Biomedicine (also referred to as Western medicine, mainstream medicine or conventional medicine) is a branch of medical science that applies biological and physiological principles to clinical practice.

The modern thesis regarding the “structural plastic” properties of the brain, as reactions to injuries, to tissue damage, and to degenerative cell apoptosis, can hardly be seen as expendable in clinical neurology and its allied disciplines (including internal medicine, psychiatry, neurosurgery, radiology, etc.). It extends for instance to wider research areas of clinical physiology and neuropsychology which almost one hundred years ago had been described as a critically important area for the brain sciences and psychology alike. Yet the mounting evidence concerning the range of structural neuroplastic phenomena beyond the significant early 3 years of childhood has shown that there is a progressive building up and refining of neural circuits in adaptation to the surrounding environment. This review essay explores the history behind multiple biological phenomena that were studied and became theoretically connected with the thesis of brain regeneration from Santiago Ramón y Cajal's pioneering work since the 1890s to the beginning of the American “Decade of the Brain” in the 1990s. It particularly analyzes the neuroanatomical perspectives on the adaptive capacities of the Central Nervous System (CNS) as well as model-like phenomena in the Peripheral Nervous System (PNS), which were seen as displaying major central regenerative processes. Structural plastic phenomena have assumed large implications for the burgeoning field of regenerative or restorative medicine, while they also pose significant epistemological challenges for related experimental and theoretical research endeavors. Hereafter, early historical research precursors are examined, which investigated brain regeneration phenomena in non-vertebrates at the beginning of the 20th century, such as in light microscopic studies and later in electron microscopic findings that substantiated the presence of structural neuroplastic phenomena in higher cortical substrates. Furthermore, Experimental physiological research in hippocampal in vivo models of regeneration further confirmed and corroborated clinical physiological views, according to which “structural plasticity” could be interpreted as a positive regenerative CNS response to brain damage and degeneration. Yet the underlying neuroanatomical mechanisms remained to be established and the respective pathway effects were only conveyed through the discovery of neural stem cells in in adult mammalian brains in the early 1990s. Experimental results have since emphasized the genuine existence of adult neurogenesis phenomena in the CNS. The focus in this essay will be laid here on questions of the structure and function of scientific concepts, the development of research schools among biomedical investigators, as well as the impact of new data and phenomena through innovative methodologies and laboratory instruments in the neuroscientific endeavors of the 20th century [1)].

1)
Stahnisch FW. A Century of Brain Regeneration Phenomena and Neuromorphological Research Advances, 1890s-1990s-Examining the Practical Implications of Theory Dynamics in Modern Biomedicine. Front Cell Dev Biol. 2022 Jan 6;9:787632. doi: 10.3389/fcell.2021.787632. PMID: 35071231; PMCID: PMC8773698.