

Parallel Paths of Evolution and Inspiration

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Abstract

Ingenious mathematical and technical invention has from time to time led to the development of processes and instruments that were only subsequently recognized as having parallels in nature. For example, it was not until after they had invented negative feedback that engineers and scientists discovered it in nature, in bodily temperature control and in the ability to catch a ball. It was not until after they developed the first cameras that engineers and scientists fully comprehended the lenses and sensors in human and animal eyes.

Technology and nature, invention and discovery, go hand in hand, as the author has had the opportunity to recognize through the application of electronic instrumentation designs to neuroscience, ranging from animal brain cell measurement systems to neurosurgical location systems based on electrical activity in human brains. All major advances in science are enabled by advances in instrumentation, and most advances in instrumentation are based on new insights from science. Wonderful examples of this virtuous circle in life sciences include mass spectrometry, the polymerase chain reaction, genetically expressed fluorescent proteins and in the author's personal experience patch clamp devices for measuring the conformational state and activity of individual cellular proteins.

Many prosthetic devices mimic the sophisticated processes that have evolved in nature and combine them with inspired engineering and scientific insights to create neuroprosthetics that can liberate afflicted individuals. This will be illustrated by a current project at Monash University to develop a bionic eye that interfaces directly to the visual cortex, in a multidisciplinary effort involving engineers, neuroscientists, neurosurgeons, psychologists and industrial designers.