Commentary

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Biological Engineering: An Overview

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About the Study

Biological engineering, often known as bioengineering, is the use of biological principles and technical methods to build practical, tangible and economically viable products. Mass and heat transfer, kinetics, biocatalysts, biomechanics, bioanalyst bioinformatics, separation and purification procedures, bioreactor design, surface science, fluid mechanics, thermodynamics and polymer science are some of the pure and practical sciences that are used in biological engineering. It's employed in the development of medical devices, diagnostic equipment, biocompatible materials, renewable energy, ecological engineering, agricultural engineering, process engineering, and catalysis, as well as other fields that help people live better lives. Bacteria created to manufacture chemicals, novel medical imaging technology, portable and speedy disease diagnostic gadgets, prostheses, biopharmaceuticals, and tissue-engineered organs are all examples of bioengineering research. Luigi Galvani's seminal work on the electrical excitability of muscles and neurons in the late 1700s paved the way for future research. Jean Pierre Flourens pioneered the experimental approach of performing targeted brain lesions in living animals and reporting their consequences on motility, sensitivity, and behavior in the first part of the nineteenth century. Emil du Bois-Raymond demonstrated the electrical character of the nerve signal in 1843, which Hermann von Helmholtz went on to test, and Richard Canton discovered electrical phenomena in rabbits and monkeys' brain in 1875. Similar observations of spontaneous electrical activity in the brains of rabbits and dogs were published by Adolf Beck in 1890. Parallel to this research, Paul Broca's work with brain-damaged patients revealed that certain brain regions were responsible for specific functions. Broca's findings were seen at the time as proof of Franz Joseph Gall's theory that language and certain psychological functions were concentrated in specific parts of the cerebral cortex. The notion of localization of function was backed by John Hughlings Jackson's observations of epileptic patients, who accurately extrapolated the architecture of the motor cortex by following the passage of convulsions across the body. Carl Wernicke expanded on the hypothesis of separate brain regions specializing in language comprehension and production. The Brodmann cerebral cytoarchitectonic map (relating to study) is still used in modern research using neuroimaging techniques.

Neuroscience became acknowledged as a distinct academic discipline in its own right during the twentieth century, rather than as studies of the nervous system within other sciences. Beginning in the 1950s, Rioch pioneered the combination of fundamental anatomical and physiological research with clinical psychiatry at the Walter Reed Army Institute of Research. Schmitt founded a neuroscience research programme at the Massachusetts Institute of Technology's Biology Department during the same time period, bringing together biology, chemistry, physics, and mathematics. James L. Smith established the first freestanding neuroscience department (then known as Psychobiology) at the University of California, Irvine in 1964. The Department of Neurobiology at Harvard Medical School, founded by Stephen Kuffler in 1966, was the next to open. During the twentieth century, our understanding of neurons and nervous system function got more accurate and molecular. The Hodgkin–Huxley model, for example, was introduced in 1952 by Alan Lloyd Hodgkin and Andrew Huxley as a mathematical model for the transmission of electrical signals in neurons of the giant axon of a squid, which they dubbed "action potentials," and how they are originated and propagated. Richard FitzHugh and J. Nagumo created the Fitzhugh–Nagumo model, which simplified Hodgkin–Huxley. Bernard Katz modeled neurotransmission across synapses, the gap between neurons, in 1962. Eric Kandel and colleagues began studying metabolic changes in neurons linked with learning and memory storage in Aplysia in 1966. The Morris–Lecar model was created in 1981 by Catherine Morris and Harold Lecar, who integrated these models. Biological neuron models and neural computation models arose as a result of this increasingly quantitative effort. Several significant neuroscience organizations were founded to provide a platform for all neuroscientists over the twentieth century as a result of the growing interest in the nervous system. For example, the International Brain Research Organization, the International Society for Neurochemistry, the European Brain and Behavior Society, and the Society for Neuroscience were all created in 1961, 1963, 1968, and 1969, respectively. Neuroeconomics, neuroeducation, neuroethics, and neurolaw have all sprung out as a result of the application of neuroscience research findings. Brain research has progressed through philosophical, experimental, and theoretical phases, with future work on brain simulation expected to be crucial.