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Review of Biological Mechanisms for Application to Instrument Design

Vital to the space program and other technological progress, the study of biosensors can lead to a better understanding of man's sensory and data processing ability, thus making possible the development of new methods of communicating information into man, new transmission systems, new data processing techniques, solution to man/machine interface problems, and the incorporation of man, as a component, into a physical system. To this end, an investigation was made of the principles of biosensor organization, structure, and function, throughout the sensed parameters, for possible application to instrument design and engineering problems.

Biological sensors are the mechanisms which enable a living organism to monitor its environment (both internal and external). As such, they are vital to successful survival. It is not surprising, therefore, that these tiny transducers and their associated systems are so sensitive and highly developed. In addition to their extreme sensitivity, they exhibit other characteristics desirable in instrumentation such as wide dynamic range, low power requirement, self-protecting mechanisms, specificity, etc.

The pressures and demands of our space exploration programs and the new requirements being established by our progress in space, are accelerating the need for advances in many areas of instrumentation. There is little assurance that all of these needs will be adequately met by the conventional process of refining or inventing strictly "physical" measuring devices and systems. It seems reasonable, therefore, to examine the principles of a different technology—the technology of nature—which accomplishes many of our goals and to derive new techniques to solve the problems of today and anticipate the needs of tomorrow.

The approach and method previously developed, as well as the body of data accumulated and evaluations made, provided valuable guidelines and a base for this interdisciplinary work. The extensive literature gathering and review were updated and current data incorporated into the material analyzed. Potentially promising applications and directions were investigated and developed further. Additional principles were investigated and applied.

Several of these concepts are ready for intensive investigation to demonstrate proof of principle and prototype development. Others need further study. And there are many yet to be uncovered by further engineering and biological analyses.

Some of the ways in which the functional mechanism of biosensors can be applied to develop new concepts of instrumentation, enhance and extend the human senses, and improve the sensitivity of existing instrumentation are described and illustrated in *Second Summary Report on a Review of Biological Mechanisms for Application to Instrument Design*, by J. Healer, et al, document number ARA-T-9211-5, Vol. 1, December 1963. Copies are available from:

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No patent action is contemplated by NASA.

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