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Biosensors: Enhancing the Natural Ability to Sense and Their Dependence on Bioinformatics

George B. Stefano [1]
Elmer A. Fernandez [2,3]

1 Department of Psychiatry, Center for Molecular and Cognitive Neuroscience, Charles University, Prague, Czech Republic
2 CIDIE, National Research Council Scientific and Technical (CONICET), Catholic University of Córdoba (UCC), Córdoba, Argentina
3 Medical Science and Technology, International Scientific Information, Corp., Smithtown, NY, U.S.A.

Corresponding Author: George B. Stefano, e-mail: gbstefano@yahoo.com

Single cells, as part of their evolution, acquired the ability to sense their internal and external environment, move to or away from a particular environment, the latter depending on the appropriate integration of the sensory input with motor ability. Clearly, the ability to sense stimuli must be a rapid process and one that has been selected upon for survival over long periods of time in concert with environmental challenges. Interestingly, various differing sensory inputs have their own receptors to respond to a specific stimulus. Thus, we have many mechanisms that alert a cell/tissue/organism to the fact its environment has been perturbed via a specific process (receptor) e, g., light, taste etc. However, the response component of this communication exhibits commonalities (respond, dampen the response or inhibition). Utilizing the wisdom of evolutionary trial, error and random occurrences, technologies today have focused not only on highly sensitive biosensors but specific ones for select targets, including "natural ones" as well as those considered important enough to make a sensor. The novel newly developed sensors include and are not limited to amperometric probes, e.g., nitric oxide, enzymes, chemical messengers to name a few. DNA chip sensors exist, which can detect genetic expression as well as product, e.g., protein polymorphisms. Cell-free protein synthesis can lead to membrane anchored receptors. Molecularly imprinted polymers can and will substitute for antibodies and the newer DNA based chips and DNA sequencers allow for the identification of other materials that can be found in cells and organisms. The strength and stability of substances, like graphene, provides a nano substance matrix with high selectivity and a rapid process time whereby sensor elements could be attached, functioning in real-time. These sensor technologies will allow one to explore cells and organisms in an unprecedented manner, providing many different views of the process in question. In this regard, as the ability to sense more potential stimuli and targeted entities increases, the ability to interpret the ever growing information and its patterns of expression in real-time becomes more difficult for our cognitive abilities, not only for the complexity of the underlying process but also for the data deluge provided by these technologies. The significance of big data and modeling through bioinformatics emerges because it can assemble meaning from the enormous amounts of data that, for example, will emerge from cognitive and non-cognitive sensing. Our minds have limited quantitative sensing abilities, however, given the ever increasing growth of bioinformatic potential, the sensory experience will undoubtedly grow along with meaning of pattern oriented association of the incoming information. It can easily be surmised that there will be an enhanced development of autonomous biosensors, which can be linked for pattern significance. This assemblage of inputs with the potential for outputting the information in an understandable form via appropriate integration will be the basis of computer-assisted enhanced intelligence. Thus, what began as a simple assembly of sensing- and -motor- processes and their integration, in the future, is only destined for being embellished in regard to the number of components that fit into the simple scheme that evolved millions of years ago. In short, what works is preserved, however, commonality complexity and novel assemblages of the same old components mask the origin. Biomedicine will grow within this arena of development since novel technologies will emerge to claim their momentary place in advancing the discipline. In a real sense, the burst of knowledge has the potential to save lives, make for better treatment options, pursuing precision medicine by means of more cost-effective, noninvasive and patient oriented therapies [1–3].

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