: 1887, waller, capillary meter; 1903, Einthoven; galvanometer, 1928, vacuum tube.
- i) Electroencephalograph: 1924, Berger.ph electrode- 1906, Cremer.
- j) Electrical surgical unit, 1928.
- k) Cyclotron, artificial radionuclides: 1936, Lawrence.
- l) Assisting ventilator: 1928, 'iron lung'; 1945, positive pressure.
- m) Ultrasonic imaging: pulse echo, 1947; Dopler, 1950's.
- n) Magnetic resonance imaging(MRI): NRM, Bloch, Purcell; MRI,1982.

- o) Computed tomography: 1969, Cormack, Hounsfield.
- p) Electrical heart defibrillator: 1956, zoll; 1980, implanted.
- q) Implanted electrical heart pacemaker- 1960, Greatbatch.
- r) Heart valves; 1975.
- s) Cardiac catheter; 1975.
- t) Artificial kidney(dialysis); 1960.
- u) Artificial heart; 1984.

I think that applying engineering techniques to the human body is a fascinating, absorbing and rewarding endeavor with

many potential benefits for health care. Arguably, all engineering disciplines seek to further our quality of life, however, what interests me in bioengineering is that it can directly affect and improve our health and well being. Applications like innovatively designed needle-less injections could reduce the great number of injuries due to syringes, and developments in minimal access surgery using imaging techniques will be incredibly valuable, for example, in reaching inaccessible disease areas. While undertaking work experience at a General Practice, I quickly realized that I would like to have a positive impact on health care, retaining a focus on engineering.



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