

At the Motor Confluence of Three 20th Century Giants: Following the Footsteps of
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Behaviour is by definition motor, typically consisting of sequences of movements of body parts that unfold in space and time. Bernstein drew attention to this spatial component, especially in relation to the evolutionary development of telereceptors, a combination that ultimately proved crucial to the dominance of animals with well-developed telereceptors, especially visual, and a spatially adapted motor apparatus to match [1]. Hebb drew attention to the neural population ("cell assembly") as the key element of brain function and proposed ways by which such cell assemblies could become associated through strengthening of their synaptic interactions by frequent use [2]. And Lashley gave a masterful treatment of the serial order in behaviour, a fundamental property of any coordinated motor act [3]. During the past four decades, our work on the brain mechanisms of motor and cognitive functions has touched all those aspects and provided the neurophysiological basis for the spatial organization of reaching movements [4], the deciphering of diverse operations by neuronal populations [5], and the neural mechanisms underlying serially drawn movements and associated transposition errors [6]. In this lecture I shall discuss those studies in reference to the pioneer work of Bernstein, Hebb and Lashley.

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3. Lashley, K. S. (1951) *The problem of serial order in behavior*. In L. A. Jeffress (Ed.), *Cerebral mechanisms in behavior; the Hixon Symposium* (pp. 112-146). Wiley: New York.
4. Georgopoulos, A.P. (2021) *Movement in Space: Following Bernstein's Thread*. In: Latash, M., "Bernstein's Construction of Movements", Routledge: New York, pp 286-292.
5. Amirikian, B. and Georgopoulos, A.P. (1999) *Cortical populations and behaviour: Following Hebb's thread*. *Can. J. Exp. Psychol.* 53: 21-34.
6. Averbach, B.B., Chafee, M.V., Crowe, D.A. and Georgopoulos, A.P. (2002) *Parallel processing of serial movements*. *Proc. Natl. Acad. Sci. U.S.A.* 99: 13172-13177.