Journal of Vestibular Research, Vol. 2, pp. 257–258, 1992
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0957-4271/92 $5.00 + .00

GUEST EDITORIAL

Editors' Note—Not infrequently, the "movers and shakers" in our field get together to present recent findings and new ideas, which invariably results in new or renewed vigor on the part of many others. Not so frequently, some insightful colleague finds the time and resources to bring together a small number of our most outstanding scientists to discuss and frame the foundation for a new initiative. Such a gathering was organised in April 1990, by Makoto Igarashi who, as then Director of Space Biomedical Division for the Universities Space Research Association, saw the importance of integrating the somewhat isolated studies relating human perception and disorientation in unusual environments. Because of the sophistication of the work represented, and its relevance to the theme of the *Journal of Vestibular Research*, the participants were invited to submit their work for publication, resulting in the first four papers in this issue. Dr. Igarashi has written an introduction, which follows as a guest editorial.

Independent and piecemeal sensory information from various modalities should be integrated most accurately within the central nervous system in order to establish the proper spatial orientation, which is essential for human locomotor activity in three-dimensional space. Ordinary vestibular inputs utilized for the maintenance of body equilibrium are subliminal in most situations. However, when the degree of stimulation is exceeded, or when stimulation takes an unusual form, it will produce unusual and unfavorable perception that may result in spatial disorientation. Such a disorientation can take place by excessive or unusual stimulation from another modality, such as vision, then it could be a vection. Furthermore, disorientation can take place by sensory mismatch or conflict among different modalities; a well-known example is space motion sickness. When the inputs have gone through the integration process, perception is established, the information is compared with the memory at the level of comparator circuit, then a decision is made to send out an order to the motor system. By performing a motor function, new sensory information is then fed into this sensory–neural–motor loop. Only accurate and desirable, good quality motor performance will allow the information to flow smoothly within this loop. Any problem within this loop can result in a disorientation, and maybe disequilibrium.

For the establishment of perception, sensory inputs, ascending systems, cerebral cortex, and limbic system including hippocampus, are all needed. Various objective measurements can be obtained through the oculomotor system, spinal motor system, and autonomic nervous system, but, even though they are clearly under the control of higher central nervous system, these basically represent functions of the hypothalamus, cerebellum, and brain stem equilibrium centers. Therefore, some discrepancies between the degree of sensory perception and/or spatial disorientation and these objective parameters are not surprising.

In the field of perception and cognition neuroscience, in order to clarify how information is being processed within the higher central nervous system, neuronal activities, which could be parallel to and could represent sensory perception, need to be analytically evaluated in a quantitative fashion. Rapid recent advancement of imaging sciences, for example, may permit, at least in part, this level of analysis in humans noninvasively. Naturally, in order to increase our knowledge, more insightful approach is definitely needed, including neurochemical analyses in experimental animals under more invasive methodology.

The Universities Space Research Association, Houston, Texas, invited a team of experts to a small workshop in Spring of 1990, focusing on perception neuroscience relating to spatial orientation and body equilibrium function. The resulting papers, which follow, are based upon the presentations at that meeting. I would like to express my sincerest appreciation to all contributors and to the *Journal of Vestibular Research*.

August, 1992

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